filo diritto editore DAL 2008

FEFSTIM 2023

PROCEEDINGS OF THE

9th International Conference of Universitaria Consortium

"Physical Education, Sports and Kinesiotherapy Active People for a Healthy Future"

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Universitatea de Vest din Timișoara

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9th International Conference of Universitaria Consortium - FEFSTIM: Physical Education, Sports and Kinesiotherapy – Active People for a Healthy Future

(19-21 October 2023, Timisoara, Romania)

Editor
Elena SÎRBU

FILODIRITTO INTERNATIONAL

ISBN 979-12-80225-75-7
DOI 10.26352/HX19-FEFSTIM2023

First Edition January 2024

filodirittoeditore.com
inFOROmatica srl, Via Castiglione, 81, 40124 Bologna (Italy)
inforomatica.it
tel. 051 9843125 - Fax 051 9843529 - commerciale@filodiritto.com

INDEX

FORWARD

WELCOME

It is a great honor to invite you to attend the FEFSTIM International Conference on "Active People for a Healthy Future" which will take place from 19 to 21 October 2023 in Timisoara, Romania.
The Faculty of Physical Education and Sport of the West University of Timisoara organizes this conference in partnership with the faculties of Physical Education and Sport of the Babeș-Bolyai University of Cluj-Napoca and Alexandru Ioan Cuza University of Iași. This international scientific event is part of the numerous actions that have been organized by our faculties, members of the Universitaria Consortium.
In parallel with the congress, the Forum of Deans of Faculties of Physical Education and Sport in Romania will also take place.
We hope that this scientific event will provide the opportunity for participants to meet national and international experts and to share knowledge and experience through presentations of scientific papers, seminars and workshops.

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Objectifying Mental Training in Skiers Through the Use of Pulse Oximeter

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Abstract

Introduction: Mental training is a crucial aspect of overall well-being and performance enhancement in various aspects of life. Through mental training individuals can enhance their focus, reduce stress, increase mental clarity and physical performance.
Aim: Based on our initial hypothesis, we initiated this study with the belief that mental training plays a significant role in enhancing attention, refining training techniques, and ultimately improving performance in the sport of alpine skiing. By using the pulse oximeter, we can identify physiological changes that occur during effort and mental training in skiers.
Materials and Methods: The study subjects consisted of seven skiers from CSS Gheorgheni and seven skiers from CSS Baia Sprie, children and juniors. We have used a pulse oximeter, especially the CMS 50F device, on skiers, with accent on the following parameters: the heart rate (PR) and the level of oxygen absorbed in the blood (SpO2). For the statistical analysis, we have used the SPSS 15.0 software, ANOVA measures to investigate whether there were any differences in the indices of interest among the testing: initial, intermediate, and final.
Results: The findings indicate an inverse proportional relationship between heart rate and the level of oxygen absorbed in the blood. The observed differences in the results can be attributed to our intervention, which involved the implementation of mental imagery specifically focused on the key technical elements within alpine skiing.
Conclusions: By implementing a properly conducted mental training program significant changes in physiological indicators can be observed. Combined with a pulse oximeter it offers a new approach towards achieving optimal mental and physical health, also an enhanced performance.

Keywords: mental training, pulse oximeter, alpine skiing, physical effort.

Introduction

Mental training is a crucial aspect of overall well-being and performance enhancement in various aspects of life. Through mental training individuals can enhance their focus, reduce stress, increase mental clarity and physical performance. Beyond talent and strength, achieving a

new goal or competing at the highest level in athletics involves other factors. When physical training eventually gets harder and harder, it takes mental toughness to keep going.

Athletes that receive mental training in sports are better able to handle the difficulties of practice and competition. Mental skills training package consisting of goal setting, relaxation, imagery, and self-talk enhanced competitive gymnasium triathlon performance.[1] Psychological skills training might increase action orientation through the help of process goals, for example, an athlete could set a process goal to focus quickly on the next situation after a mistake [2,3,4].

The findings illustrate the emotional distress, specific anxiety, and varied attentional expressions of all the skiers who competed in national championship sports clubs. These outcomes will guide how we use neurolinguistic programming tailored to each sport and mental training methods for athletes in experimental groups. [5,6]. Imagery was related to increased sport-confidence [7], plays a critical role in the planning and execution of movements or actions. It is often employed to aid motor skill learning, or relearning, as well as to enhance motor performance in clinical, dance, and sport settings [8].

Therefore, mental training needs special individual supervision [9]. Therefore, creating an image of a movement can be viewed as an individual mental effort that is dependent on prior experiences and impractical without a mental model of the movement [10].

Aim

Based on our initial hypothesis, we initiated this study with the belief that mental training plays a significant role in enhancing attention, refining training techniques, and ultimately improving performance in the sport of alpine skiing. By using the pulse oximeter, namely the CMS 50F device we can identify physiological changes that occur during effort and mental training in skiers. In establishing the research hypothesis, we started from the assumptions that by applying mental imagery techniques, new behavioral patterns are created and athlete's performance in alpine skiing is improved, optimizing their performance.

Material and Methods

The study subjects consisted of seven skiers from CSS Gheorgheni and seven skiers from CSS Baia Sprie, children and juniors. The effort made by the athletes during the race is between 1,20 min and 2,30 min, which is a short duration and high intensity effort, anaerobic and anaerobic-mixed effort. The main objective was observing the subjects to determine if they have acquired relaxation techniques that can lead to a decrease in heart rate, after listening to a relaxation exercise (for example "grounding", designed by Liliana Stanciu in 2014).

A pulse oximeter, also known as CMS, or the CMS 50F watch, was the device used, with accent on the following parameters: the heart rate (PR) and the level of oxygen absorbed in the blood (SpO2). The testing was carried out with the help of a device called Computerized system for evaluation in transport and work psychology, version 04/2007, made by Management Design SRL Iași, by professor Hăvîrneanu C. (2007), at Psitest Cabinet.

For the statistical analysis, we have used the SPSS 15.0 software, ANOVA measures to investigate whether there were any differences in the indices of interest among our testing.

Results

Three tests were carried out to compare the outcomes among the skiers from CSS Gheorgheni. An initial one tested while at rest, an intermediate one tested after practicing relaxation techniques, and a final one tested after engaging in ski simulator workouts on a 54-gate descent, just like in the competition. Only the first two skiers in the group—subjects L.R. (who won the CSS National Championship) and M.E. (who finished third)—can be seen in the tables and graphs from the perspective of the pulse oximeter. In table 1, you can see the pulse oximeter report for the above-named subjects.

Nume și prenume L.E.	Probe T Inițială		Probe T Intermediară		Probe T Finală	
	SpO2	PR	SpO2	PR	SpO2	PR
Event Data						
Total Event	0	1	0	1	0	1
Time in Event (min)	0.0	0.7	0.0	0.5	0.0	0.6
Avg. Dur. (sec)	-	43.0	-	31.0	-	35.0
Index (1/hr)	0.0	30.0	0.0	37.9	0.0	28.6
Artifact (%)	3.3	3.3	11.6	11.6	20.6	20.6
Adjusted Index (1/hr)	0.0	31.0	0.0	42.9	0.0	36.0
SpO2 Data						
Basal SpO2 (%)	**97.8**		**97.8**		**91.3**	
Time (min)<88%	0.0		0.0		0.2	
Events < 88%	0		0		0	
Minimum SpO2 (%)	96.00		96.00		44.00	
Avg. Low SpO2 (%)	-		-		-	
Avg. Low SpO2 <88%	-		-		-	
PR Data						
Avg. Pulse Rate (bpm)	**68.70**		**80.0**		**128.1**	
Low Pulse Rate (bpm)	65.00		75.0		92.0	

Nume și prenume M. E.	Probe T Inițială		Probe T Intermediară		Probe T Finală	
	SpO2	PR	SpO2	PR	SpO2	PR
Event Data						
Total Event	0	1	1	0	0	2
Time in Event (min)	0.0	0.2	0.2	0.0	0.0	1.0
Avg. Dur. (sec)	-	13.0	11.0	-	-	30.5
Index (1/hr)	0.0	31.6	34.6	0.0	0.0	57.6
Artifact (%)	0.0	0.0	0.0	0.0	9.6	9.6
Adjusted Index (1/hr)	0.0	31.6	34.6	0.0	0.0	63.7
SpO2 Data						
Basal SpO2 (%)	**87.9**		**92.0**		**85.3**	
Time (min)<88%	1.20		0.0		0.6	
Events < 88%	0		0		0	
Minimum SpO2 (%)	85.00		90.00		64.00	
Avg. Low SpO2 (%)	-		90.00		-	
Avg. Low SpO2 <88%	-		-		-	
PR Data						
Avg. Pulse Rate (bpm)	**100.9**		**93.7**		**150.3**	
Low Pulse Rate (bpm)	90		89.0		143.0	

Fig 1. Pulse oximeter for subject L.R. and M.E. - Gheorgheni group

The results of athletes M. E., who finished first, and L.R, who finished third at the 2015 CSS National Championship, are shown above. Initial test SpO2 values were reported to vary from 87.9 to 92.0 to 85.3 during subsequent tests. The following heart rate measurements were made initial test: 100.9; intermediate test: 93.7; final test: 150.3, in M.E. subject.

Initial test SpO2 levels were 97.8, intermediate test SpO2 values were 97.8 and final test SpO2 values were 91.3 in L.R. subject. The following heart rate measurements were made: first test: 68,.4; intermediate test: 80.0; final test: 128.1. All these findings show PR and SpO2 have an inversely proportional relationship. SpO2 falls as the PR increases (Fig. 1).

As a result, we may conclude that the concentration of oxygen in the blood decreases from the first to the third measurement and that an increasing amount of oxygen is used, which lowers SpO2 and raises the heart rate (Fig. 2).

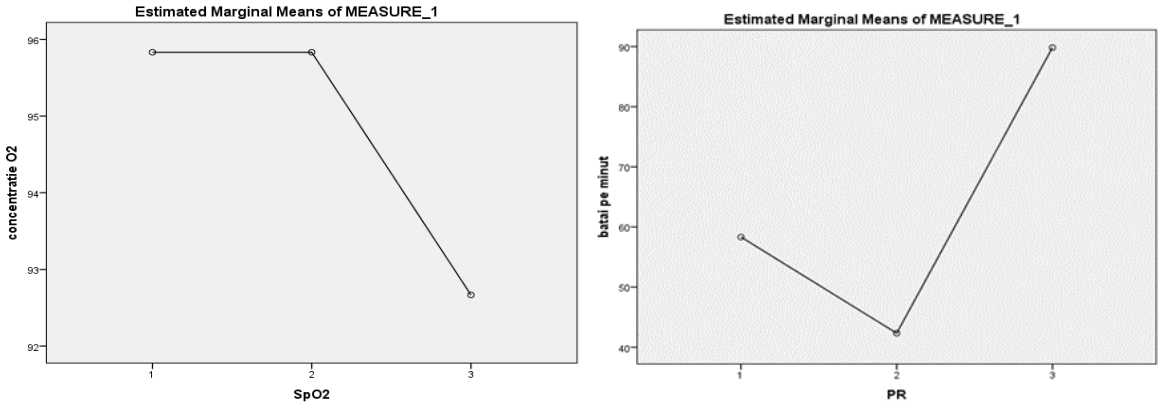


Fig. 2. Relationship of SpO2 and O2 concentration in Gheorgheni group (left)
Fig. 3. Relationship between beats / minute and PR (pulse rate)

We have also applied ANOVA with repeated measures to get PR, which stands for heartbeats per minute. As seen in Fig.3, the pulse is initially high, reduces at the intermediate measurement, and then increases at the final measurement, it presents the relationship between SpO2 and PR in all the testing.

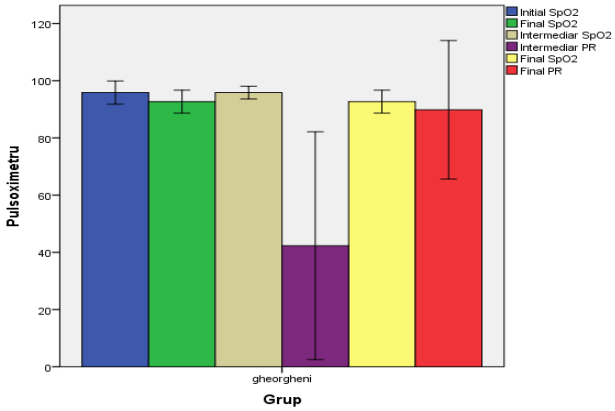
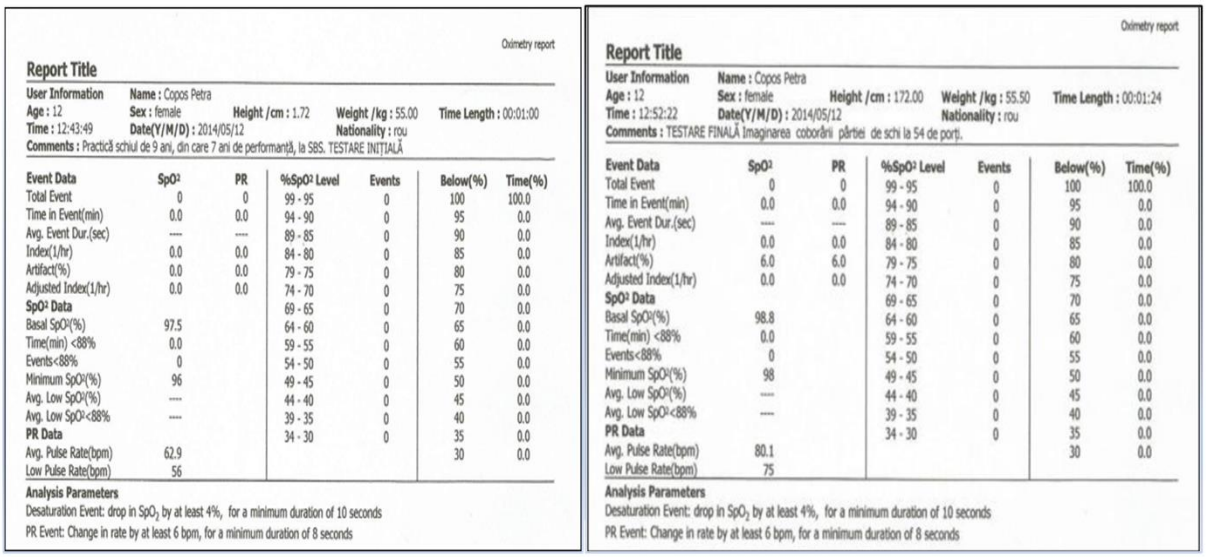


Fig. 4. The SpO_2 and PR relationship in Gheorgheni group

We need to specify that within the experimental group, the team from Baia Sprie, without a simulator, only two recordings were conducted. These recordings show the initial testing with relaxation techniques and the final testing with the recording of the descent on 54 gates (as in competition) in imaging. Additionally, the differences between the initial pulse test, which is lower with a value of 62.9, and then increases during the imaging, to grow to a value of 80.1, show that the athletes have assimilated the imaging procedures.

We shall only follow the tables and graphs from the perspective of the pulse oximeter for the first competitor in the group (the subject C.P., who won the CSS National Championship in the age group 11–13). Regarding the SpO2 values, depending on the respective test, they increased from the value of 97.5 initial test to the value of 98.8, final test (Table 2).



Oximetry report

Report Title

User Information **Name :** Copos Petra
Age : 12 **Sex :** female **Height /cm :** 1.72 **Weight /kg :** 55.00 **Time Length :** 00:01:00
Time : 12:43:49 **Date(Y/M/D) :** 2014/05/12 **Nationality :** rou
Comments : Practică schiul de 9 ani, din care 7 ani de performanță, la SBS. TESTARE INIȚIALĂ

Event Data	SpO²	PR
Total Event	0	0
Time in Event(min)	0.0	0.0
Avg. Event Dur.(sec)	----	----
Index(1/hr)	0.0	0.0
Artifact(%)	0.0	0.0
Adjusted Index(1/hr)	0.0	0.0
SpO² Data		
Basal SpO²(%)	97.5	
Time(min) <88%	0.0	
Events<88%	0	
Minimum SpO²(%)	96	
Avg. Low SpO²(%)	----	
Avg. Low SpO²<88%	----	
PR Data		
Avg. Pulse Rate(bpm)	62.9	
Low Pulse Rate(bpm)	56	

%SpO² Level	Events	Below(%)	Time(%)
99 - 95	0	100	100.0
94 - 90	0	95	0.0
89 - 85	0	90	0.0
84 - 80	0	85	0.0
79 - 75	0	80	0.0
74 - 70	0	75	0.0
69 - 65	0	70	0.0
64 - 60	0	65	0.0
59 - 55	0	60	0.0
54 - 50	0	55	0.0
49 - 45	0	50	0.0
44 - 40	0	45	0.0
39 - 35	0	40	0.0
34 - 30	0	35	0.0
		30	0.0

Analysis Parameters
Desaturation Event: drop in SpO_2 by at least 4%, for a minimum duration of 10 seconds
PR Event: Change in rate by at least 6 bpm, for a minimum duration of 8 seconds

Oximetry report

Report Title

User Information **Name :** Copos Petra
Age : 12 **Sex :** female **Height /cm :** 172.00 **Weight /kg :** 55.50 **Time Length :** 00:01:24
Time : 12:52:22 **Date(Y/M/D) :** 2014/05/12 **Nationality :** rou
Comments : TESTARE FINALĂ Imaginarea coborârii părtiei de schi la 54 de porți.

Event Data	SpO²	PR
Total Event	0	0
Time in Event(min)	0.0	0.0
Avg. Event Dur.(sec)	----	----
Index(1/hr)	0.0	0.0
Artifact(%)	6.0	6.0
Adjusted Index(1/hr)	0.0	0.0
SpO² Data		
Basal SpO²(%)	98.8	
Time(min) <88%	0.0	
Events<88%	0	
Minimum SpO²(%)	98	
Avg. Low SpO²(%)	----	
Avg. Low SpO²<88%	----	
PR Data		
Avg. Pulse Rate(bpm)	80.1	
Low Pulse Rate(bpm)	75	

%SpO² Level	Events	Below(%)	Time(%)
99 - 95	0	100	100.0
94 - 90	0	95	0.0
89 - 85	0	90	0.0
84 - 80	0	85	0.0
79 - 75	0	80	0.0
74 - 70	0	75	0.0
69 - 65	0	70	0.0
64 - 60	0	65	0.0
59 - 55	0	60	0.0
54 - 50	0	55	0.0
49 - 45	0	50	0.0
44 - 40	0	45	0.0
39 - 35	0	40	0.0
34 - 30	0	35	0.0
		30	0.0

Analysis Parameters
Desaturation Event: drop in SpO_2 by at least 4%, for a minimum duration of 10 seconds
PR Event: Change in rate by at least 6 bpm, for a minimum duration of 8 seconds

Fig. 5. Initial test, with relaxation techniques and final test, imagining going down the ski slope, 54 gates in C.P. subject.

We have evaluated the values for SpO2 and PR performed with the pulse oximeter (table 3). The oxygen absorption is inverse proportional with the pulse (Fig. 4)

Table 1. Descriptive statistics for SpO2 in Baia Sprie group

	Average	Standard deviation	N
Initial SpO2	96.15	2.609	13
Final SpO2	95.08	3.451	13

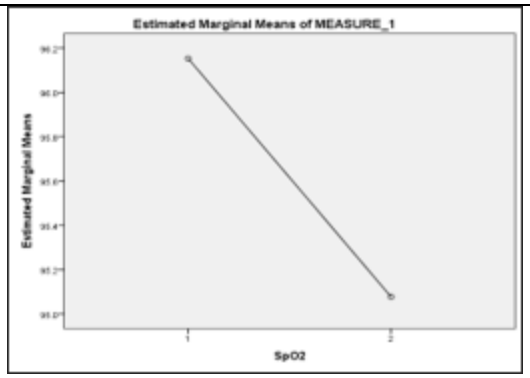


Fig. 6. Oxygen absorption is inverse proportional with the pulse

From the first measurement to the second, the graph shows a rise in pulse rate while the blood's ability to absorb oxygen falls (Table 4, Fig. 5)

Table 2. Descriptive statistics for pulse rate in Baia Sprie group

	Average	Standard deviation	N
Initial PR	45.92	43.519	13
Final PR	55.62	41.840	13

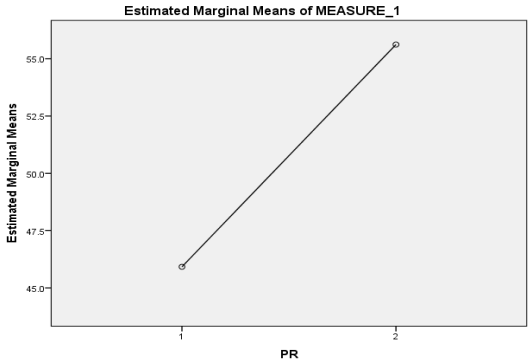


Fig 7. Increased heart rates during effort

Discussions

It has been argued that using mental techniques could help athletes improve their motor skills. According to some authors this behavioral effect is linked to alterations in premotor area neural activity that emphasize the action's key moment both during movement execution and while performing ideomotor representations.[10]

Regarding the effort in alpine skiing, improving concentration ability plays a role in self-regulating mental activity on micro intervals and intermittently. Concentration is the degree to which attention is focused on research, and it is inversely related to volume: the more an athlete concentrates, the fewer elements he fixes, and vice versa. [11]

According to numerous research, the effort of attention can be sustained for a longer period in the conditions of a decline with a varied informational field than in the event of a lower variation, such as after the start. Skiers need to know how to "focus and concentrate their attention" to get good outcomes. [12]

Our findings support some theories that athletes' success in competitions or matches is influenced by their mental skills, which enable athletes and coaches perform better during practice and competition. Setting goals, for instance, enhances abilities, methods, and gaming tactics. [10,13] Others have concentrated on the impact of personal psychological aspects on performance, such as goal planning, relaxation, imagery, and self-talk. [2,14,15]

Conclusions

After three tests were completed for the CSS Gheorgheni group, the blood oxygen level and pulse were recorded for analysis. The oxygen consumption increased, and the blood concentration decreased from the first test to the third, where we are dealing with the lowest concentration, according to statistical analyses of the blood oxygen concentration. The pulse

appears to alter over the course of the three tests; specifically, it is greater in the first test, then drops, then rises again in the last test.

Two tests were conducted on the CSS Baia-Sprie group, highlighting a drop in oxygen concentration from the first test to the second and an increase in pulse at the final test.

By implementing a properly conducted mental training program significant changes in physiological indicators can be observed. Combined with a pulse oximeter it offers a new approach towards achieving optimal mental and physical health, also an enhanced performance. Our research showed that by using a mental training programme based on images and neurolinguistic programming had a positive effect on improving alpine skiers' athletic performance. Also, we have seen a decreased stress level and mental anguish together with an improved concentration, both before and during sport

Acknowledgement

This article represents a small part of the first author's doctoral thesis.

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Introduction the Role of Monitoring the Efforts Parameters in Sports Training

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Abstract

Introduction: The training has, now, a great development based on health status, motricity potential and also psychological profile.
Aim: The aim of our literature analysis is to develop a research about the main important training parameters in athletic training in term of duration, intensity, speed.
Material and Methods: We make the analysis of 95 papers, for research database based on keywords: training intensity, duration, training, physical parameters. For included the studies we used Downs and Black checklist.
Results: We find that training intensity is one of the most important parameters that is based on heart rate, blood pressure, biochemistry changes. In specific athletic race walk heart rate (HR) allows to estimate the heart activity and report to sport performance.
We find that intensity has a linear evolution because the average of HR is 185 ± 14,9 b/min, average report HRmedium/HRmax is 0,96, but for 91,8% from whole distance, HR is ≥90% din FCmax. This means that for 1000m is the higher speed, slowly for the next 3000m, and again increase for the last 1000m.
Conclusions: The conclusion of our review is that monitoring the HR during hole distance help the athlete to develop the optimal training.

Keywords: intensity, heart rate, race walk

Introduction

In the world of sports, a topic of interest is the identification and use of the most beneficial means and methods of training in order to improve performance.

Achieving high sports performance is unthinkable without systematic training throughout the year, training that is carried out through methods and means of preparation specific to each type of sport practiced.

Sports performance training is the systematic process of developing athletic characteristics for the purpose of sports competition.

Training is defined as a "complex pedagogic and biological process carried out systematically and continuously graded to adapt the human body to physical and mental efforts of different intensities, in order to obtain results of a certain value in a form of competitive practice of physical exercises, the concept being accepted both as a cause (a dynamic process, of pedagogical essence, structured on general and specific didactic principles), and as an effect, of

state, measured by obvious biological and mental changes that intervene and considerably increase the athlete's effort capacity". [1]

In athletics, achieving a higher performance is the result of a pedagogical process of training and sports education, staggered over several years, in which athletes, through an integrative system, perfect their motor skills, competition test technique, physical and willpower qualities, strengthens the state of health, forms knowledge and skills to comply with a certain lifestyle, in order to increase work capacity in general and performance in sports competition.

All movements performed by humans are made possible by the fact that muscle works as an energy transformer, converting chemical energy into mechanical energy.

Chemical energy can be released by process in which O2 does not intervene (aerobic pathway) or by chemical reactions in which O2 is indispensable (aerobic pathway).

By studying how competitive conditions require the use of only one or both chemical energy release pathways, three types of effort have been described: anaerobic, aerobic and mixed.

The main characteristic of aerobic efforts is the achievement, after an initial adaptation period of 3-5 minutes, of a constant level of O2 consumption during the effort (steady-state).

If the intensity of the effort in the competition does not exceed approximately 50% of the maximum oxygen consumption (VO2max) of the athlete, a total balance can be achieved between the O2 consumed and that required for the performance of the effort (stable state, true, real steady-state).

The O2 debt contracted only during the adaptation period represents a percentage of the total O2 consumption that is smaller the longer the effort lasts.

In this paper, we propose a review of the profile of the athlete who practices marching, a profile sketched by analyzing the specialized literature.

Materials and Methods

We make a narrative review based on analysis of 22 papers, in field of sports training focused on race walk. For our documentation we access database including Web of Science, PubMed, Medline, Medscape, Sport Discuss.

In order to create a narrative review, we browsed the PubMed database and also other electronic database with the keywords: `efforts, physical activity, cardiovascular parameters and marching race, respiratory parameters, exercise profile. Our research includes original articles, review articles and case reports. All original articles, regarding physical training, functional parameters, in race walk characterized by high energy consumption. Our review proposes to present information about the following important topics: effort profile in race walk, indicators of training in race walk, post-exercise recovery.

Selection Criteria

A literature search was conducted on the 1st of December 2022. The sorting of the papers was done in accordance with the PRISMA flow diagram (Fig. 1). In our paper were selected the most relevant articles, which used modern digital methods. The considered publications include the new aspects about the race walk and functional adaptation in specific effort. We were taken in consideration only materials published in English language.

Regarding the exclusion criteria for these studies were considered: studies that have not specific results for marching race, studies that do not present results about cardiorespiratory aspects in marching race, abstracts.

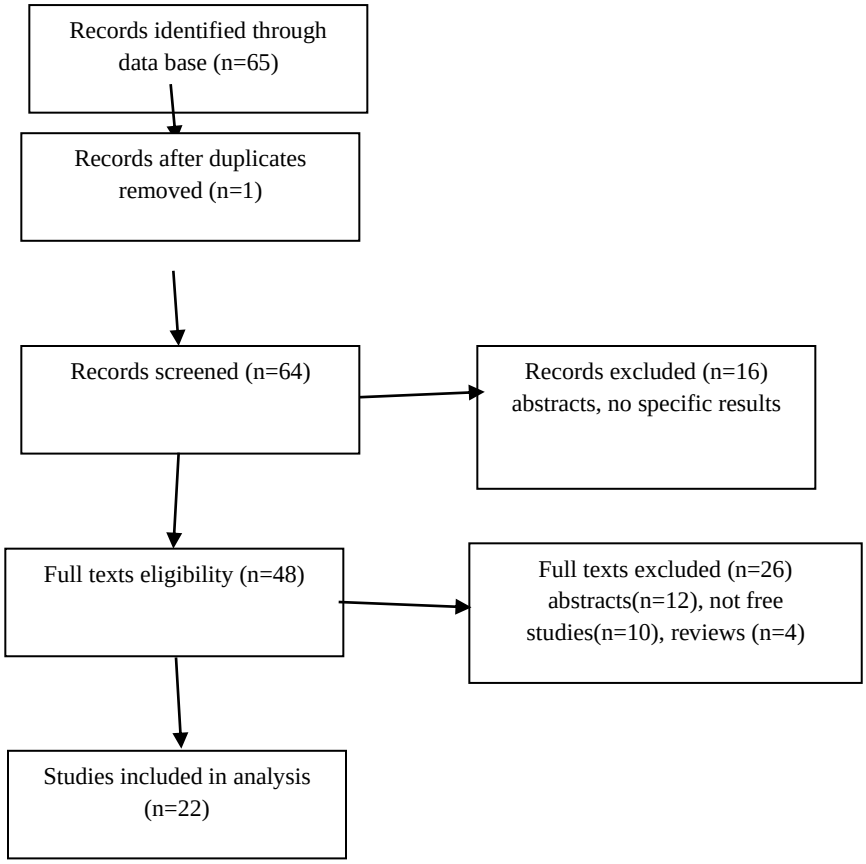

Fig. 1. PRISMA 2009.Flow diagram

Results

Effort Profile in Running and Walking Trials

Race walk is an aerobic athletic discipline that varies from moderate to high intensity forms and is characterized by high energy consumption. The result in the marching race depends on the morphological, motor and functional potentials (aerobic and anaerobic capacity, cardio-vascular and respiratory system function) of the marcher, as well as on the technique used by the competitors.[2]

The study performed on subjects who were tested by 2 submaximal treadmill tests at 12.2 ± 0.5 km • h-1 (74.7 % VO2max speed) before and after a 3-hour run, allowed the quantification of changes in the energy cost of walking (C), ventilation (VE), respiratory rate (RF), heart rate (HR), expiratory ratio (RER), blood lactate concentration (LA), weight (W) and duration pitch (SD) after a 3-hour race at competitive pace in elite walkers, significant increases ($p < 0.05$) were found in C, HR and significant decreases in RER, W, VE, while no changes in LA or SD were

observed. However, variability was observed in some coefficients of variation for C, VE, RF, HR, SD, W.

These results suggest that, in the well-trained, the energetic cost of walking increases with exercise duration, but the walkers are able to maintain the same step duration after the test when the treadmill speed is controlled. In addition, some individuals appear to be more sensitive to the onset of fatigue. The explanation for this aspect is a possible effect of changes in the use of the substrate, of thermoregulation or the decrease in mechanical efficiency to maintain the marching stroke outside the effect of fatigue. [3]

There are concerns to compare the exercise profile in terms of VO2max, in running and walking. Thus, a study was conducted that sought to identify the speed at which running and walking become equally effective. More precisely, it is about the speed at which VO2max in running and walking is similar. The speed at which running and walking produced similar VO2 (about 30 ml •kg-1•min-1) was between 8 and 9 km•h-1. Walking was more efficient at lower speeds and running was more efficient at higher speeds. When race walking and running were compared at similar oxygen consumption, heart rate, ventilation, perceived exertion, and respiratory exchange ratio responses were identical.

During maximal exercise, running and walking resulted in similar VO2 max (60.4 ± 1.3 vs. 58.1 ± 1.5 ml•kg-1•min-1), heart rate (193 ± 4 vs. 188 ± 4 bpm), ventilation (130.6 ± 5.9 vs. 126.3 ± 6.6 l•min-1) and blood lactic acid concentration after exercise (9.8 ± 0.6 vs. 9.6 ± 0.7 mM).

These results indicate that the speed at which walking and running become equally efficient is similar to the speed of conventional walking and running. Cardiovascular, respiratory, and perceptual responses during running and walking are the same in terms of VO2.[4]

There have also been studies that examined cardiovascular responses during a 3 km distance marching competition for female athletes and 5 km for male athletes. During the Italian RW championship, heart rate was monitored on eleven well-trained runners (five men and six women) and then arbitrated as a percentage of theoretical maximum heart rate (206-0.7•age). To provide a measure of relative intensity, five heart rate (HR) zones were evaluated. Changes in %HRmax were determined for both the five and three 1000 m distances.

During the 5 km race, athletes spent 79.7% (15 min 45 s) at HR5 (ie 90–100% of HRmax). Specifically, % HRmax increased by 10% in the last compared to the first sector of 1000 m ($P=0.006$, effect size = 2.47±0.83, very large), with the first 1000 m sector smaller than subsequent ones ($P= 0.01$, effect size=2.17 to 2.47, very large). Whereas, for the 3 km, athletes spent 86.9% (11 min 35 s) at HR5 (i.e., 90–100% of HRmax), with no observed differences in %HRmax between the three 1000m sectors ($P >0.01$).

The results of the present study demonstrate that the intensity of effort in marching competitions is high and heart rate monitoring in the 5 zones will help coaches and athletes in preparing the training and recovery process.[5]

Indicators of Training in Race Walk

There is research that has aimed to develop and implement specific training for participation in the Olympic Games among elite athletes. During selected periods of the year within the training plan, measurements of walking speed variability at the level of the anaerobic threshold (starting speed) were performed outside using the incline test. The observation of the sports training process was supplemented with an observation of the effects of overtraining (ORT), and

included the following measurements: somatic characteristics and anthropometric indices; blood hematological parameters and non-enzymatic antioxidant profile, glutathione (GSH), vitamin D3, and concentration: pro-inflammatory cytokines -IL1β and IL-6, markers of The previously developed model of sports training for running races, as well as the proposed system of control and monitoring of the processes of adaptation to physical effort be considered as a reference point for development, high performance sport, safety training for the target event (without exceeding the functional load limit); [6]

At the same time, attempts to develop training programs were also based on case study analysis, as we find in the work projects that analyzed the impact of training indicators on the sports performance of the Olympic and world champion in the men's 50 kilometers event Matej Tóth in annual training YTC cycles - annual training cycles 2013/2014 to YTC 2015/2016.

In YTC 2013/2014 (50 km 3:36:21 h); 20 km: 1:19:48 indicators of tempo endurance, especially intensive and extensive tempo endurance was imposed in the model. The peak of the YTC 2014/2015 (50 km 3:34:38 h; 20 km 1:20:21 h) was the World Championships in Beijing. Intense aerobic endurance and time-extended endurance have been implicated as predictors of walking performance. YTC specific periodization showed cumulative effect of rate and aerobic endurance or training units. [7]

Post-exercise Recovery

Most performance athletes engage in demanding training two or more times a day, pushing their physiological and psychological limits. Athletes also experience other social and professional stressors that increase the general tension of training and competition. To be able to cope with training and sports competitions they need to maintain a balance between social life, training and recovery.

Recovery after exercise is a crucial part of an exercise program. It plays an essential role in optimizing performance, preventing injuries and promoting overall health.

Recovery and medication support influence performance in training and competition. Recovery means combating the fatigue caused by the best effort.

In general, most coaches and athletes assumed that increased training was the ultimate prescription to need. Endurance sports have, in some cases, taken this to the extreme. It is well accepted that loading is necessary to perform, while overtraining results in breakdown at some level, affecting rather than perhaps performance. Overtraining is usually thought of strictly in terms of training, but overtraining can also be expressed as under recovery. If the rate of recovery can be established, higher training volume would be possible without the negative after-effects of overtraining. Zone recovery can lead to the stability of a performance plateau at a higher level.

The simplest forms of training represent acute challenges for the body, aimed at further optimizing chronic physiological capacities. Research has advanced our knowledge of the physiological, biomechanical and psychological aspects of physical training and performance. Most research has focused on training, although most exercise-induced adaptations occur during recovery. Recovery is one of the least understood and least researched components of the exercise-adaptation cycle. Even the most dedicated athlete spends far more time in recovery than in active training. We define recovery, from a practical perspective, as the ability to achieve or exceed performance in a given activity.

Athletes spend much more time recovering than training. However, much attention has been paid to training with very little investigation of recovery. Recovery can be categorized into three terms: immediate recovery between exercises; short-term recovery between repetitions (e.g., between resistance sets or interval breaks); and recovery between workouts. Full recovery from training is essential for optimal performance and growth. The researchers found that recovery measures and considered practical are briefly discussed. Attention needs to be paid to key issues in recovery research, particularly individual response to recovery treatments.[8]

The ratio between effort and rest, between energy consumption and accumulated fatigue is the basic characteristic of training methods. Thus, in the training activity, periods of effort alternate with periods of recovery.

Conclusions

Monitoring of cardiorespiratory parameters, the element that guides a good adaptation to effort, an optimal VO2 consumption.

Heart rate monitoring during race walk training, but also post-training recovery, are important to improve the athlete's optimal training.

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The Role of Different Exercise Training Programs in the Fight Against Obstructive Sleep Apnea: A Narrative Review

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Abstract

Introduction: Obstructive sleep apnea (OSA) is a sleep disorder with increasing prevalence worldwide, characterized by repeated apneas, hypopneas, and respiratory effort-related arousals generated by collapse and obstruction of the upper airways during sleep. Physical exercise is considered a helpful intervention in OSA management due to its favorable impact on weight, genioglossus muscle dysfunction, nocturnal rostral fluid shift, daytime symptoms, and quality of life parameters. Different types of exercise training (ET) programs have been studied alone or on top of standard treatment, but no clear recommendations have been formulated.
Aim: The main objective of this narrative review was to assess the effectiveness of different ET programs in OSA management. Furthermore, we aim to offer a comprehensive overview of the specific approaches, including their strengths and limitations.
Materials and Methods: We conducted this narrative overview by searching our articles via the Google Academic search engine, PubMed database, and ERIC online library. Using as keywords "obstructive sleep apnea" and "exercise", we found over 2000 articles published in the last five years. After the list of initially selected studies was verified by all the authors, only 13 studies meeting the inclusion criteria were selected.
We excluded the secondary research, grey literature, books, and articles that were not available in full or written in English.
Results: Most studies showed that different ET programs efficiently reduce OSA severity in terms of the apnea-hypopnea index, index of desaturation, and daytime symptoms, mainly in mild and/or moderate OSA.
Conclusions: Sustained physical activity appears to be efficient in reducing OSA severity. Different ET programs could represent an efficient treatment option for those intolerant or non-compliant with standard treatments, especially in moderate to severe OSA. Further studies are needed to establish the phenotype of OSA patients, more likely to respond to ET and to identify the optimal physical exercise program for each OSA patient.

Keywords: obstructive sleep apnea, training, exercise, rehabilitation

Introduction

Obstructive sleep apnea (OSA) is a sleep disorder with increasing prevalence worldwide, characterized by repeated apneas, hypopneas, and respiratory effort-related arousals generated by collapse and obstruction of the upper airways during sleep. Chronic hypoxemia observed in OSA patients generates severe cardiovascular and neurological long-term consequences, leading to increased morbidity and mortality [1]. The currently available treatment options, CPAP (continuous positive airway pressure) and MAD (mandibular advancement devices) lack long-term compliance in numerous OSA patients, especially in mild or moderate forms [2].

Exercise training (ET) was proved to be an effective non-pharmacologic treatment option due to its favorable impact on OSA severity, sleep patterns, daytime symptoms, hemodynamic parameters, cardiovascular risk, and quality of life. Various mechanisms are involved, from weight loss, genioglossus muscle toning, and nocturnal rostral fluid shift to the anti-inflammatory effect of ET [3]. Different types of ET programs have been studied alone or on top of standard treatment options, but no clear recommendations have been formulated [4].

Aim

The main objective of this narrative review was to assess the effectiveness of different ET programs in OSA management, according to recent data from the literature. Furthermore, we aim to offer a comprehensive overview of the specific approaches, including their strengths and limitations.

Materials and Methods

We conducted this narrative overview by searching our articles via the Google Academic search engine, PubMed database, and ERIC online library. Using as keywords Obstructive sleep apnea and exercise, we found over 2000 articles published in the last five years.

In order to ensure that search results from the three sources only include articles on physical exercise in the context of OSA treatment, we used Boolean operators. However, the Google Academic search engine initially generated, as a result, a large number of articles that were outside our area of interest. To further narrow the results, we have limited the search to original (primary research: clinical trials and randomized clinical trials), current articles (from the last five years), and studies written in English, available in full text. We excluded the secondary research (systematic review and meta-analysis articles), grey literature, books, and guidelines from the search. The inclusion and exclusion criteria are systematized and listed in Table 1.

Table 1. Inclusion and exclusion criteria

	Inclusion Criteria	Exclusion Criteria
Population	• Articles that debate the direct impact of different PA programs on OSA	• Articles that do not analyze the effect of PA on OSA
Intervention	• Different PA programs applied in OSA management	• Studies that did not include any rehabilitation method in OSA treatment
Comparison	• Standard treatment	• -
Timing	• New articles (≤5 years)	• Articles older than five years

Type (Study Design)	• Primary research (Clinical Trials)	• Secondary research (reviews, Grey' literature, books, and guidelines)
Language	• Articles written in English	• Other language than English

PA- physical activity; OSA – obstructive sleep apnea

After the list of results was diminished using the advanced search options, the team members analyzed the remaining articles. Only 13 articles were found eligible for the present study after this process. Even though we performed a narrative review and not a systematic or meta-analysis type, for a clearer illustration of the selection process, we modified and used the Prisma flow diagram model [5]. The entire sorting process (automatic and manual) and selection of items are illustrated in Fig. 2.

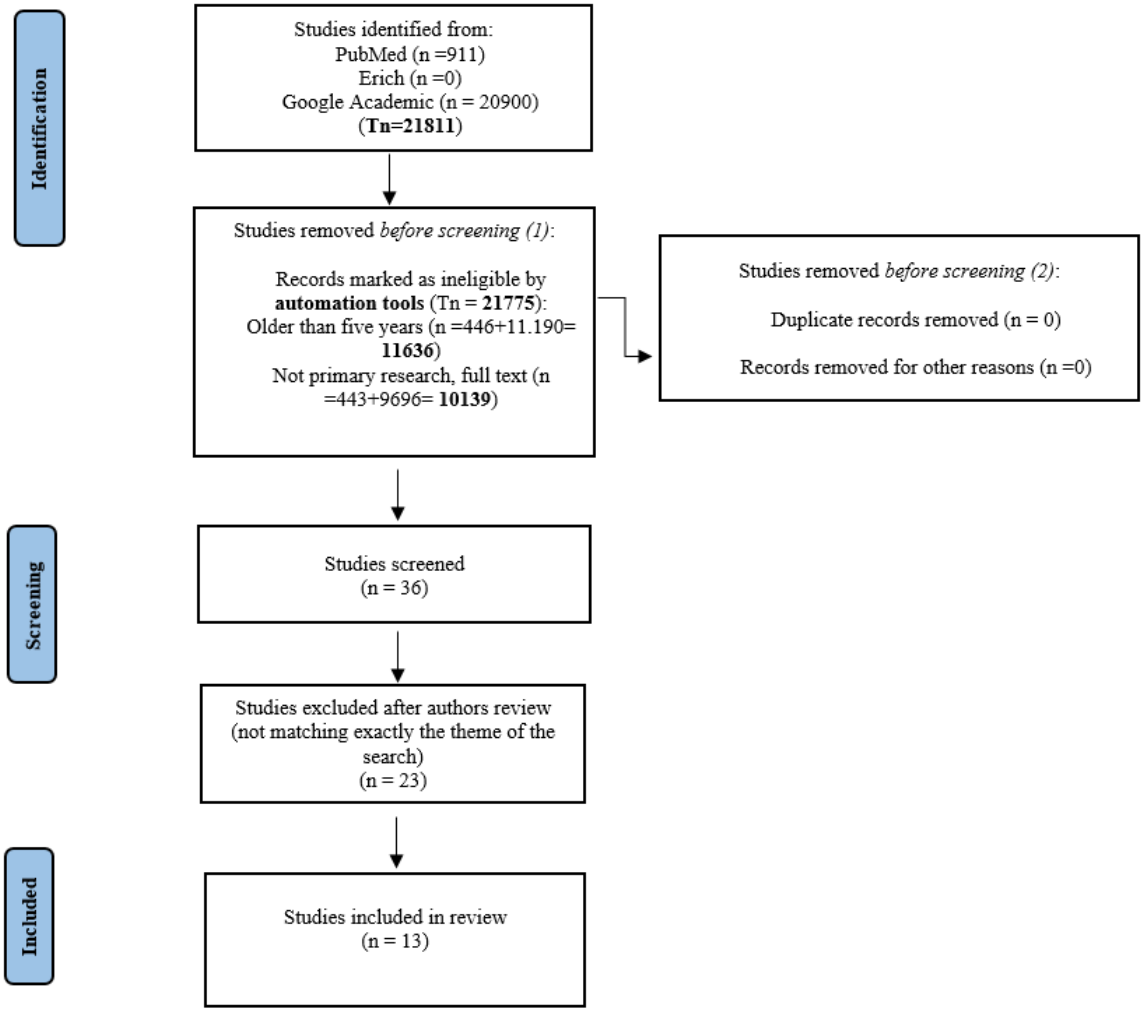

Fig.2. Prisma Flow diagram

Results

All eligible studies enrolled small groups of patients, ranging from 9 to 96 patients, the great majority diagnosed with moderate to severe forms of OSA. In the analyzed studies, four different physical activity protocols were applied: aerobic ET – 6 studies, generalized respiratory muscle training (RMT) – 3 studies, inspiratory muscle training (IMT) – 3 studies, and targeted hypoglossal neurostimulation, myofunctional therapy – 1 study. The duration of ET programs varied between 5 weeks to 40 weeks. A summary of the studies used for this work is listed in Table 3.

RMT and IMT programs proved effective in reducing OSA severity, improving inspiratory muscle strength and aerobic capacity, and lowering blood pressure [6,7,8,9]. Myofunctional therapy exercises seem to be a promising treatment option for severe OSA since they reduce OSA severity and associated symptoms in patients enrolled in such a program [10].

Moderate to severe OSA patients enrolled in aerobic ET programs for at least six months presented a favorable evolution in terms of OSA severity and associated symptoms, reduced body weight, improved quality of life, and hemodynamic response to physical activity [11,13,14,15]. Some studies proved that the impact was more evident in obese patients, which underlines the importance of weight reduction for obese OSA patients [11,12].

Table 3. Summary of included studies

Nr. crt	First Author, Title, Year	Subjects	OSA severity	Type of PA	Duration	Benefits of PA
1	O'Connor-Reina C. Myofunctional Therapy App for Severe Apnea-Hypopnea Sleep Obstructive Syndrome: Pilot Randomized Controlled Trial (2020)	28 patients newly diagnosed	severe OSA	Orofacial exercises with the AirwayGym app (for 20 minutes daily; 9 myofunctional therapy exercises)	3 months	reduces OSA severity and symptoms, and represents a promising treatment for OSA;
2	Ueno-Pardi LM Effects of exercise training on brain metabolism and cognitive functioning in sleep apnea (2022)	40-65 years sedentary adults -ET (n = 23) or no intervention control (n = 24)	moderate to severe OSA	3 times/week,60 min supervised exercise. (5 minutes of stretching, 25 minutes of cycling on the ergometer bicycle in the first month and up to 40 minutes in the last 5 months, 10 minutes of local strengthening exercise, and 5 minutes of cool down with stretching exercises).	6 months	improves exercise capacity and OSA severity;
3	Araújo CEL. Effects of exercise training on autonomic modulation and mood symptoms in patients with obstructive sleep apnea (2021)	18 -control patients;16 patients- ET	NS	3 weekly sessions of aerobic exercise, local strengthening, and stretching exercises	40 weeks	improves heart rate variability, BRS, fatigue, sleep parameters, and cardiac autonomic modulation;
4	Goya TT. Exercise training reduces sympathetic nerve activity and improves executive performance in individuals with obstructive sleep apnea (2021)	44 OSA sedentary patients (15 control, 18 ET group)	NS	3 sessions/week of aerobic exercise, resistance exercises, and flexibility	40 weeks	improves sympathetic response and executive performance
5	Lin HY. Effects of a comprehensive physical therapy on moderate and severe obstructive sleep apnea- a preliminary randomized controlled trial (2020)	15 newly diagnosed	moderate or severe OSA	hospital-based physical therapy,	12 weeks	safe and effective treatment for moderate to severe obstructive sleep apnea.
6	Ramos-Barrera GE. Inspiratory muscle strength training lowers blood pressure and sympathetic activity in older adults with OSA: a randomized controlled pilot trial (2020)	25 adults (17 men, 8 women); high-intensity IMST (n = 15); control group (n = 10)	moderate and severe OSA	5 min/day high-intensity inspiratory muscle strength training (IMST)	6 weeks	lowers BP
7	Moawd SA. Inspiratory Muscle Training in Obstructive Sleep Apnea Associating Diabetic Peripheral Neuropathy: A Randomized Control Study (2020)	55 patients with DPN and OSA. (IMT, n = 28) and placebo training group (P-IMT, n = 27).	mild to moderate OSA	30 min a session, three times a week for 12 consecutive weeks (using electronic inspiratory muscle trainer (TRAINAIR®, Project Electronics Ltd., UK)	12 weeks	may improve inspiratory muscle strength and aerobic capacity

8	Jurado-García A. Effect of a Graduated Walking Program on the Severity of Obstructive Sleep Apnea Syndrome. A Randomized Clinical Trial (2020)	29 sedentary subjects in each arm were analyzed by protocol.	moderate to severe OSAS.	progressive walks without direct supervision	6 months	reduces body weight and sleepiness, improves the patient's perceived well-being and lipid profile, reduces respiratory events,
9	Berger M. Benefits of supervised community physical activity in obstructive sleep apnoea (2018)	96 patients (63±7 years, BMI: 28.5±4.2 kg·m−2, 61% male, 71% hypertensive, and 19% diabetic);	moderate OSA	3 supervised sessions / week: nordic walking, aqua gym, and gymnastics. 60 min: 10 min -warm-up, 40 min-combined resistance, and aerobic exercises at the anaerobic threshold, and 10 min of cool-down; Control group -educational sessions about healthy diet and physical activity recommendations.	9 months	the effect was greater in obese patients, with a potential change in pharyngeal fat mass distribution
10	Iliou MC. Is ventilatory therapy combined with exercise training effective in patients with heart failure and sleep-disordered breathing? Results of a randomized trial during a cardiac rehabilitation programme (SATELIT-HF). (2018)	ET group -61 CHF patients; V + ET group-60 CHF patients; 18–85 years		at least 180 minutes/ week (3–5 days/ week) of supervised exercise training. 20–30 minutes bicycle or treadmill endurance bouts and another dynamic physical activity (calisthenics, resistance training, water-based exercise, walking, etc.).	4–9 weeks.	short-term nocturnal ventilation, combined with ET, does not increase the exercise capacity in CHF patients
11	Berger, M A. Supervised Community Physical Activity Program as an Effective Treatment in Moderate Obstructive Sleep Apnea: A Randomized Controlled Trial. (2018)	96 pac., 40-80 years	moderate	NeuroGyV community training program; 3x1h Exercise/week (nordic walking, aquagym,	9 months	long-term PA programs may help improve moderate OSA, but AHI improvement remains modest. Obese patients- better results-
12	LABEIX, P. Impact of Inspiratory Muscle Training on Obstructive Sleep Apnea in coronary patients. (2018)	19 coronary patients with OSA; CTL (classic training)-9; IMT-10	moderate	2 sets of 30 breaths a day, 6 days a week IMT (inspiration into a device allowing the air to pass during the inspiration only according to the force developed-resistance applied -70% of Pimax.	2 months	significant reduction in AHI (IMT group had a significant decrease vs. control)
13	Herkenrath, S D. Effects of respiratory muscle training (RMT) in patients with mild to moderate obstructive sleep apnea (OSA). (2018)	9 lean patients	mild to moderate OSA.	generalized RMT;(normocapnic hyperpnea RMT five times a week for 30 min each)	5 weeks	no evidence that 5 weeks of RMT influence AHI, pulmonary function, daytime sleepiness, or QOL

***OSA**: obstructive sleep apnea; **OSAS**: obstructive sleep apnea syndrome; **OSAHS**: Hypopnea Sleep Obstructive Syndrome; **Pimax**: maximum inspiratory pressure; **RMT**: respiratory muscle training; **IMT**: Inspiratory Muscle Training; **AHI**: apnea hypopnea index; **CHF**: Congestive heart failure; **CSA**: central sleep apnea; **ET**: exercise training; **BRS**: baroreflex sensitivity; **V**: ventilatory therapy; **BMI**: body mass index; **DPN**: Diabetic Peripheral Neuropathy;*

Discussions

The benefit of aerobic ET on OSA severity was also observed in other original studies and was associated mainly with weight reduction and, more specifically, with the reduction of fat deposits in the oropharynx, leading to increased airway circumference [3]. Other authors appreciated that increased tonus of genioglossus or pharyngeal dilator muscle tone explains better the favorable role of aerobic ET on OSA severity [16]. Investigators of the Ontario Health Study also showed the benefit of aerobic exercise on OSA and other sleep-disordered breathing prevalence in over 150 00 individuals, independent of BMI. They showed that OSA individuals were sedentary compared to those with OSA, with increased aerobic activity levels leading to reduced OSA prevalence [17].

The effectiveness of IMT and RMT on OSA severity and associated symptoms observed in the studies from our narrative review are inconsistent with those from the literature. A recent systematic review and meta-analysis about the effectiveness of IMT programs in OSA patients showed no benefit on OSA severity or physical performance. However, improvement in sleep quality and sleepiness was obtained [18]. Another meta-analysis that evaluated RMT's impact on OSA severity found uncertain results. The authors showed that associating cardiac rehabilitation exercises with standard RMT programs increased effectiveness, improving OSA severity, sleepiness, and sleep quality compared to each intervention alone [19].

Inconsistent results with our study were also found regarding the impact of myofunctional therapy in OSA in a meta-analysis conducted by Camacho et al., who showed that training oropharyngeal muscles has uncertain benefits, even in mild OSA [20]. Our results are consistent, though, with those of a more recent meta-analysis, which proved that myofunctional exercises reduced AH by 34% and improved sleepiness, underlying the conclusion that this particular exercise therapy can represent an adjunctive therapy in OSA management [21].

Conclusions

Different ET programs analyzed in our narrative review proved to be effective in reducing OSA severity. Aerobic ET, through its multiple mechanisms, has direct and indirect benefits in moderate to severe OSA patients. RMT and IMT are specific ET programs that proved to significantly reduce respiratory events rate compared to control, and their impact is even greater when associated with cardiac rehabilitation exercises. Myofunctional therapy seems to be a promising treatment option for severe OSA, mainly for those intolerant or non-compliant with standard treatments. Further studies are needed to establish the phenotype of OSA patients, which is more likely to respond to ET, and identify the optimal physical exercise program for each OSA patient.

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Identification of the Use of Isoinertial Training in the Training of Athletes from Romania

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Abstract

Introduction: After studying the specialized literature, we noticed that isoinertial training is still a relatively new phenomenon in our country in terms of its use in the training of athletes.
Aim: This confirmatory study aimed to obtain information from coaches regarding their knowledge about isoinertial training, if they introduce it in the practice and if they do, which devices they are using.
Materials and Methods: In the elaboration of this study, the on-line questionnaire method was used, thus facilitating the distribution of the form and the interpretation of the answers obtained. The questionnaire consisted of 15 items that were answered under conditions of anonymity. The questions were aimed at aquairing some socio-demographic data about the respondents' professional experience and also how familiar they are with this type of training and if they use it.
Results: 54 respondents participated in the study, all of them being coaches in different athletic events. 66.7% (36) of them stated that they have heard about isoinertial training, only 16% of them (9) use specific devices for this type of training.
Conclusions: Their answers materialize the idea that isoinertial training can be successfully introduced in the practice of athletes, but needing greater popularization and finding solutions for the purchase of such devices used in the training of athletes.

Keywords: isoinertial training, athletes, evidence-based research, performance

Introduction

Over time, athletes and coaches have sought and tried the best methods and means to improve their sports performance and to finalize their sports form.

In this struggle to achieve performance, they were joined by researchers who wanted to combine the physical work, training, and perseverance of athletes with the newest and most innovative inventions of the moment. Thus, scientists began to study the human body and its reactions to different internal and external stimuli and then to build various technological devices and programs to facilitate the specific improvement of athletes' motor skills.

In the specialized literature, some researchers also refer to the sports form as "maximum training state" [1] or "training degree" [2], but none of these fully defines the idea of sports form, this not being an independent state but rather "a cumulative effect of a succession of states"[3] obtained after a long, staged process.

From a physiological point of view, the sports form is an exceptional state, acquired through continuous and gradual training, in which the athlete can reach his best performances [4], this state being also the upper step of the training degree.

Aiming for this superior sports form, athletes and researchers introduced new training methods into the physical training of the first ones, testing them with the help of modern devices and thus creating new means and types of training.

Sports training is a complex process, carried out with a well-structured and graded plan, in which the athlete's body must adapt to intense physical and mental efforts, those being necessary to obtain the best results during sports competitions [5].

In addition to classical types of training, isoinertial training proves to be a beneficial means of improving athletes' strength since this type of training is carried out with the help of a device that maintains a constant resistance during the entire movement, both in the contraction phase and in the relaxation phase, thus combining rudimentary means of training with modern ones. With the help of the user's individual strength, resistance is created by the inertia of a wheel [6]. Researchers hypothesize that for optimal resistance strength development, athletes should incorporate flywheel exercises into their training in addition to traditional resistance exercises to optimize their benefits [7].

Following the in-depth research of the recent specialized literature, we noticed that isoinertial training is still a relatively new phenomenon in our country in terms of its use in the training of athletes, especially in the training of track and field athletes.

Aim

This confirmatory study aimed to obtain information from coaches regarding their knowledge of isoinertial training, if they introduce it into the practice of their athletes, and which devices they use.

Based on the data obtained, we would like to confirm our assumption that isoinertial training is not widely used in our country, and that is why it should be popularized among athletes.

By studying the benefits that this type of training brings to athletes, its introduction among athletes would facilitate the improvement of their performance and physical condition.

Materials and Methods

In developing this study, we used the questionnaire method, made with Google Forms, thus facilitating the distribution of the form and the interpretation of the answers obtained.

The questionnaire consisted of 15 questions that were answered under conditions of anonymity. Respondents' personal data was kept confidential, with only the research team having access to it.

The research was conducted over a period of 10 days, August-September 2023 (30.08.2023-08.09.2023), the questionnaire being created and distributed online.

The questions' purpose was to obtain socio-demographic data about the respondents' professional experience and also how familiar they are with this type of training and if they use it.

In the composition of the questions, we took into account the criteria for creating a questionnaire namely: relevance, symmetry, clarity and simplicity [8], but also the adaptation of the language [9].

The questionnaire was composed of closed, open and semi-open questions, with the respondents having the possibility to add their own answer to some questions, in addition to the already existing ones.

The criterion for selecting the subjects was the respondents had to be track and field coaches, regardless of the category of the athletic test (speed runs, half-distance runs, long-distance runs, jumps and throws) and the age category of the athletes they train.

Another criteria was the respondents had to have results with the athletes they train at least at the national level.

54 respondents who met the inclusion criteria from Romania participated in the study, all of them being coaches in various track and field events.

The data obtained from the questionnaire were introduced into the Excel and SPSS 28 program to statistically interpret the answers. We wanted to calculate the average age of our respondents, but we were able to calculate the average age of 53 respondents, since one person didn't answer the question regarding their age and was thus excluded from the study. Using the formula for calculating the average we obtained an average of 45.8 this being the average age of our respondents, the youngest respondent being 22 years old and the oldest, 67 years old.

After obtaining that information, we also calculated the standard deviation, which is 10.6

Average	45.8
Min	22
Max	67
Standard deviation	10.6

Fig.1 Statistics based on the age of the respondents

Before answering the questions about isoinertial training, all respondents were given the definition of isoinertial training and the principle behind it to ensure that they would understand what information we wanted to get from them.

Results

With the first question asked, we wanted to detect to what extent our respondents had heard about the concept of isoinertial training.

66.7% (36) of them stated that they had heard of isoinertial training, and 33.3% (18) declared that they had never heard of this type of training (Fig.2).

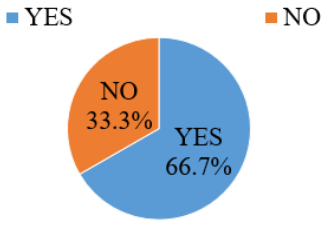

Fig. 2 Percentage of respondents who have or have not heard of isoinertial training

Through the second question we wanted to identify if the respondents know devices used in isoinertial training. Thus, 57.4% (31) answered that they know devices used in isoinertial training, and 42.6% (23) do not (Fig.3).

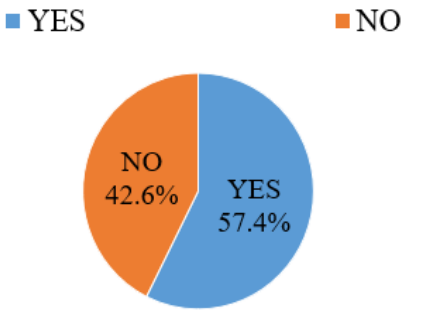

Fig.3 Percentage of respondents who have or haven't heard of the devices used for isoinertial training

After that we wanted to find out if they use isoinertial training in the practice of their own athletes. Among the 54 respondents, 37% (20) introduce isoinertial training in the practice of their athletes, and 63% (34) do not use this type of training (Fig.4).

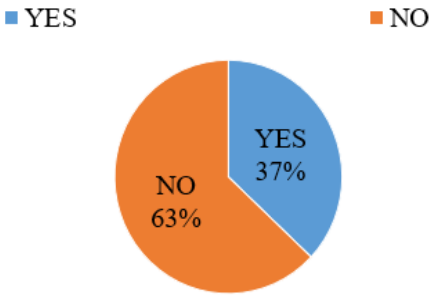

Fig.4 The percentage in which training is used by respondents with their athletes

To check the validity of the answers, we added an additional question, the answer to which was not mandatory, so out of 54 respondents, only 29 gave us answers. At this question, we asked them to tell us what devices for isoinertial training they use in training with their athletes. Of the 29 responds, only 9 were correct, naming a device used in isoinertial training.

This was discordant with the answers given previously of the 66.7% (36) who said they had heard about isoinertial training and 57.4% (31) who said they knew what devices are used in this training, ask what devices they use, only 2.61% (9) gave a correct answer.

Table 1. The correlations between the devices involved in isoinertial training, the frequency of its practice, the desire to use it, the involvement of a multidisciplinary monitoring team and the physical parameters to be improved of the athletes *(N=53)*

		The presence of isoinertial training devices	Frequency of practicing isoinertial training	Devices used in practicing isoinertial training	Involvement of a multidisciplinary team in the monitoring of the athletes	Parameters to be improved in athletes
The presence of isoinertial training devices	Pearson Correlation	1	**-.561****	**.435****	-.167	-.224
	Sig. (2-tailed)		<.001	.001	.228	.103
	N	54	54	54	54	54
	N	54	54	54	54	54
Frequency of practicing isoinertial training	Pearson Correlation	**-.561****	1	**-.487****	.260	**.286***
	Sig. (2-tailed)	<.001		<.001	.057	.036
	N	54	54	54	54	54
Devices used in practicing isoinertial training	Pearson Correlation	.435**	**-.487****	1	-.179	-.066
	Sig. (2-tailed)	.001	<.001		.196	.635
	N	54	54	54	54	54
Involvement of a multidisciplinary team in the monitoring of the athletes	Pearson Correlation	-.167	.260	-.179	1	**.533****
	Sig. (2-tailed)	.228	.057	.196		<.001
	N	54	54	54	54	54
Parameters to be improved in athletes	Pearson Correlation	-.224	**.286***	-.066	**.533****	1
	Sig. (2-tailed)	.103	.036	.635	<.001	
	N	54	54	54	54	54

It is observed that the frequency of practicing isoinertial training is negatively associated with the presence or absence of devices in carrying out this type of training, r = -.561**, p < .001, with the type of devices involved in carrying it out, r = - .487**, p < .001, while with the physical parameters to be improved, there is a positive association r = .286*, p < .001 and it is not associated with the other analyzed variables, an aspect that means that the devices used by to trainers are not indispensable in performing isoinertial training, while physical parameters improve significantly as a result of performing isoinertial training. The coaches defined, among

these parameters: strength in resistance mode, reaction speed, movement speed, relaxation, psychological preparation, explosive strength, ability to maintain speed or intensity.

The involvement of a multidisciplinary team to monitor the athletes' training of the interviewed coaches was positively associated with the improvement of the physical and psychological parameters that the athletes could improve, $r = .533^*$, $p < .001$. Thus, if multidisciplinary teams were involved in training and their journey to performance, the athletes' performance would be improved by increasing their sports ability.

The physical parameters of the athletes were positively associated, as expected, with the frequency of practicing sports, $r = .286^*$, $p < .001$, thus it is expected that the physical and psychological condition of the athletes will improve significantly in the context of the increase in the frequency of practicing performance sports.

Discussions

Similar studies had as unanimous conclusions the importance and place of isoinertial training in improving athletes' performances and emphasized the importance of the presence of this type of training in the specific programs of performance athletes, regarding the improvement that this type of training can bring in both strength and velocity training [10], in the assessment of the force-velocity relationship in isoinertial resistance exercises [11], in practices of sprint and jump [12], in strategies for maximizing power and strength of the athletes [13], on motor skills performance [14], greater power [15] and greater strength [16].

At the same time, other researches have analyzed the differences between the devices used in isoinertial training and their implications. For example, studies were carried out in which, among the devices used for isoinertial training, were found: the spinning flywheel [17], the electric-motor [18], or the functional inertial eccentric overload and the vibration training [19] or an isoinertial dynamometer [20].

Conclusions

After studying some other researches [21, 22], the idea that isoinertial training can be successfully introduced in the training of the athletes was materialized, but considering the answers from the questionnaire, the isoinertial training need a greater popularization among the coaches and the athletes from Romania since the meaning, the methods and the devices of it aren’t understood and clearly defined in common knowledge.

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Biomechanical Analysis of Technical Exercises for Right Kicking for U12 Children Using ANSYS Software

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Abstract

Introduction: In the organization and conduct of an experimental approach to elucidate the issue related to the value and technical particularities of the right hand shot in children aged between 10-12 years in the game of tennis, a very important part is owned by the evaluation of the tools and methods of investigation, as well as experimenting with their use in the process of acquisition, processing and interpretation of data from the investigated sample (Segărceanu A., 2006).
Aim: In the preliminary study, we propose an analysis of the biomechanical chain involved in making the right shot in the game of tennis, in order to objectify the hitting technique**.**
Materials and Methods: The main methods used to fulfill the tasks proposed for the research are the following: Studying specialized literature; Remark; Test method; The experimental method; The statistical-mathematical method of data processing and interpretation; Graphical and tabular method.
Results: The kinematic data, which characterize the execution of the right shot in the game of tennis, contribute to the establishment of the biomechanical parameters involved in the technical execution.
Conclusions: We believe that all the tools we used provided us with objective data regarding the biomechanical analysis of the technical exercises for the forehand stroke of the U12 tennis players, by using ANSYS software, in order to customize the biomechanical chain of the hitting technique in tennis.

Keywords: Evidence on court, Off court trials, free jump, Hexagon Test

Introduction

Correcting technical errors can be done more easily using Ansys software, which allows the rendering of errors of all phases in 3D format. The correction will have the initial errors in the preparatory phase and then move on to removing other large technical errors. Following the detection of technical mistakes with the help of the Ansys 3D Design product, it will be put into

practice by working specifically for sports and using a varied range of specific exercises, thus intervening in the effective correction of technical mistakes.

In this stage, the emphasis is on assessing the technicality index of the execution, on determining the performance capacity and on comparing the results with existing technical models. Elaboration of some technical parameters of the right shot through 3D analysis, represents an important objective in the modeling of sports training in the game of tennis [1].

In the modeling of sports training in the game of tennis, a periodic analysis of some parameters involved in conducting a tennis training or competition is necessary. At this stage, there must be a coherent implementation system, which requires the collection of data recorded during tennis competitions, the compilation of reports on the information obtained as a result of the research, in the present case of the technical procedure – the right shot, analysis and at the same time, the development of new indicators in preparation [2].

Aim

The aim of the present study is to develop and verify some methodologies for the objectification of the individual biomechanical particularities of the right shot in the game of tennis. To achieve this goal, we propose in this study the use of some means and implicitly a modern device, specific in the development of a methodical line for the efficiency of the right shot in the game of tennis.

Hypothesis 1: The development and implementation of some algorithmic systems specific to the right shot determines the quantification of training programs at the level of subjects aged between 10-12 years.

Hypothesis 1.1: Subject groups are homogeneous in terms of biometric and functional index values.

Hypothesis 2: The results of the kinematic study through the ANSYS simulator determine the improvement of motor parameters in children aged 10-12 years, in the game of tennis.

Materials and Methods

The test method was applied during the preliminary research in order to objectively highlight the training level of the samples proposed for the study [3].

Evidence on court: fan (evaluation of specific movement speed on the ground), added step (evaluation of movement speed by added step), hexagon test (evaluation of agility).

Evidence off court: free jump (explosive strength assessment), medicine ball throws (ATF – teste nationale tennis camp.)

Tests specific to the right shot: right-handed shot at a fixed point in different areas of the field and in different directions: along the line, right cross; right volley shot from the attacking zone; right lob shot in different areas of the court (bottom line area of the court). The tests will be applied using a ball cannon [4]. The experimental method – measuring instruments, of the causal-contestative type, regarding the transposition of the athlete`s movement from reality into kinematic data. Ansys is a simulation software widely used in engineering for finite element analysis (FEA), computational fluid dynamics (CFD), electromagnetism, thermodynamic simulations, and others. Over the years, Ansys has demonstrated in various engineering fields, including biomechanics [5].

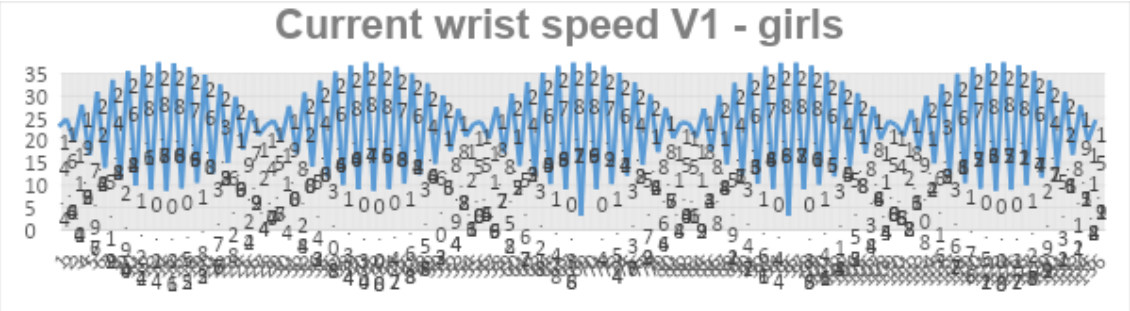
The Ansys 3D Design product enables direct modeling of athlete's movement into kinematic data. Its use can be highlighted in the measurement of biomechanics (analysis of the first forehand in tennis, health, analysis of gait and recovery, analysis of movement on the court after an injury) by designing and simulating in a unique analysis environment [6].

Results

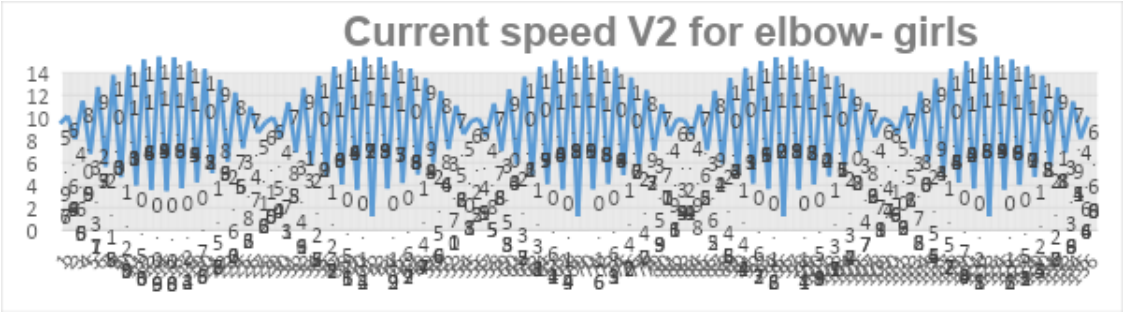
Biomechanics in the game of tennis:

1. The serve: Analysis of the trajectory and strength of the serve to achieve powerful and accurate serves.
2. Right and left hitting: Study of rotation and force mechanisms [7].

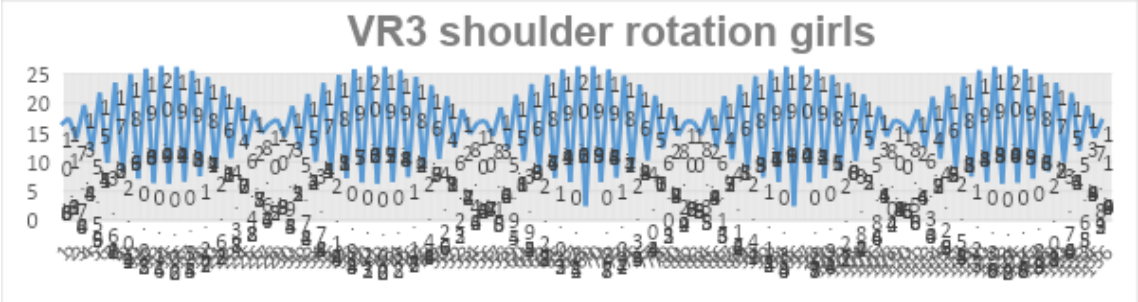
Following the analysis of the data for the female group and the male group entered in the Ansys simulator, the graphs related to the current velocity of the wrist V1, the current velocity V2 for the elbow and VR3 shoulder rotation were made, both for the group of girls and for the group of boys (for example chart no.1, chart no. 2, chart no. 3).



Graph no. 1 – Current wrist speed V1 – girls



Graph no. 2 – Current V2 speed for elbow – girls



Graph no. 3 – VR3 shoulder rotation – girls

In order to argue and prove the veracity of Hypothesis 1, we applied to research subjects the investigation of specific physical training parameters, performing the initial testing and their final.

After analyzing the results of the statistical indicators of specific physical training: Evidence on court (fan, added step, hexagon) and Evidence off court (Free jump) for the group of girls presented in table no. 2, it can be concluded that the statistical significance of the difference between the means is expressed by t with values between 1.377 at the significance threshold p=0.05 and 2.535 at the significance threshold p=0.025 according to table no.1.

Table 1. Statistical indicators of specific physical training – female

Nr. Crt.	Parametrii comparați		$\overline{X} \pm DS$		Criterii			
					„Cv”		“t”	“p”
			Testarea inițială	Testarea finală	T. I	T. F		
1	Probe on court	Evantai (sec)	18,209± 0,185	18,003± 0,139	1,016	0,772	**2,355**	<0.025
2		Pas adăugat (sec)	7,031± 0,146	6,871± 0,081	2,077	1,179	**2,535**	<0.025
3		Hexagon (sec)	10,471± 0,268	10,171± 0,223	2,559	2,193	**2,277**	<0.025
4	Probe on court	Free Jump (cm)	24,943± 1,177	27,114± 1,635	4,719	6,03	**2,851**	<0.01
5	Probe on court	Aruncarea mingii medicinale (m)	7,397± 0,385	7,664± 0,339	5,205	4,423	**1,377**	>0.05

Table 2. Statistical indicators of specific physical training – fan/female

Nr.crt	T. inițială	T. finală	Evantai-sec				
1	18.05	17.90	Numar subiecti - N1 – T. inițială	7			
2	18.20	18	Numar subiecti - N2 – T. finală	7			
3	18.10	17.92	Mediana - M0 – T. i	18,2			
4	18.25	18.10	Mediana - M0 – T. f	18			
5	17.98	17.80	Coeficient de asimetrie - β1 – T. i	0,049	Asimetrie normală		
6	18.50	18.20	Coeficient de asimetrie - β2 – T. f	0,022	Asimetrie normală		
7	18.38	18.15	M1 ± DS1 - T. i	18,209	±	0,185	
			M2 ± DS2 - T. f	18,003	±	0,139	
			Împrăștierea valorilor - M1 ± DS1 - T. i	M1 ± 2DS1	Împrăștierea valorilor normal		
			Împrăștierea valorilor - M2 ± DS2 - T. f	M2 ± 2DS2	Împrăștierea valorilor normal		
			Coeficientul de variabilitate - CV1 - T. i	1,016	%	Populație de valori omogenă	
			Coeficientul de variabilitate - CV2 - T. f	0,772	%	Populație de valori omogenă	
			Test "t" independent	**2,355**			
			Prag de semnificatie	p<0.025			

Both initial and final tests show a normal asymmetry. The spread of values is normal for both tests. The values of the coefficient of variability CV1 (1.016%) – for the initial testing and CV2 (0.772%) – for the final testing, highlight a homogeneous population.

In order to demonstrate the veracity of Hypothesis 1.1., we used a TANITA MC 780 professional device and a dedicated analysis software, version 3.4.5. with the support of FEFS Constanța.To demonstrate the veracity of Hypothesis 2, we used the ANSYS simulator and the biomechanical results given by it.

Conclusions

At the end of the study, we found the fulfillment of some objectives and formulated useful conclusions for future studies, as follows:

The results obtained from the determinations carried out provide clear information on certain parameters, such as specific physical training tests, being able to make an objective evaluation and diagnosis of the kinematic data that characterize the execution of the right shot in the game of tennis, contributing to the establishment of the biomechanical parameters involved in the technical execution of the athletes included in the research [9].

At the end of the study, we established that between the parameters within the proposed test batteries there are positively significant correlative relationships of the technical-tactical parameters, which confirms the established hypotheses. Also, body composition assessment in children U12 is important for identifying health and physical activity problems, for monitoring progress and for developing personalized interventions.

The implementation in the training process of some methods and means through algorithmic systems specific to the right-hand kick at the level of subjects aged between 10-12 years, determines the quantification of training programs in order to obtain data that allow the biomechanical characterization of the right-hand kick in this age group.

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Body Composition Changes of Students from Physical Education and Sport Faculty Timisoara During Christmas Holiday

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Abstract

Introduction: The recent World Health Organization (WHO) agreement on the standardized classification of overweight and obese, based on body mass index (BMI), allows a comparable analysis of prevalence rates worldwide.
Aim: The aim of the study consisted of the evaluation of body composition changes after Christmas Holiday.
Materials and Methods: The study was conducted on 73 students of Physical Education and Sport Faculty from Timisoara. To identify the change in body composition parameters, 2 measurements were performed from 12th December 2022 until 13th January 2023. The parameters determination of student body composition was performed using InBody 770 body composition analyzer, following a standard protocol.
Results: Data analysis revealed significant differences in the parameters: weight, BFM, BMI, PBF, FMRA, FMLA, FMT, were it was able to see an increase in body fat, a loss in muscle mass, and a decline in the fitness score after the Christmas Holiday both boys and girls.
Conclusions: In conclusion, we were able to see an increase in body fat, a loss in muscle mass, and a decline in the fitness score over the Christmas holidays. In terms of the analysis of the data by gender, male participants showed a significantly higher quantity of adipose tissue ($p > 0.05$) than female subjects. Further research is necessary to study the trend of students in terms of body composition during holidays.

Keywords: body composition, students, Christmas Holiday

Introduction

The recent World Health Organization (WHO) agreement on the standardized classification of overweight and obese, based on body mass index (BMI), allows a comparable analysis of prevalence rates worldwide [1].

According to the World Health Organization every year, an estimated 17 million people globally die of cardiovascular diseases (CVD), particularly heart attacks and strokes. CVDs occur almost equally in men and women. Although heart attacks and strokes have a high incidence of mortality in all parts of the world, 80% of premature deaths from these causes could be avoided by controlling the main risk factors: tabaco, unhealthy diet and physical inactivity.

Obesity has become a pervasive disease affecting all ages, socio-economic classes, and ethnicities [2].

The World Health Organisation states that many studies took in consideration the worldwide decline of physical activities and the increase of obesity and other disease risks [3]. Also, WHO agreement on the standardized classification of overweight and obese, based on body mass index (BMI), allows a comparable analysis of prevalence rates worldwid. In most countries, women show a greater BMI distribution with higher obesity rates than men do [1].

According to the last Eurobameter in the EU four in ten respondents never exercise or participate in any sports [4]. In Romania from a total number of 1057 interviews collected between 19th of April and 13th of May 63% of respondents had never exercised or participated in any sports [4]. A meta-analysis conducted by Jesica de Bloom [5] investigate if vacation had some effects on the impact on health and well-being. They observed that the role of activities on vacation was unclear, and the topic was not studied. Further studies beeing necessary to be conducted in order to observe the impact of holiday inactivity. Also, some authors have found a sedentary trend in young children and adolescents during holidays [6] [7].

Material and Method

This study was conducted on students from Physical Education and Sport Faculty (West University of Timișoara). A number of 88 students, 63 male and 25 female, had made the first evaluation. At the final measurement a total of 89 students were evaluated (67 male and 22 female). Those subjects that had not made both evaluations had been excluded from our study. The final sample was composed of a total of 73 subjects, from which 52 male (71,23%) and 21 female (28,77%). Female subjects had an average age of 20,66 ± 4,68 years female, height 165,90 ± 7,04 cm, weight and 59,45 ± 12,36 kg . Male subjects were 20,75 ± 3,50 years old, height 179,65 ± 6,54 cm, weight 76,30 ± 9,68 kg. All students were informed about the study aim and gave their approval for participating.

The parameters determination of student body composition was performed by InBody 770 body composition analyzer, following a standard protocol. InBody 770 body composition analyzer provides standard data like Percent Body Fat, Skeletal Muscle Mass, and BMI, plus a specialized Body Water Result Sheet for double the outputs [8].

Inbody 770 software provided us the following variables to research: weight, skeletal muscle mass (SMM), fat free mass (FFM), body fat mass (BFF), body mass index (BMI), percentage body fat (PBT), soft lean mass (for each segment), fat mass (for each segment).

Data collected using the Inbody 770 were recorded and analyzed using IBM SPSS (Statistical Package for the Social Sciences, version 22). Using this software, descriptive analysis of the data was performed, the distribution of data was checked (Shapiro - Wilk test was used), and tests according to the distribution of the data were utilized to determine the significance of differences between means.

The body composition analysis took place in the Faculty of Physical Education and Sport. For each student it was necessary about 3-5 minutes for measurement of the body composition. To identify the change in body composition parameters, 2 measurements were performed. The first step, before the Christmas Holidays between 12-21 December 2022 and the second step after the Christmas Holidays between 05-13.01.2023. All students have been informed about the study and all have been free of chronic or acute diseases.

Experimental Procedure

Following approval by the Physical Education and Sport Faculty the research procedure has started.

First step of our procedure was to measure the body composition of our subjects before the Christmas and New Year Holidays between 12-21 December 2022. Second evaluation was done between 05-13 January 2023, during the first week of classes after holiday. For each student it was necessary about 3-5 minutes to measure their body composition. The measurement was mainly carried out in the morning when students was an empty stomach. The equipment was as basic as possible, without metal accessories or socks.

Results

In this study took part 73 students from the Faculty of Physical education and sports 71.23% male and 28.77% female.

We observed some variations in the case of several investigated parameters when we compared baseline data with those collected after the Christmas holiday. Global assessments of the initial and final testing revealed significant differences in body fat mass, BMI, percentage body fat, fat mass of right arm (FMRA), fat mass of left arm (FMLA) and fat mass of trunk (FMT) (Table 1).

Table 1. Variables with significant mean differences between T1 and T2

Parameter	T1	T2	p
BFM	11.69 ±6.17	12.13 ±5.96	0.022
BMI	23.03 ±2.97	23.19 ±3.15	0.019
PBF	16.39 ±7.56	16.90 ±7.31	0.030
FMRA	0.59 ±0.55	0.62 ± 0.51	0.043
FMLA	0.60 ±0.56	0.63 ±0.52	0.046
FMT	5.78 ±3.39	6.05 ± 3.38	0.009

Next step was to divide the group by gender in order to observe how each one was influenced separately by this brief holiday.

Regarding BMI we could observe an increased value in case of male participants and a small decrease for female subjects (Fig 1). Male participants had a mean at baseline of 23.67 ± 2.66 while at the final testing their mean was 23.91 ± 2.93, the difference between these two moments is significant $p = 0.003$.

During both assessments, female individuals' body fat mass values were higher, although there were no significant differences between means.

Significant differences were observed on following parameters, for male participants: weight T1 = 76.30 kg (± 9.68), T2 = 76.96 kg (± 10.17), p = 0.009, body fat mass T1 = 14.46 (± 8.11) , T2 = 14.30 (± 6.98), p = 0.002, percent body fat T1 = 23.22 (± 7.63), T2 = 23.32 (± 6.73), p = 0.009, FMRA T1 = 0.97 (± 0.77), T2 = 0.94 (± 0.63), p = 0.000, FMLA T1 = 0.98 (± 0.77), T2 = 0.96 (± 0.62), p = 0.001, FMT T1 = 6.91 (± 4.24), T2 = 6.85 (± 3.75), p = 0.001, FMRL T1 = 2.29 (± 1.11), T2 = 2.28 (± 0.95), p = 0.014, FMLL T1 = 2.28 (± 1.10), T2 = 2.27 (± 1.01), p = 0.09.

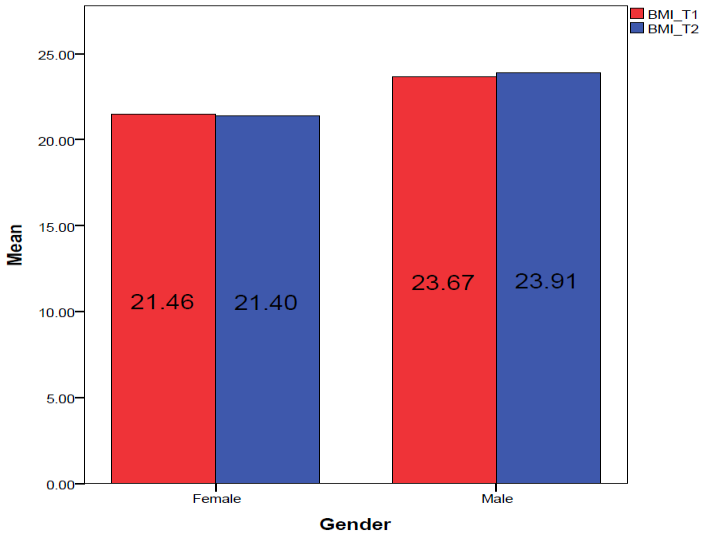

Fig. 1. Mean body mass index

Female participants had a slight decline in their body fat mass when compared to the male individuals who had a greater BFM after Holiday (Fig.2). Although female participants had some mean variations between evaluations we could not observe any significant difference at any parameter. After the holiday, we observed a small decrease in both genders' skeletal muscle mass.

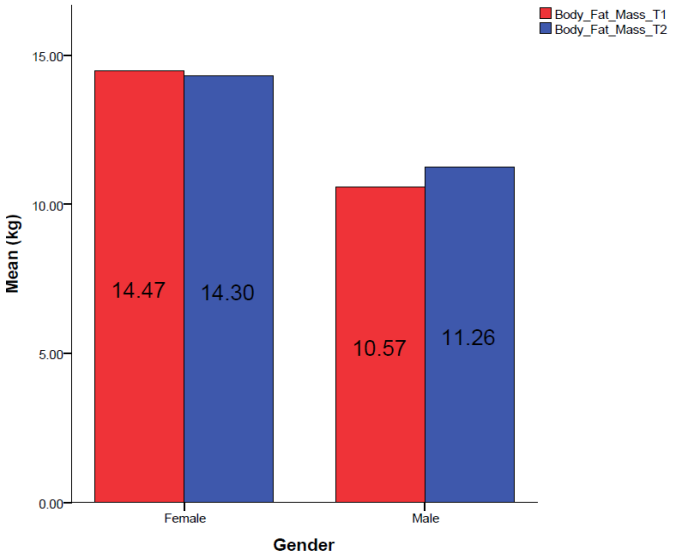

Fig. 2. Body fat mass values

Discussion

The goal of the current study was to determine how the holiday affected the body composition measurements of first-year students at the Physical Education and Sport Faculty.

Following the literature study, several authors assert that considerable variations in students' anthropometric parameters occur over holidays, irrespective of which holiday is in review.

Some authors found that in general, a significant increase ($P < 0.05$) in body weight was found between the first measurement and the ensuing measurements during the holidays. The students with a high-fat diet presented with a more pronounced change in weight, with significant differences being found between weights 1 and 3 and between weights 1 and 4 ($P < 0.05$) [9].

In another study, the authors observed that participants gained an average of 0.78 kg, which indicates the majority of average annual weight gain (1 kg/y) reported by others may occur during the holiday season. Obese participants are most at risk as they showed the greatest increases in BF%. Initial BW, not exercise, significantly predicted BF% and BW gain [10].

According to Hull [2], public opinion, advertisements from health clubs, and news from the mainstream media lead one to believe that people are likely to gain a large amount of fat during the winter holidays, yet there have been very few scientific studies published on this topic. Several studies have examined the weight change of college students during the Thanksgiving and Christmas Holidays.

Another author analyzed the impact of a short vacation by medical staff revealed that it is a vulnerable time when it comes to weight growth and body fat. Similar increases in BMI values (0.19 units) were seen in their participants as they were in ours (0.16 units) [11].

Dommel and Sayer observed that during winter holiday male athletes gained fat mass and increased their BMI while female athletes have not registered any significant differences. Similar situation appeared in our study where male participants had a greater BMI and fat mass on their segments after the holiday break. data collected from female participants had not revealed any significant difference between evaluation [12].

Conclusion

In conclusion, we were able to see an increase in body fat mass, a loss in muscle mass, and a decline in the fitness score over the Christmas holidays. In terms of the analysis of the data by gender, male participants showed a significantly greater quantity of body fat mass after vacation ($p > 0.002$) than female subjects. Further research is necessary to study the trend of students in terms of body composition during holidays, by trying to conduct a longitudinal study over the 3 years of college in the 2 longest holidays of the year: Christmas and Summer Holidays.

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Opinions of Physical Education Teachers on the Concepts of Punishment, Sanction and Additional Tasks Applied During Physical Education Lessons

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Abstract

Introduction: Punishment in schools, particularly in physical education and sport lessons, is, according to studies, a form of institutionalised violence against children that is widespread throughout the world.
Aim: The aim of this study is to identify the opinion of PE and sport teachers regarding the application of punishments, sanctions or additional tasks, and their perception on the differences between the three concepts.
Materials and Methods: This study involved six teachers from Timis County who work in six pre-university educational institutions. Data was collected through a semi-structured interview. The teachers were asked different questions, and their answers led to the identification of the current use of the concepts in discussion.
Results: Following the interview and the analysis of the answers, we found that corporal punishment is not a means that PE and sport teachers use in their lessons. Instead, to draw pupils' attention who do not follow the rules, they use various additional tasks, which are often represented by physical actions, such as squatting or jumping.
Conclusions: In conclusion, the concepts of punishment, sanctions, additional tasks exists and are still used in PE and sport lessons, but they are presented in a different form, which allows teachers to use them precisely in order to maintain control of the lesson.

Keywords: punishment, sanction, additional tasks, teachers, physical education and sport, semi-structured interview

Introduction

Discipline is the control that is achieved by requiring compliance with rules, in which misbehavior ends up being punished [1]. Positive discipline focuses on modeling positive behavior and ensures the contribution of the pupil or player in developing class or team rules. Negative discipline refers to pupils who perform various additional tasks as a result of inappropriate behavior [1]. In general, it is a reaction to a negative occurrence and sends the message that the teacher or coach is upset or annoyed.

In the academic environment, there are still teachers who punish pupils excessively, sometimes with little justification and in ways that undermine their educational progress. Teachers' "response" and vaguely defined categories of "disobedience" and "defiance" are are

commonly invoked as grounds for punishment [2]. Also, according to Curren [3], schools give primacy to teachers' control over pupils, to the detriment of their prudent self-governance. At the same time, they work in ways that inevitably contribute to unwanted behavior on the part of pupils, which teachers eventually end up sanctioning [3]. It is argued that behavioural discipline methods sometimes fail because they neglect important dimensions of children's experience [4]. In this study we will address the two methods often used in the physical education and sports lesson (punishment and sanction), but also the identification of the attempt to mask them by adding additional tasks by teachers. Punishment involves using negative consequences to reduce an undesirable behaviour. The aim is to form an association between behaviour and negative consequences. Once this association is created, the expectation is that the behavior will subsequently be less likely to occur [5]. Another opinion is that "punishment" is any stimulus applied or removed, subject to a response, in order to reduce its future occurrence [6]. Although the punishment can be effective in some cases, you may probably think of some examples of cases where a punishment does not constantly reduce unwanted behavior. Prison is an example. Spending time in prison does not necessarily have a discouraging effect on future criminal behavior [7].

At the same time, the second concept applied in the educational environment is the sanction, defined by Gómez [8] as a measure of authority that assesses whether a conduct is sanctionable, that is, if a behavior is inappropriate and violates certain rules. In the same paper it is mentioned that a person is guilty or not guilty depending on whether there is a rule prohibiting a certain conduct. Therefore, the existence of the rule and its relationship with the act are those which determine the sanction. What would be the differences between the two and how do physical education and sports teachers perceive them?

It should be noted that both terms have certain similarities that can lead to confusion and doubt when used. In this sense, it is understood that punishments are offence-oriented and are usually a direct consequence of inappropriate behavior. Sanctions, on the other hand, occur when a rule or law is infringed. With regard to the consequences themselves, Delval [9] considers that while punishment tends to humiliate the person (without the repercussions being directly linked to the offence committed), sanction has a more social purpose, with objectives aimed at repairing the act committed by the person, and is often the result of a momentary impulse. Although there are differences between the two terms, the concept of punishment as a source of power has evolved quite a bit, and some studies show that teachers, as well as parents, consider violence to have an "educational" value [9]. In this way, we can observe that the imposition of punishment has been the most used method for decades to reinforce hierarchy and authority [8].

As the subject of teachers' use of these concepts catches our attention, there are critics who worry that schools are "getting weaker" on discipline and that punishment is becoming the result of the chaos we find ourselves in [6]. How did it get to this point of confusion about punishment in schools? And what should be done? Should schools punish children when they break the rules or fail to meet expected standards of behavior? Are we obliged to impose a disadvantage on children who misbehave or should we avoid such imposition? Are there fairer, more effective or less vindictive ways of getting children to respect school rules, other than by punishing offences?

Currently, few studies address this issue, much less in the physical education and sports lesson. However, there are social debates about the use of punishments by teachers, especially in primary and secondary schools, which question the credibility of these methods. On the basis of these issues, the present study aims to obtain answers about the use of punishment and sanctions precisely through the people who interact with pupils on a daily basis, i.e. their teachers.

Objective

Troi Bechet argues that the purpose of restorative justice in schools is to work "with" pupils to solve problems, rather than to "impose" things on them through punishment [10]. Thus, the objective of this study is to identify the opinion of physical education and sport teachers regarding the application of punishments, sanctions or additional tasks at different moments of the lesson. Also, an increased interest has been directed towards exploring on how these concepts are used and applied.

Material and Methods

In this qualitative study, 6 physical education and sport teachers from 6 different educational institutions participated. The participants, aged between 26 and 35, live and work in Timis County, in the city of Timisoara and its surroundings.

The research method used in this study is the semi-structured interview. It involves the collection of certain data, which is based on asking questions within a predetermined thematic framework. In our case, the interviews took place in the physical education and sports hall, or on the outdoor field. Most of the questions asked were planned before, but along the way, the discussion had a flexible note and led to other directions of approach, having an exploratory nature. The "Voice Recorder" appliation was used to record the interviews.

The interview grid was written following certain steps:

1. Establishing the main objectives
2. Projecting the questions of interest
3. Grouping questions by categories and sub-themes of interest

In Table 1 one can see the interview grid, according to which the whole study was guided:

Table 1. Semi-structured interview grid

TOPIC	SUB-TOPIC	QUESTIONS
1) CONCEPT	- Identifying the concept of punishment - Identifying the concept of sanction - Identifying the concept of additional tasks Perception about the differences between the 3 concepts	How do you define the concept of punishment? How do you define the concept of sanction? How do you define the concept of additional tasks? Do you think there are differences between the 3 concepts? If so, please tell us which. Were you subjected to punishment in physical education and sports lessons as a child? If so, can you tell us in what form they were in? If not, could you describe the environment you were in at that time? Have you ever had discussions with your teaching colleagues about the application of punishments during lessons? If so, could you describe their perception on this topic? Do you think that pupils should be disciplined in physical education and sport lessons? Did you encounter difficulties in maintaining silence and discipline in the lesson, which you did not know how to manage? If so, please tell us what solution you found then.
2) OPINIONS	- Effectiveness of punishments in physical education and sport lessons - Identifying the moments when punishments or sanctions should be applied - Examples of punishments used in physical education and sport lessons	What is your opinion on the effectiveness of punishments during physical education and sports lesson? Have you ever felt constrained by the fact that you couldn't apply punishments and therefore couldn't find ways to keep the attention of the pupils collective? Do you consider that there are opportune moments when punishment would be effective and, moreover, would only do good for the pupil and for the whole class? Do you think that punishment should be one of the methods used during physical education and sport lessons? If so, why? If not, why not? What examples of "harmless" punishments have you applied so far?

		Could you give us other examples that you have not used?
3) REASONING	- Reasons for the application of punishments - Corporal punishment - Effective means of maintaining harmony in the educational environment	Which do you think is the reason why physical education and sports teachers continue to apply punishments? What were the situations that led to the application of punishments, sanctions, or additional tasks? What do you think about corporal punishment that is still applied in some regions? Do you have or have you had colleagues who applied them? Do you think they were effective? If not, can you give us some examples of ways in which the physical education and sports teacher could maintain discipline and therefore the pupils' attention? Do you consider that corporal punishment is similar to forcing pupils to go through a strength program?
4) LEGISLATION	- Legality of the application of punishments in the academic environment - Identifying legal substitutes for punishment	Do you know the legislation on the application of punishments in the educational environment? What are the repercussions according to the legislation in force in the situation of the application of punishments? Do you think the law is harsh and should still leave open ways in which the punishment should still be applied? If not, what other effective teaching methods do you know? What advice on the application of punishments can you give to teachers who are just starting out?

Results

Following the analysis, it was found that the three concepts mentioned above are quite unclear and the meaning is vaguely perceived by the teachers interviewed, with no clear delineation of them. They unanimously revealed that punishment is not a method they use, as it can have repercussions on children's mental and physical health. On the other hand, all teachers believe that in case of indisciplinary behaviour, they should apply legal measures that will lead them to solve the problem. Furthermore, in order not to use the two terms mentioned above, teachers use 'additional task' as an ideal method, which they perceive as a physical activity program geared towards pupils who do not follow the rules. This has the purpose, in their perception, to draw the pupil's attention to inappropriate behavior and to force him to experience additional activity that his colleagues are not obliged to do. In this way, the teacher cannot be sanctioned for the fact that the method used to discipline the child is illegal and immoral. Moreover, unlike other disciplines, physical education and sports lessons offer a facilitation to capture the attention of the student through the main medium used, i.e. exercise.

According to the answers given by the interviewed teachers regarding the usefulness of punishment, we can say that punishment is not a suitable method. One of the interviewed teachers believes that pupils should not be disciplined during physical education lessons, precisely in order to feel relaxed during physical activity and not to feel constrained. On the other hand, the rest of the teachers consider that given that the physical education lesson takes place in the educational environment, as do the other disciplines, the rules system should be followed regardless of the situation. Under such conditions, the pupil would not differentiate between them and would behave appropriately, adapting to the rules and requirements imposed. Interestingly, although that teacher stated the above point, he admitted that sometimes pupils do not pay attention to him, often having to apply punishment as a disciplinary measure, which he indirectly calls an " additional task". Also, unanimously, the teachers stated that for them it is very important to interact with the pupil, saying that they used the conversation as a method for restoring discipline. They believe that a first step in disciplining the collective may be to

establish a relationship with its members. The term they used was "friendship" between teacher and pupil.

According to the teachers' answers, the reasons behind the application of punishments are convenience, the lack of interest, but also the reproduction of some behaviors they have encountered over time. Teachers who use such methods are either unwilling to take the time to make pupils aware that they have done wrong in certain situations, ignoring aspects of their emotional side, or they want to get immediate results in terms of discipline in class.

None of the teachers interviewed use corporal punishment, about which they expressed their complete disapproval. However, they did reveal to us that they are aware of situations where their colleagues have used corporal punishment during physical education and sports lessons. The use of corporal punishment led in one of the cases to the exclusion of the teacher from the school environment.

All the teachers participating in the study mentioned that they were not aware of the legislation on punishment in the school environment and that they had never had the curiosity to find out, as they used other methods to restore a pleasant and disciplined atmosphere in the physical education and sports lessons.

Discussion

The present study aimed to examine how punishments and sanctions are still applied in physical education and sports lessons. It was thus found that teachers continue to use the punishment, but but disguises it as an "additional task", precisely to cancel out possible repercussions on the pupil's mental health. Thus, common research has found that intrusive control can lead to higher levels of inhibition or fear, and positive control is associated with lower levels of inhibition or fear as well as satisfaction with the educational environment of preschool children [11]. The teachers included in our study confessed that these punishments are applied most of the time on a disciplinary basis, in order to make pupils more careful, to follow the rules and to have a suitable behavior for the educational environment. There is also evidence that suggests that the use of disciplinary practices through punishment and exclusion from the group (e.g. expulsions and restraints, or corporal punishment) disproportionately affects some young people [12]. Therefore, it has been suggested that exposure to harsh disciplinary punishments may affect children's self-regulation and cognitive development.

However, the processes by which this can happen are not clear. Punishment can lead to children's cognitive decline due to adults' over-reliance on assertive power discipline and less inductive methods of behavioral control that favor the internalization of norms and problem-solving. In addition, discipline imposed by harsh methods (body punishments or highlighting inappropriate behavior) can affect cognitive development in children through stress-related emotional responses. Stress can negatively affect cognitive functioning, leading to decreased processing capacity [13]. Straus and Paschall [14] reported a 4-year longitudinal study showing that corporal punishment was associated with a decrease in children's general cognitive abilities over time.

Conclusions

After the analysis we found that physical activity imposed as a punishment is an outdated method that can have a negative impact on pupils, affecting them in many ways. The use of

punishments will not allow pupils to benefit from positive learning experiences during the physical education and sports lesson, aspect that can drive them away from this discipline.

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The Physical Exercises Role in Increasing the Life Quality of the Elderly People

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Abstract

Introduction: In the context of the 3.8 million elderly people in Romania, meaning 20% of the population, the improvement of their life quality must represent a permanent preoccupation of all the factors in charge. One of the factors which can contribute to the efficient solving of this problem is represented by sport activities.
Aim: The research had as aim the identification of the profile of elderly people which benefit of different services in The Centre for elderly in The Town of Reșița, as well as their level of involvement in the programs of the organised sport activities.
Materials and Methods: The 74 participating people are elderly people involved in sport activities, from a total of 317 beneficiaries of social services in the mentioned Centre. A sociologic inquiry was achieved in which the questionnaire technique was used, by means of which we pursued the identification of the elderly people interest for sport activities, if they have practised this type of activity, and the motivation for practising these activities at present.
Results: According to the study, we can observe that less than 25% of the total number of social services beneficiaries in the research participate in sport activities.
Conclusions: The study proves that although the contribution of sport activities on the individual's health and wellbeing is well-known, when aging, the number of people involved in this kind of activities decreases as a result of the elderly non-involvement in this type of activities. The elderly's non-involvement in the program of sport activities can be the result of the lack of Project implemented at community level by means of which to pursue the formation of a habit for adult people to regularly practice sport activities, thus, shaping for them an active lifestyle.

Keywords: Elderly, life quality, sport activities

Introduction

Ageing is an essential part of the all the living, being considered the last stage of human life, when weaknesses appear from a physical point of view, and from an emotional point of view. Old age is often described in negative terms, being related to the deterioration of the psychology of all physical factors, isolation of social, economic and other activities [1]. Thus, a reflection on the aging process should begin with an awareness of the magnitude of this phenomenon, which affects all aspects of life. Recent statistics point to excessive ageing, a subpopulation of very old

people (80 years and over), a phenomenon due to the decrease in the number of births, but also the lower mortality rate, as confirmed by the latest global decomposition analysis. The increase in the level of the elderly population at the level of the European Union, on January 1, 2022, was estimated at 446.7 million. Young people (0 to 14 years) represented 15.0% of the EU population, while people considered to be of working age (15 to 64 years) represented 63.9% of the population. Older people (aged 65 or over) had a share of 21.1% (an increase of 0.3 percentage points (pp) from the previous year and an increase of 3.1 pp from 10 years ago) [2].

In Romania, in 2022, the elderly population of 65 years and over exceeded by 672,000 people the young population of 0-14 years (3.860 million compared to 3.188 million people), according to the data provided by the National Institute of Statistics. Thus, the demographic aging index increased: from 119.3 (as of July 1, 2021), to 121.1 elderly persons per 100 young persons (as of July 1, 2022). In other words, the number of elderly people over 65 is 21.1% higher than the number of children in the 0-14 age group [3]. According to the World Health Organization [4] designing an exercise program for older people should take into account their goals and aspirations, so that they are more motivated to engage in systematic physical activity. One of the most important factors influencing the health status of the elderly is physical activity, according to specialized literature [5]. Physical activity undertaken systematically supports the treatment of chronic diseases and allows a healthy, active life without functional barriers [6, 7]. Furthermore, reduced physical activity in the elderly favours many chronic diseases, including hypertension, diabetes, obesity, cardiovascular disease, stroke, and some cancers [8].

Quality of life (QOL) was proposed since the 1950s by the American economist J. Calbraith [9] and was later defined by the World Health Organization (WHO) as "the experience of individuals from different cultures and value systems regarding the goals of life, the expectations, standards and living conditions of the things they care about [10, 11].

Recently, the quality of life of the elderly has become an important indicator of healthy aging [12], but also a comprehensive indicator of good physical and mental states. Physical exercise is one of the main factors affecting the quality of life in older adults [13]. Daimiel et al. [14] pointed out that physical activities and fitness are strongly associated with a better level of QOL - Authors' study Puciato et al. [15] that included over 1000 participants showed that perceived health status and QOL in the physical, psychological, social and environmental domains were significantly better in people with higher levels of physical activity. Also, Oh et al. [16] investigated the effects of three of the most representative exercises (resistance, flexibility and walking) on quality of life in a population of community-dwelling older adults. They observed that QOL parameters such as mobility, self-care, usual activities, pain/discomfort, anxiety/depression were improved.

Materials and Methods

The present scientific approach was carried out in the Centre for the elderly in the town of Resita, which offers elderly people, over 65 years old for men and 63 years old for women, various possibilities for socializing and serving meals. The beneficiaries of the Centre can participate in various activities, such as: chess, backgammon, cards and occasionally folk dances, as part of the socialization activities.

In the context of the permanent concern aimed at finding new ways to contribute to improving the quality of life of the elderly, it was considered necessary and useful to implement new forms of spending free time within the Centre. From the vast offer of means specific to the field of physical education and sports, adapting to the existing material conditions, we proceeded with

the implementation of a program of regularly organized sports activities. Thus, the students from the physical education and sports program participated on a weekly basis, for nine months, in the organization and carrying out of some activities, offered to the beneficiaries of social protection services, a program of activities that consisted of: exercise games, dance, hiking, gymnastics aerobics and swimming. 74 people participated in these activities.

At the end of the process, in order to verify the effectiveness of the implementation of such programs, a sociological survey was carried out. Thus, a questionnaire containing 18 items was applied. Among the 317 beneficiaries of social services within the Centre, a number of 267 subjects answered the questionnaire.

Figure 1. Images from sports activities programs

Results

From the total number of beneficiaries of the Centre for the elderly in Resita Municipality, 74 people, aged between 63 and 85, participated in the sports activities' programs, of which 53% were female and 47% were male. Among them, 24.3% completed primary education, 24.3% secondary education, 37.8% professional education, 6.8% high school education, and 6.8% university education. According to the data obtained as a result of collecting the answers provided by the 267 respondents, it was found that for various reasons, only 28% of the beneficiaries were involved in this type of activity. Compared to the relatively low percentage of people directly involved in these activities, it can be found that a percentage of 79% did not practice this type of activity even before benefiting from the Centre's services, the reasons mentioned being: that they didn't have time (51.4%), they didn't like it (15.4%), they didn't have anything to do (14.1%), they couldn't afford it (12.7 %), as well as other reasons (6,4). For people who were active even before retirement, it is found that the frequency of practicing physical activities was once a week for a percentage of 48% of these people, twice a week for a percentage of 33%, three times a week 14 %, and never 5%.

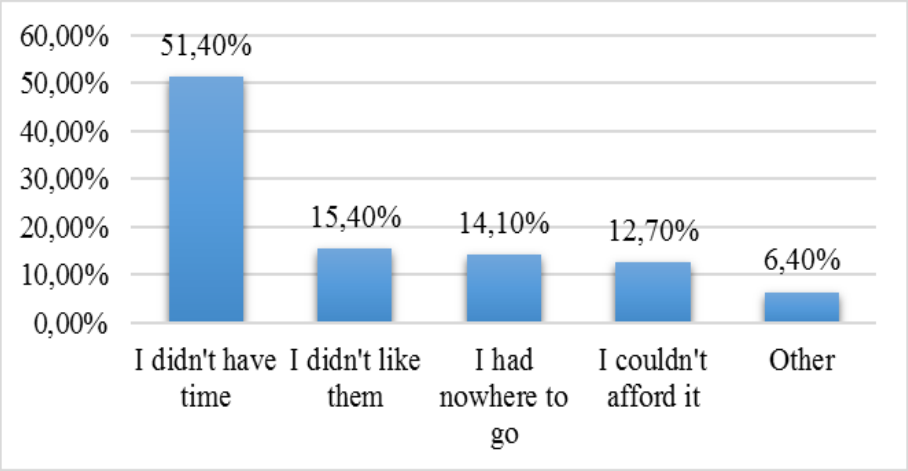

Figure 2. The reason for not practicing sports activities before retirement

Following the implementation of the program, the direct beneficiaries involved in the offered activities considered, in relation to the influence on the state of health, in a percentage of 61.9%, that the participation offered them the possibility of maintaining an optimal state of health, in relation to the energy tone, 66.7% referred to a gain of energy, regarding well-being, 76.2% spent their time in a pleasant way, opposite to relaxation, 71.4% relaxed, and from the perspective of relationships, 76.2% declare that they were able to socialise with other people.

With reference to the data above, regarding the level of training of the respondents, it is noted that the participation in a higher proportion of subjects with a higher level of training.

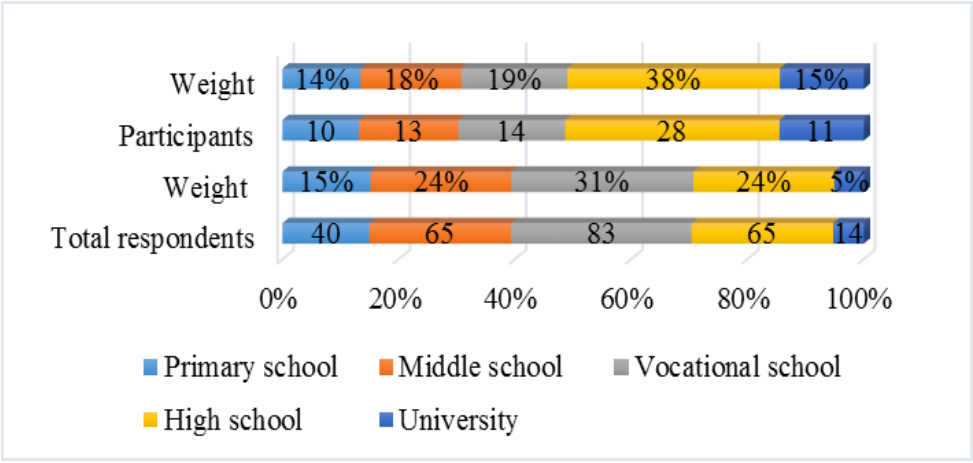

Figure 4. Correlation between education level and people with an active lifestyle

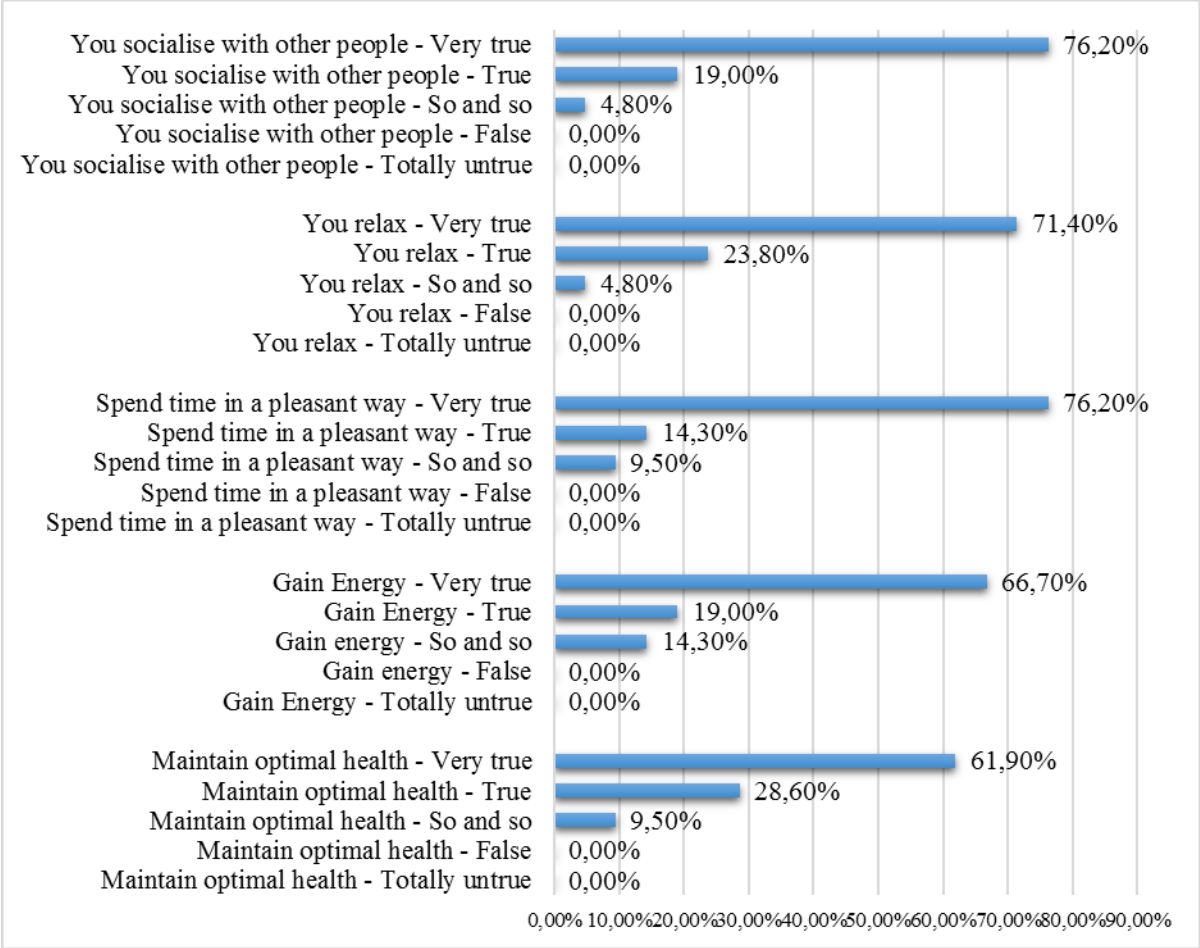

Figure 3. Perception of the benefits of participating in sports activities

Discussions

The study demonstrates that although the contribution of sports activities to the health and well-being of individuals is well known, with age the number of people involved in this type of activity decreases, the reasons cited being among the most diverse, from the lack of time necessary to be allotted, to the lack of some spaces intended for such activities. The fact that over 75% of the research subjects have a sedentary lifestyle, without the habit of regularly practicing sports activities, may be the result of the lack of projects implemented at the community level, through which to follow the formation of the habit, in adults, of regularly practice sports activities, forming in this way an active lifestyle, as well as an appropriate offer of spaces arranged and intended for the practice of sports activities, for all members of the community. Inactivity is associated with an increase in percentage of body fat and a concomitant decline in body mass. Skeletal muscle atrophy is often considered a hallmark of aging and physical inactivity. Consequently, low physical performance in activities of daily living is more common among older people, as shown by studies in the field [17,18]. However, even a small amount of physical exercises has been shown to increase lean body mass [19], improve physical performance [20], as well as the quality of life of the elderly [12].

Participation in physical exercises activities can contribute to maintaining quality of life, health, and physical function [21] among older people in general and older people with morbidities in particular. The increased attention to the relationship between exercise and the quality of life in elderly people over the last decade is reflected in specialty literature, which showed that a moderate level of activities combined with physical exercises s had a positive effect on activities in daily living, highlighting the importance of physical, mental, and social demands [22]. This has also been confirmed by the beneficiaries included in this study, who confirmed the possibility of maintaining an optimal state of health (66.7%), 76.2% spent their time in a pleasant way, 71.4% felt more relaxed, and in addition 76.2% declare that they were able to socialise with other people.

Conclusions

Following the study, it can be observed that less than 25% of the total number of beneficiaries of social services within the research participate in sports activities. It should be noted that the lifestyle is directly influenced by the level of education of the citizens. A higher level of information and understanding of things contributing to an appropriate approach including this issue related to improving the quality of life at the age of senescence. The use of physical exercise as a means of improving the quality of life, along with other strategies, must represent a permanent concern, throughout life, regardless of age. From an individual perspective, the way we relate to ourselves, to what happens around us, the goals set, the expectations related to them, have, without doubt, a major impact on the quality of life.

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The Importance of Joint Mobility in Learning to Swim in 8-10 Year Old

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Abstract

Introduction: The methodology of motor skills development is a central concern of teachers and coaches in different branches of sport. Mobility is the ability of the human body to perform movements with different amplitudes of movement. These movements are expressed in degrees, since movements of the locomotor system are at different angles to each other. Mobility is also associated with sports performance, using coordinated movements associated with a well-developed locomotor apparatus.
Aim: The complexity of swimming training, starting from the nature of the swim and ending with the values of the effort indicators, provides hypothetical variations of work. The rhythmic use of specific mobility development exercises in swimmers' training can lead to real improvements in joint mobility as well as improved sports performance.
Materials: The present work has its scientific basis in personal concerns materialized in the study of a rich bibliography, but especially in the exploitation and interpretation of the results obtained from the study and scientific research of the topic.
Results: The rhythmic use of specific mobility development exercises in swimmers' training has led to real improvements in joint mobility as well as improved sports performance.
Conclusions: An increased mobility of the main joints (scapulo-humeral, spine, coxo-femoral, talo-crural) widens their range of movements, making them easier to execute, so that a correct learning of technical procedures will be achieved and thus superior sports performances will be obtained.

Keywords: swimming, mobility, methods, sports performance

Introduction

Motor qualities, or movement qualities in general, are a subject of great interest among specialists, as they are known to play a determining role in human motor capacity. For this reason, the methodology of developing motor skills is a central concern of teachers and coaches in various branches of sport. Mobility is the ability of the human body to perform movements of

different amplitudes with the segments of the body. These movements are expressed in degrees, since movements of the locomotor system are known to have different angles [1],[2],[3],[4].

Mobility is a prerequisite for the effective performance of technical procedures and other preparatory exercises in various branches of sport or for the correct acquisition of basic motor and application skills. Mobility is usually associated with physical performance, with coordinated movements and associated with a well-developed locomotor apparatus [5],[7],[9].

Good mobility is needed in every motor act, where movements with a large amplitude are required. Low mobility creates numerous disadvantages in the performance of the motor act [8],[10],[12]:

- lengthens the period for learning and perfecting motor actions;
- favours injuries;
- reduces the development indices of the other motor skills (speed, skill, endurance, strength) and limits their use to maximum efficiency;
- decreases the efficiency in performing motor actions, the lack of which is compensated by extra efforts, by high energy expenditure;
- decreases the quality of the execution, as the movements cannot be executed expressively, freely, relaxed and with ease.

Mobility peaks around the age of 15-16, and some joints and movements even later Sermeev. After this age, especially under non-exertional conditions, mobility gradually decreases. The claim that children show greater joint mobility is not entirely justified, but it is true that childhood age is the most effective for the development of this quality [6],[11],[13],[14].

The topicality of the theme lies precisely in the concern to achieve the best possible performance, which in swimming and in addition to the other necessary qualities (speed, skill, endurance, strength), mobility plays an important role [18],[19]. Good joint mobility makes it much easier to learn the correct swimming technique and increases performance. Since mobility development is easier at a younger age, it is logical that the coach should pay special attention to this aspect of training, ensuring that the future swimmer has a good motor background, achieving now what later will be very difficult or probably not at all [15],[16],[17].

Aims and Objectives

The present study aims to investigate theoretically and experimentally the effectiveness of using mobility exercises. In order to increase the efficiency of the training, of the instructional-educational process, it is necessary to establish precise goals, well-objectified drive systems, and to choose the most effective methods and means of drive. This paper aims to provide some practical and methodological suggestions for developing mobility.

Materials and Methods

Materials needed are:

- a graduated stick from 0-100 cm, where 0 is halfway between the ends;
- goniometer;
- a Go-Pro HERO BLACK 9 video system for underwater filming (fig. 1.);
- gym bench;
- the graduated ruler;
- centimetre of tailoring.

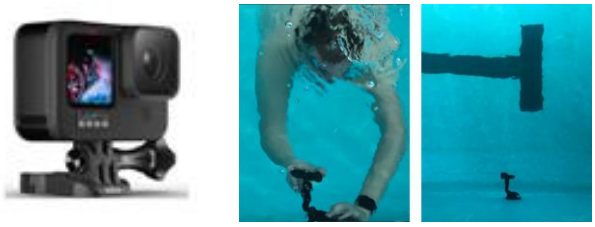

Figure 1 - Go-Pro HERO BLACK 9 video system and its mounting on the wall of the swimming pool

Working Methods

The present work has its scientific basis in personal concerns materialized in the study of a rich bibliography, but especially in the exploitation and interpretation of the results obtained from the study and scientific research of the topic.

In order to achieve the proposed objectives, we used the following research methods: pedagogical observation method, test method (consists of determining joint mobility using deliberately designed measurements), statistical method and experimental method.

With the help of these materials we made measurements at the following joints:

- For the scapulohumeral joint (shoulder mobility), required for the technical procedures of crawl, backstroke and butterfly swimming, we performed measurements in flexion (active and passive) and extension (active and passive).
- For the spine joint, we performed measurements in flexion (active and passive).
- For the hip joint we performed measurements in extension (active and passive).
- For the talocrural joint we performed measurements in active and passive dorsal and plantar flexion and internal and external rotation.

Duration and Period of Measurements

The experiment was conducted over a period of 6 months: September **2022-March** 2023, during which period we performed two tests initially in September 2022 and the final one in March 2023, when we performed measurements for the scapulohumeral joint, the spinal joint, the coxofemoral joint and the talocrural joint, as well as two tests in the 50m crawl and 50m backstroke events, scoring from 1-10 the technical execution of the technical swimming procedures, which was evaluated both by observing the swimming technique performed by the athletes above and below water level (with a Go-Pro HERO BLACK 9 video system for underwater filming). After initial testing, we introduced specific exercises on land into the training of the experimental group, with the aim of developing joint mobility in the main joints necessary to perform the technical swimming procedures correctly.

Description of Subjects

The sample of subjects consisted of 15 athletes (8 boys and 7 girls) from the swimming section of CSM Arad. The swimmers are aged between 8 -10 years, most of them were born in 2013-2015.

The children being in the learning-consolidation period, where they lay the foundations for learning the correct swimming procedures. It is very important that during this period and at this

age, joint mobility is properly developed so that athletes can learn the correct technique of the procedures. The subjects had the same training programme, a similar level of physical and technical training, so the group was homogeneous.

Results

After observing the data obtained from the organised experiment, the following can be deduced:

- Compared to the initial test, there is an improvement in the manifestation indexes, the targeted mobility in all joints;
- The most significant improvements are seen in the scapulohumeral, talocrural and hip joint.
- Calculating the statistical indicators used in this research, the following can be observed:
  - **The arithmetic mean** improved in the final test by a higher percentage at all joints (Table 1.). This shows progress at the group level, as we know that poor results on this trend parameter can lower the level of statistical indicators.
  - After calculating the **standard deviation**, it can be seen that the individual deviations from the mean decrease in the final test, which means that the spread indices from the mean have a decreasing trend (Table 2).
- The calculation of **the coefficient of variability** shows the following:
- On initial testing, inhomogeneity is observed in all joints except the talocrural joint at internal rotation.
- On final testing, high homogeneity is observed at the scapulohumeral joint in active flexion, passive extension, coxofemoral extension, active and talocrural internal rotation active and passive (Table 2).
- The coefficient of variability values obtained show high variability between group members and large individual differences.
- in the case of indices of joint mobility compared to other motor qualities, there is an excessive coefficient of variability due to the fact that it cannot be compensated for by other motor qualities apart from muscular strength.
- After calculating the **probable error** using the **t-test,** it can be seen that the only joint for which the arithmetic mean is not certified for both groups is the scapulohumeral joint in active and passive extension, both in the initial and final tests.
- at the other joints, the t-test values obtained provide a high degree of certainty for the statistical indices.
- **Using the correlation method** (the relationship between two different variables of the collective) in our case, the link between good mobility and good performance in child swimmers was found:
- The correlation coefficient values obtained show a positive correlation, values quite close to the positive value.
- a positive correlation is observed at the scapulo-humeral, sitalo-crural joint, which validates increased swimming performance;
- After assessing the values of the results obtained, it can be concluded that the independent variable (proposed exercises) caused an increase in the dependent variable (sports performance) thus confirming the specific hypothesis (Table 1, 2, 3).

Table 1 - Values of statistical indicators at **initial testing**

Joints	**Scapulohumeral**				**Spine**		**Coxo femoral**		**Talocrural**							
Indexes statistics	Flexie		Extension		Flexie		Extension		Flexie back		Flexie plantar		Rotation internal		Rotation external	
	Activ	Pasiv	Activ	Pasiv	Activ	Pasiv	Activ	Pasiv	Activ	Pasiv	Activ	Pasiv	Activ	Pasiv	Activ	Pasiv
Arithmetic mean	32,33	56,4	-4,8	9,66	7,2	12,2	21,33	18,2	19,13	24,2	55,60	65,33	162,06	168,6	13,8	18,26
Standard deviation	18,44	24,05	23,51	30,04	18,52	13,36	13,63	10,95	12,82	12,02	26,72	18,97	16,30	27,52	10,42	10,69
Coefficient of variability %	57,62	42,94	470,37	300,04	264,57	111,35	64,9	60,87	67,51	50,11	47,72	29,19	10,06	16,95	74,45	59,39
T test	14,16	18,29	6,07	7,76	8,11	14,42	12,64	10,18	11,91	11,16	24,84	17,64	15,15	25,59	9,68	9,93
Correlation	0,972	0,984	0,999	0,845	0,706	0,999	0,864	0,853	0,998	0,999	0,999	0,893	0,984	0,926	0,998	0,832

Table 2 - Values of statistical indicators at **final testing**

Joints	**Scapulohumeral**				**Spine**		**Coxo femoral**		**Talocrural**							
Indexes statistics	**Flexie**		**Extension**		**Flexie**		**Extension**		**Flexie back**		**Flexie plantar**		**Rotation internal**		**Rotation external**	
	Activ	Pasiv	Activ	Pasiv	Activ	Pasiv	Activ	Pasiv	Activ	Pasiv	Activ	Pasiv	Activ	Pasiv	Activ	Pasiv
Arithmetic mean	35	59	-2,4	12,46	10,46	14,86	17,33	15,6	20,06	24,60	56,26	67,86	164,73	171,53	17	21,33
Standard deviation	5,77	20,31	11,22	23,78	12,82	14,69	12,82	13,63	9,35	12,29	26,99	21,38	15,50	15,50	10,95	8,55
Coefficient of variability %	16,48	34,42	56,1	19,81	128,2	104,9	7,22	98,86	46,77	49,16	48,19	31,44	9,39	9,39	64,41	40,71
T test	5,36	18,89	10,43	18,11	10,91	13,64	11,91	12,67	11,41	8,69	25,10	19,88	14,4	7,92	16,67	18,11
Correlation	0,979	0,988	0,999	0,850	0,710	0,999	0,868	0,855	0,998	0,999	0,999	0,896	0,986	0,929	0,999	0,840

Table 3 - Percentage increase in joint mobility between baseline and final testing

Scapulohumeral joint				**Spine**		**Hip joint**		**Talocrural joint**							
Flexie		Extension		Flexie		Extension		Flexie back		Flexie plantar		Rotation Internal		Rotation external	
Activ 1	Passiv 2	Activ 3	Passiv 4	Activ 5	Pasiv 6	Activ 7	Pasiv 8	Activ 9	Pasiv 10	Activ 11	Passiv 12	Activ 13	Pasiv 14	Activ 15	Pasiv 16
7,6%	4,4%	30%	22,4%	31,1%	17,10%	23%	16,6%	9,50%	8,24%	1,62%	3,72%	1,62%	1,70%	18,82%	14,39%

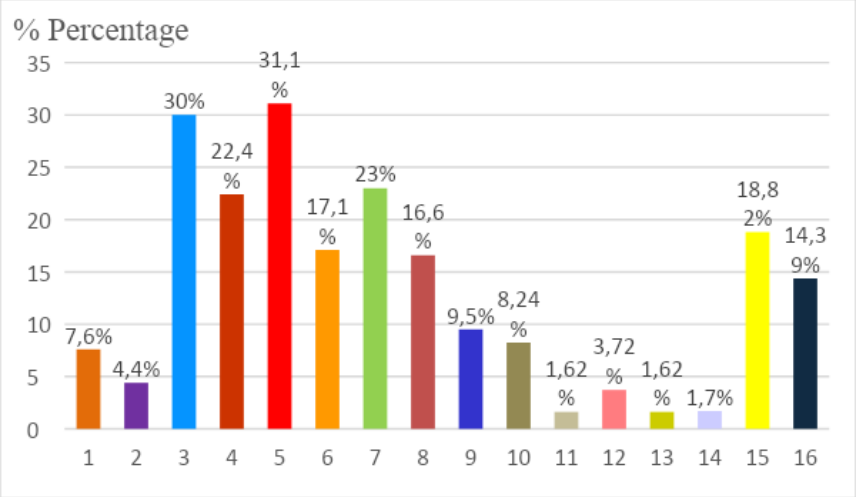

Figure 2 - Graphical representation of the percentage increase in joint mobility between the initial and final tests

Discussions

In the coming period we will extend the data recording to a larger group of subjects and will also perform other types of measurements, assessments, using the processing and interpretation of underwater recordings using Dartfish Software to break down and analyse the athletes' movements.

The software uses digital video graphics to provide instant visual feedback. It will be able to improve processes and performance [8,10].

Conclusions

From the detailed study of the present work, its tables and graphs, the following conclusions can be drawn (fig. 2.):

- using **land-based exercises to develop joint mobility**, there was a marked improvement in joint mobility indices.
- between the initial and the final test, the arithmetic mean increases in parallel with the decreasing trend of the coefficient of variability, resulting in an increase in the degree of homogeneity.
- large individual differences have been found in the improvement of this mobility quality, so one cannot overlook the hereditary endowment of the individual nor other factors that contribute to the development of a quality: morphological, functional, psychological, etc.
- a more obvious improvement in mobility is observed at the scapulohumeral and talocrural joints, which also attests to the good performance obtained in the tests and the degree of performance achieved by the subjects.
- The performance of the two groups shows an improvement, which is also due to better joint mobility.
- increased joint mobility widens the range of joint movements, making them easier to perform, so learning correctly is easier.

- We believe that other qualities such as speed, strength, endurance, skill, have a great contribution to a good swimming performance, but we cannot neglect the joint mobility, which also helps to achieve the quality of the movement.

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Study on Correcting the Technical and Tactical Mistakes of a Defensive Central Midfielder from a Romanian Football Team

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Abstract

Introduction: In modern football, defensive central midfielders are no longer just there to recover balls and stop opposition's attacks. Most teams now use a player in front of the defence who can contribute in the build-up phase and even appear to finish when needed in the offensive phase.
Aim: The aim of this study is to observe whether the training sessions we propose to correct the technical and tactical mistakes made by the central defensive midfielder of Politehnica Timisoara are effective.
Materials and Methods: A 21-year-old defensive central midfielder who plays for Politehnica Timisoara, a third league team, participated in the study. For the game analysis we used the Nac Sport Basic video analysis system and the matches were filmed with a Veo camera.
Results: After the intervention, we filmed a match in which Poli's (Politehnica Timisoara football team) defensive central midfielder played and we could see that his technical and tactical mistakes (receiving the ball with his back to the opponent's goal, making wrong first touches, failing to block passing lanes, completing too few recoveries, passing directly to the opponent or passing backwards) were corrected and his stats in this match were much better.
Conclusions: The central defensive midfielder will always be an important player in both the offensive and defensive phases. In the construction phase he has the role of receiving the ball from the defenders and taking it to the attackers, and in the defensive phase he has to stop the attacks of the opposing team. The game systems in which a defensive central midfielder can play are both with 3 defenders and with 4.

Keywords: football, defensive midfielder, video-analysis

Introduction

In modern football, defensive central midfielders are no longer just there to recover balls and stop the opposition's attacks. Most teams now use a player in front of the defence who can contribute in the build-up phase and even appear to finish when needed in the offensive phase [1]. The modern number 6 has good technical qualities, is able to pass very well, plays well under pressure (many teams do advanced pressing and usually the defensive midfielder is under pressure when he gets the ball) and moves forward with the ball at his feet when he sees that there is an open space on the pitch worth exploiting [2]. Although the main role of the position is to provide defensive cover [3], the defensive midfielder must also contribute on the offensive phase. The defensive midfielder is responsible for taking the ball from defence to attack and

quickly moving the team from defence to attack when the ball is recovered from the opposition.

The responsibilities of a defensive central midfielder on the defensive phase are slowing down the player in possession (delaying opposing attacks), marking players entering his area, recovering the ball from opposing attackers [4], communicating with other midfielders to change the players he is marking, clearing balls entering the box and marking a man or defend an area on defensive set pieces.

The responsibilities of a defensive central midfielder in the attacking phase are passing the ball to attacking players [5], playing long passes to wide players (wingers or full-backs), maintaining possession when the opposing team blocks the passing lanes well, [6] participating in offensive set pieces and shooting from distance.

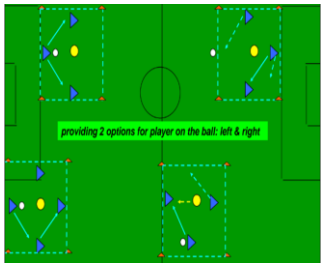
The aim of this study is to observe whether the training sessions we proposed to correct the technical and tactical mistakes made by the central defensive midfielder of Politehnica Timisoara are effective. In order to achieve the objective of this work, we have analyzed a match in which this player plays to see the mistakes he makes and afterwards, in training, we carried out some exercises in order to correct the mistakes seen during the game. After this exercise, we filmed another game and observed the all differences.

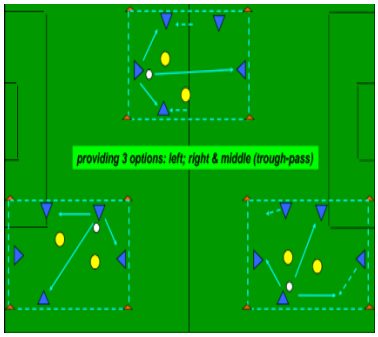
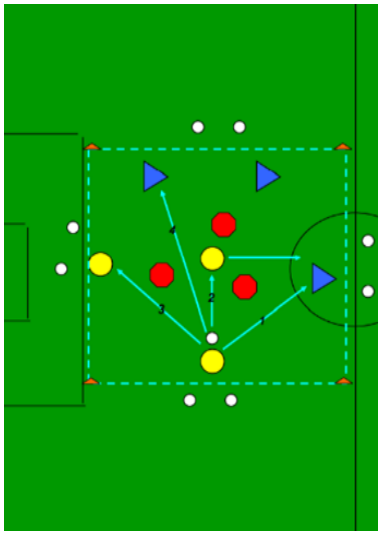
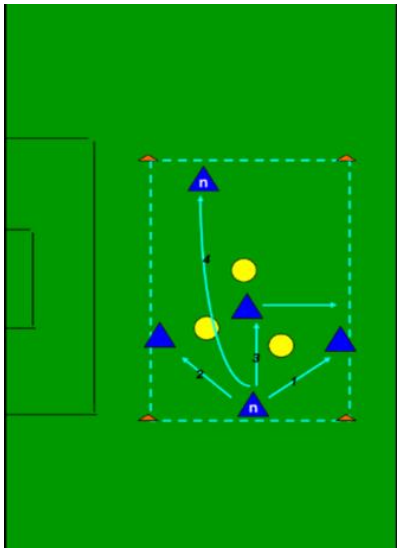
Methodology

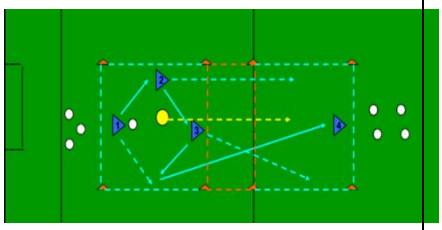
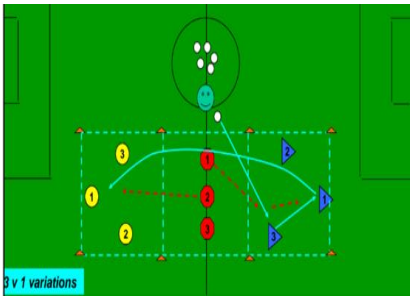
A 21-year-old defensive central midfielder who plays for Politehnica Timisoara, a third league team, participated in the study. For the game analysis we used the Nac Sport Basic video analysis system and the matches were filmed with a Veo camera. The drills that we will present below were performed for a month by this central midfielder. It should be noted that the exercises were not analytical, they were all in the form of a game and were mainly dedicated to the central midfielders. In all the proposed exercises the defensive central midfielder was involved.

The exercises we used to correct technical and tactical mistakes are:

Table 1. Description of exercises

Exercise	Description	Draw
4vs1 & 3vs1	Size of squares 10x10 m Blue players keep possession, defender (yellow) try to intercept (then defender changes position with attacker that lost position) Game intention: passing and positioning. Always providing 2 options for player on the ball (left & right). Methodical development: free touches, limited (3/2) touches; smaller squares (8x8m)	

5 vs 2	Size of rectangle(s) 15x15m 5 attackers maintain possession and defenders try to intercept (then defender changes position with attacker that lost possession), our defensive midfielder needs to go into the middle to receive a pass. Game intention: passing and positioning. Always providing 3 options for player on the ball Methodical development: free touches, 3/2 touches, smaller rectangle(12x12m, 10x10m)	
6 vs 3 with 9 players (3x3)	Spaces: square 25x25 m Game intention: 6 players (yellow & blue) maintaining possession against 3 defenders (red). Providing 4 options for the player on the ball (left, right, middle near and far) Our defensive midfielder was always in the centre. When possession is lost, the whole team of the player that made the mistake becomes defenders. Methodical development: • smaller square • limited touches Defenders: organized pressing as a unit (communication & coaching)	
5 vs 3 in rectangle 25-20 m	Game intention: 5 players maintaining possession against 3 defenders Providing 4 options for the player on the ball (left, right, middle near and far) Our defensive midfielder was always in the center. When possession is lost, the player that made the mistake becomes a defender. Methodical development: • smaller spaces • limited touches • 3 vs 3 with 2 neutral players Defenders: organized pressing as a unit (communication & coaching)	

Positioning game 3 vs 1 with 5 players in 2 squares divided by a neutral area (orange)	Size of squares 10x10m, (neutral area-5m) Game development: start 3 vs 1 in one square, after minimum 5 passes play to blue player 4 in other square. Passing player (blue 1) stays behind; blue 2 & 3 as well as defender follow the ball. Defender changes with player that lost possession or after 2 minutes. In this square we have our 3 midfielders, one striker and one defender. Game intention: passing, positioning, preparing for pass to striker (right moment and position) & support Methodical development: free touches, 3/2 touches, min 5/7/10 passes, with second defender in the neutral area or smaller/no neutral area.	
Positioning game 3 vs 1 with 9 players in 3 squares	Size of squares: 12x12m; 3 teams of 3 players wearing different colors; each team is positioned in one of the squares. The team in the middle square (red) starts defending. Game development: the coach plays the ball one of the blue players; red defender 1 starts pressuring in 3 vs 1. After a minimum of 5 passes, blue can play to a yellow player in other square. Red defender 2 starts pressing as soon as pass to yellow has been played. Red 1 goes back to the central area. Defenders try to intercept (than defending team changes position with team of the player that lost possession). The defenders are also allowed to intercept the passes through/across the middle area. Game intention: passing, positioning, handling speed, change of direction (right moment and position), ball pressuring (defenders). Methodical development: free touches, 3/2 touches, min 5/7/10 passes, smaller squares(10x10m).	

Results

Following the intervention, we filmed a match in which the Poli's defensive central midfielder played and we could see that his technical and tactical mistakes (receiving the ball with his back to the opponent's goal, making wrong catches of the ball, failing to block passing lanes, managing to make few recoveries, passing directly to the opponent or passing backwards) were corrected and his numbers in this match were much better. In the graphs below we can see the comparison between the match we filmed before the training exercises to correct technical and tactical mistakes (blue) and the match filmed at the end of the intervention program (orange). In fig. 7, we can see that the number of forward passes increased from 10 to 28, the number of recoveries from 4 to 8, the number of balls received with the face at the direction of play increased from 14 to 32, while the number of correct passes increased from 43 to 62.

Graphic 1. Statistics before and after the intervention

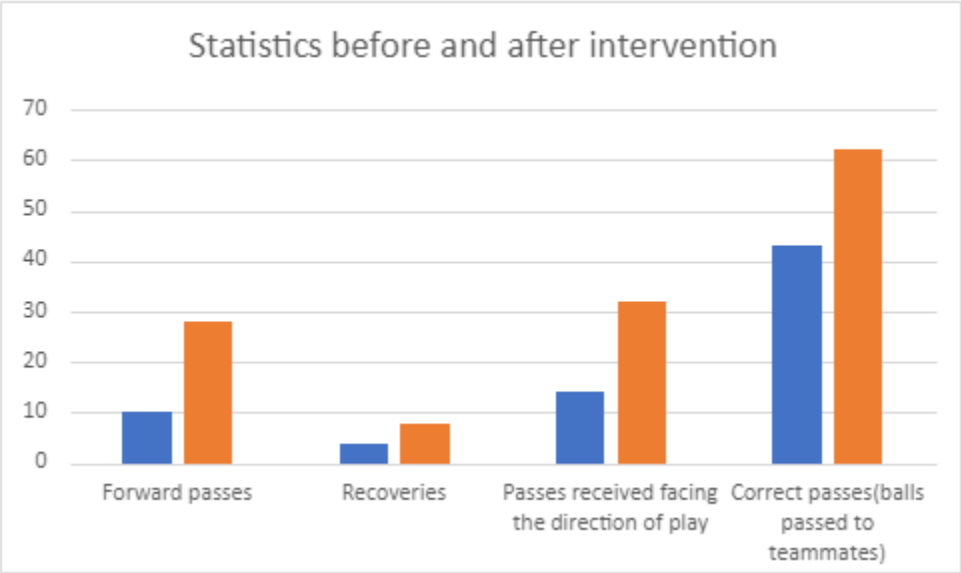


Fig. 8. The difference between the way our midfielder receives the ball-before and after the intervention

Discussion

The study by Mendes et. al [7] concluded that the defensive midfielder is the player most balls pass through, followed by the right back and the centre back. These playing positions show higher levels of passing without high pressure from the opponent, serving as "security" lines for ball movement. Many coaches say that the defensive central midfielder is a player with a great ability to see and analyze the game, confirming the importance of this player to serve as a link between the defensive and attacking lines during the construction of the attack. The midfielders' main role is to operate between attackers and defenders, creating variability in the exploration of possibilities for action of attackers to destabilize the defending team and score goals. It means that they constantly need to explore the relevant environmental information during performance that support their positioning and actions to allow the team to progress up field [8].

Conclusions

We can say that the exercises in the playing form (small-sided games) help the players improve their game and correct their technical and tactical mistakes.

The central defensive midfielder will always be an important player in both the offensive and defensive phases. In the construction phase he has the role of receiving the ball from the defenders and taking it to the attackers, and in the defensive phase he has to stop the attacks of the opposing team. The game systems in which a defensive central midfielder can play are both with 3 defenders and with 4.

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Study on the Use of Anaerobic Exercises to Increase Utility Swimming Test-specific Performance

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Abstract

Introduction: The study of the involvement of anaerobic effort in the utility swimming event started from the ascertainment analysis of the performance results in the naval pentathlon, aeronautical pentathlon and military pentathlon events held during the World Military Games, Wuhan, China, October 2019, the last of which were held under aegis CISM.
Aim: In large-scale competitions, physical preparation for the naval pentathlon events, in our case for the utility swimming event, can make the difference in achieving important and significant results.
Materials and Methods: In the present study we used different methods, which had the role of highlighting, on the one hand, the evolution of performances in the naval pentathlon and, on the other hand, the relationship between some components of the performance capacity and competitive results. In this sense, in addition to the known methods for investigating somatic, physiological, and motor parameters, we used new and adapted methods, which targeted the specific physical training, as well as the specific psychological profile of the naval pentathlon athlete.
Results: The exercises and the training plan chosen for the development of the anaerobic capacity of the athletes participating in the utility swimming test within the naval pentathlon proved to be useful.
Conclusions: Anaerobic effort is particularly important in the naval pentathlon - for the utility swimming event.

Keywords: anaerobic effort, physical preparation, naval pentathlon, utility swimming

Introduction

The study of the involvement of anaerobic effort in the utility swimming event started from the ascertainment analysis of the performance results in the naval pentathlon, aeronautical pentathlon, and military pentathlon events held during the World Military Games, Wuhan,

China, in October 2019, the last of which were held under aegis CISM (International Council of Military Sports).

Materials and Methods

The test takes place over a distance of 125m, with 6 obstacles. It can take place in covered or uncovered pools of 25 m. The swimming style is a freestyle with legs.

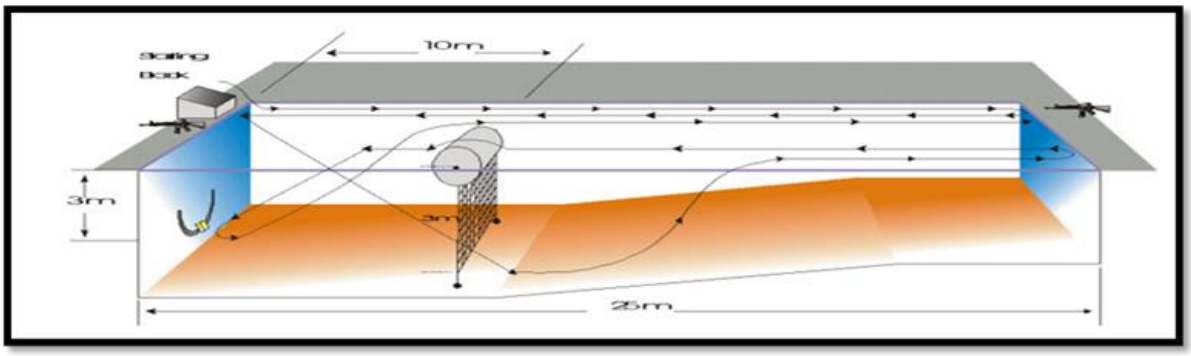

Fig.1. Arrangement of obstacles in the naval pentathlon after Ene-Voiculescu V. & Co. 2023

In large-scale competitions, physical preparation for the naval pentathlon events, in our case for the utility swimming event, can make the difference in achieving important and significant results.

The effort capacity represents the body's ability to perform a work, a mechanical work of as high an intensity as possible and to maintain it for as long as possible, and Cordun M. (2011) [4] adds the following: its limits are very wide and depend on age, sex, state of health, degree of training, etc. Anaerobic efforts: are characterized by a high intensity (100%), with the body's oxygen requirement exceeding the O2 supply provided by the cardiovascular system. These efforts take place under conditions of a lack of oxygen, leading to the depletion of the energy substrate in the muscles, the accumulation of lactic acid beyond normal limits, and the impossibility of continuing the effort.

Anaerobic interval exercises using 4-10 sets of 15–30 s total work interspersed with 45sec-12 min recovery breaks have been shown to significantly increase VO2max [15].

Anaerobic resistance is determined by:

- type of muscle fibers;
- energy reserves – ATP, CP, muscle glycogen;
- resistance to acidosis, respectively to lactic acid accumulated intracellularly and in the blood [2].

Anaerobic efforts are divided into:

- lactacidic anaerobic efforts in which a few contractions with maximum intensity exhaust the ATP (7-30 sec. according to some authors); muscle activity can only continue if ATP is resynthesized from creatine phosphate. The breakdown of phosphocreatine allows for 10-20 more contractions;

- lactacid anaerobic efforts in which ATP resynthesis is obtained due to the energy resulting from anaerobic glycolysis, with the massive formation of lactic acid (30 sec. maximum intensity).

Given that the utility swimming test takes place in water, the body adapts to this type of effort. Marinescu, Gh. (2008)[11] specifies that "entering the water, even at a temperature close to that of the body, causes the volume of circulating blood to increase by about 35% (~ 700 ml) simultaneously with the increase in central venous pressure by 3-15 mmHg ; this increase causing the heart rate and respiratory rate to increase". The same author adds: "thermolysis is intensified and fully demands the thermoregulatory processes of the swimmer, due to the energy consumption necessary for the mechanical work performed in difficult conditions (increased resistance to forward movement, unstable support for propulsion), as well as two other factors that increase the period of heat: the lower temperature of water and the higher thermal conductivity of water than air."

The formation of the Romanian naval pentathlon team has become an indisputable necessity in the face of political and social phenomena, which were imposed by modernization and implicitly, by connecting the Romanian military system to international requirements.

In the preliminary research we used different methods, which had the role of highlighting, on the one hand, the evolution of performances in the naval pentathlon and, on the other hand, the relationship between some components of the performance capacity and the competitive results. In this sense, in addition to the known methods for investigating somatic, physiological and motor parameters, we used new and adapted methods, which targeted the specific physical training, as well as the specific psychological profile of the naval pentathlon athlete.

The quality of lung function was assessed by means of spirometry results. Spirometry is one of the most useful and easy to perform lung function tests. It measures the volume of air exhaled at certain times during full forced expiration, preceded by a maximal inspiration. The main results of spirometry are forced vital capacity (FVC), peak expiratory volume in one second (FEV1), and peak expiratory flow (PEV), i.e., the maximum expiratory rate that is reached during forced expiration. The spirometry procedure has three phases, namely a maximal inspiration, explosive expiration, and continued expiration until the end of the test through a mouthpiece tightly positioned around the patient's lips.

The instrument used was the Contec SP-10W spirometer, which is a small portable medical device. The device is suitable for use in hospitals, clinics or sports medicine offices, for routine testing. With the help of this device: forced vital capacity (FVC), maximum expiratory volume in the first second (FEV1) and peak expiratory flow rate (PEV) can be determined. Portable spirometer used to evaluate lung function parameters: Peripheral oxygen saturation (SpO2).

The pulse oximeter was used to measure peripheral oxygen saturation (SpO2) and heart rate (HR), both at rest and after performing the 50m Underwater Swim Test. Accurate estimation of SpO2 using a pulse oximeter requires consideration of several aspects of wearable design.

Results

Swimming performance depends on physiological (endurance capacity and anaerobic fitness), technical and morphological factors [8],[9],[12]. Regarding physiological aspects, studies have shown that both aerobic and anaerobic metabolism are important for swimming performance [5],[8], [16].

Although the aerobic contribution appears to be easily calculated by the integral of oxygen consumption (VO2) during exercise (Figueiredo et al., 2011[5]), the determination of the anaerobic contribution is complex. In this context, the most accepted method for estimating the anaerobic contribution is the accumulated oxygen deficit (AOD), which is assumed to be the difference between the oxygen demand and the aerobic contribution during an effort [7], [13]. However, at least three limitations may reduce its applicability for swimmer assessments.

The first limitation is the time taken to determine oxygen demand, which requires multiple submaximal efforts performed on different days and at different intensities, decreasing the applicability of this method during training routines. The second limitation is that total (AnAl) and glycolytic (AnLa) phosphagen contributions cannot be determined separately using the AOD method, reducing the possible investigation of these metabolism at different swimming distances.

Finally, the third limitation is the use of a snorkel and valve system to assess VO2 during swimming [13,14], which reduces speed and clearly disrupts the motor pattern, making undulations impossible , turns and lateral breathing. during exercise [3], [6]. Given the importance of these mechanical factors, the use of a snorkel and valve system could influence AOD values and, consequently, lead to the misinterpretation of the importance of anaerobic metabolism in different performances [1].

Following this analysis of the anaerobic effort, we can classify and characterize according to table no. 1 and table 2.

Table 1. Classification of effort in applied swimming trials by energy supplier
(after Saltin B. and Lundin A., cited by Counsilman J., 1996 and Badescu V., 2006)

Test	Sport result	Productivity		Oxygen duty
100m	1min. - 1min.40sec.	75%	25%	8-11l
200m	1min.- 1.35sec.	50%	50%	8-11l

Table 2. Characterization of efforts in the applied swimming trials
(after Iniașevschi K., cited by Ene and Abramiuc, 2020)

Distance	Anaerobic capacity		Aerobic capacity %
	Creatine phosphate %	Glycolysis %	
100m	25%	38%	37%
200m	10%	25%	65%

Anaerobic effort is particularly important in the naval pentathlon - for the utility swimming event.

Conclusion

Anaerobic effort is particularly important in the naval pentathlon - for the utility swimming event.

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Study on the Opinions of Specialists Regarding the Impact of Children with Special Educational Requirements (sen) in Physical Education

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Abstract

Introduction: The legislative changes regarding the access of pupils with special needs to the school system in recent times have caused some concern among teachers and especially among physical education and sport teachers.
Aim: The study aims to identify the number of pupils with integrated SEN (those who have supporting documents as well as those who do not have medical certificates but create similar difficulties during physical education lessons); to inventory the categories of behaviours recorded during lessons; to detect the most appropriate means of action in working with these pupils in order to improve the behaviour of children with SEN (mild forms, which do not require an accompanying person in class) and implicitly their social integration.
Materials and Methods: The research is a statistical analysis of the opinions of 71 respondents from Iasi municipality, who teach physical education at primary school level. The research was conducted in the school year 2022-2023 and respondents were recruited through Google Forms.
Results: Following the analysis of these recorded responses, 94 pupils with supporting documents were identified, 73 pupils with the same type of behaviour found in pupils with special educational needs. Also, the main manifestations found were: aggressive verbal behaviour, aggressive physical behaviour, restlessness, delayed reaction to teachers' demands, attention deficit, concentration disorders and lack of self-confidence. The survey showed that there are two categories of pupils with SEN, those with documented and those without documentation but with the same behaviour.
Conclusions: The presence of these pupils in physical education lessons leads to changes and adaptations in the way the lessons are conducted in order to ensure the safety of the group.

Keywords: pupils, SEN, investigation, problem

Introduction

There In the literature, the complex role of physical education is captured by the definitions given to it by several authors, being seen by some as, in essence, "the activity that systematically exploits all forms of exercise in order to increase mainly (n.n. - so not exclusively!) of the biological potential of man in accordance with social requirements" [1], and by others, as: "a type of body-motor activity, consisting of motor actions systematised according to specific criteria of the subjects for whom it is designed and programmed" (as a motor-biological activity) [2], "a component of general education, carried out as part of an instructional-educational

process or independently, with a view to the harmonious development of the personality and the improvement of the quality of life.

Physical education comprises a complex of stimuli influencing the processes of somato-functional and psychological development" (as an instructional-educational process)" [3], practical and theoretical, bringing together a set of ideas, norms and rules structured in a unitary concept of organisation and concrete application to different categories of subjects" (as a system of concepts and actions) [4], "a set of forms of organisation that systematically use physical exercise to achieve specific objectives" [5] (as a form of organisation), "a complex system of influences that are rationally applied to individuals, favouring their physical and mental improvement and socio-cultural integration" (as a factor of socio-cultural integration) [6].

Experts point out that both internationally and nationally "there is a continuous debate on the advantages of including children with special educational needs in educational structures alongside their peers [7]. The school integration of children with special educational needs creates discussions, disputes, but exists as a trend worldwide. Inclusive education encompasses this discussion but, in addition, the orientation towards quality and efficiency of the whole educational system, formal and non-formal" [8]. In the Comparative Study on Inclusive Education Policies for Children with Special Educational Needs (November 2018) - to which we will refer hereafter with the prefixed phrase "Comparative Study" [9], the normative acts regulating at international and European level the education of students with Special Educational Needs (SEN) were indicated, among which, the most important are: UNESCO's 1994 Salamanca Declaration [10], the 2006 UN Convention on the Rights of Persons with Disabilities [11], UNESCO's 2015 Inchon Declaration: Education 2030, the 1996 Luxembourg Charter and the European Commission's 2010-2020 European Disability Strategy, as well as a number of reports and policy briefs by EU bodies on the education of people with SEN [12].

According to the national legislative regulations in force, the schooling of a child with special needs can take place in the following ways: a) in special schools, b) in special classes (groups) (the European Agency for Development in Special Needs Education considers this to be a "segregated educational context"), c) in mainstream general schools, including mother tongue teaching, d) at home, e) in hospital beds. With regard to the results of previous research, the existing statistical data indicated in the "Comparative Study" confirm the difficult situation of access of children with SEN to inclusive education, "although the monitoring of access to education of people with disabilities and/or SEN is cumbersome in Romania" [9]. Thus, "regarding the inclusion of students with special needs in mainstream schools, according to A.R.A.C.I.P.[1], in the school year 2013-2014, 32,060 students with special needs were enrolled in mainstream schools. Of these, 39.3% in primary education, 34.8% in secondary education, 7% in pre-school and 18.8% in secondary/vocational/post-secondary education. What is even more important to note is that 21% of these, only 17,037 pupils benefit from educational support services" [13]. It was concluded that the statistical data highlights the need to bring to the forefront the issue of access of children with SEN in the Romanian state to inclusive education, justifying the attempt to change and update the educational system in Romania and to be in line with existing changes at international and European level [14].

Aim

This study aims to identify:

- The number of students with SEN interviewed (including those with supporting documentation) as well as those who do not have SEN but create similar difficulties during

physical education lessons in the classes where the respondent teachers teach and the situations they encountered during lessons;

- To identify the most appropriate means of action in working with all these pupils, in particular the impact of adapted movement games in the lesson, according to the school curriculum, to improve the behaviour of children with SEN (mild forms, which do not require an accompanying person in class) and implicitly their social integration.

The questionnaire was completed by 71 specialists, 55% of whom were female and 45% male. This questionnaire was administered to physical education teachers in Iasi and the metropolitan area who teach at primary school level, to find out if they also face difficulties/different situations during physical education classes, from pupils with SEN (with supporting documents) and from other pupils in the class.

Material and Methods

The main research methods used in the present study were documentation, sociological survey using the mixed questionnaire technique in which 71 respondents (physical education teachers from Iasi municipality and the metropolitan area who teach primary school) and the statistical-mathematical method. The questionnaire included 11 questions, 7 of which were strictly related to the study issues. The others were related to gender, work environment, experience in the education system, qualification level reached. Ancillary questions were designed to support the validity of responses to the core items.

Results and Discussions

As a result of the teachers' answers to question 1 (on the presence of pupils with SEN) 92% answered that they had and still have pupils with SEN in the classes they teach and only 8% answered that they did not have/do not have pupils with SEN in the class. From these responses it is clear that a very high proportion of respondents have had or still have pupils with special educational needs integrated in the classes they teach, which shows that there have been and still are children with SEN enrolled in primary classes in urban and rural mainstream schools, with 94 identified in almost all classes of the PE teachers who completed the questionnaire. The percentages show that there were and still are pupils with SEN in mainstream schools, that there are a large number of them, and that they are in most of the classes where the teachers who completed the questionnaire teach, thus integrating these children into the urban and rural school population.

Percentage of pupils with special educational needs who are/are not integrated in the classes taught by physical education teachers, in the second question (what is the number of pupils with special educational needs who have supporting documents in the classes you teach - respondents are asked to indicate the number (out of the five options indicated in the questionnaire - 1/2/3/4/5) of pupils with special educational needs who have supporting documents in the classes they teach. Thus: 51% answered that they have 1 pupil, 23% answered that they have 2 pupils, 18% have 3 pupils, 7% answered that they have 4 pupils and 1% have 5 pupils with special needs who have supporting documents. The answers provided show that more than half of the respondents have at least one pupil with ESL who has supporting documents in the classes they teach physical education. Therefore, the result highlights that there are many children diagnosed by specialists as having special educational needs (even 3, 4, 5 pupils are integrated in some

classes - according to the answers to the questionnaire), who are therefore officially recognized as having deficiencies and who request specialized support from the competent institutions (such as CJRAE[2]), issuing them with documents justifying the need for adapted education in order to be able to integrate at school. This item result indicates that the situation of children with SEN in schools (in both urban and rural areas) is a common one among teachers who teach physical education, and that there is a need for support in dealing with this phenomenon (with all that it entails), in order to know how to manage the related situations arising in lessons [13].

In the next item of the questionnaire (if the answer to the previous question was YES, what difficulties have you frequently encountered with students with disabilities and/or SENs in the classes where you teach?) has as a prerequisite the affirmative answer to the previous question, i.e., whether physical education teachers have encountered difficulties from pupils with SEN in the classes where they teach, by ticking (out of the eight options indicated in the questionnaire) those difficulties frequently encountered by the pupil(s) with disabilities and/or SEN.

The results of the answers were distributed as follows:

- or verbally aggressive behavior: sometimes - 39%, often - 24%, rarely - 21%, never - 13% andf almost always - 3%;
- for the situation when pupils with SEN disturbed other pupils: often - 30%, almost always - 28%, sometimes - 24%, never - 13% and rarely - 6%;
- physically aggressive behavior was found in the respondents' classes: sometimes - 35%, rarely - 27%, often - 20%, never - 14% and almost always - 4%;
- on the situation in which they get agitated, the following answers were recorded: often - 37%, almost always - 31%, sometimes - 17%, never - 8% and rarely - 7%;
- on the delayed reaction to demands: often - 28%, almost always - 27%, sometimes - 27%, never - 11% and rarely - 7%;
- for the attention deficit variant, they answered: often - 34%, almost always - 34%, sometimes - 18%, never - 8% and rarely - 6%;
- they also experienced concentration disorders on the part of pupils with SEN, as follows: often - 32%, almost always - 30%, sometimes - 23%, never - 8% and rarely - 7%;
- on students' lack of self-confidence, they answered: often - 32%, sometimes - 27%, almost always - 21%, rarely - 11% and never - 8%;

In the fourth question - What is the number of students who create problems similar to those of students with (undocumented) SSD in the classes you teach - physical education teachers were asked to indicate the number of students who create problems similar to those of students with (undocumented) SSD in the classes they teach. The results show that 62% of the respondents indicated that they have 1-2 pupils in their class who create problems similar to those with SEN (without supporting documents), 24% responded that they have between 3-4 pupils and 14% responded that they have more than 5 pupils. The answers to this question lead to the conclusion that 62% of the teachers had asked 1-2 pupils in their class who create problems similar to those of pupils with SEN (without supporting documents), and 14% of the respondents have more than 5 pupils in their class who create the above-mentioned difficulties. Thus, it is evident that in the classes where the respondent teachers teach, there are many pupils (73) who, although not diagnosed with SEN, cause problems similar to those with SEN.

In the item: "What would these problems be?", physical education teachers were asked about the problems created by the category of students shown in the previous question. They answered that: 68% encounter problems of indiscipline from pupils, 62% have pupils in class who talk without being asked, 55% encounter pupils with uncontrolled reactions and 37% encounter

pupils who joke and make fun of another pupil. This result leads us to estimate that the majority of responding teachers frequently encountered among pupils without special educational needs (without supporting documents) multiple difficulties, such as: indiscipline, unsolicited communication and uncontrolled reactions, which means that some teachers (among those who responded) are also confronted with other behavioral manifestations of pupils without special educational needs, but which nevertheless disturb the smooth running of physical education lessons.

On the question of the means of action to engage pupils with (documented) and problem-makers with SEN recommended in lessons in classes with pupils with SEN, many of the responding teachers use praise and encouragement to increase self-esteem and interest in the lesson, games with simple rules, additional explanations and constant reminders, movement games, assigning additional responsibilities and tasks. We note that teachers predominantly used, combined and complementary, the same means of action, among which the movement games - which were used by 58% (41 teachers out of 71) - stand out, being one of the most applied tools in physical education lessons with students (both with and without SEN), as presented by other specialists [14].

To the last basic question (the role and form of movement games) a determinant percentage of physical education and sport teachers consider that the application of movement games in the lesson, according to the school curriculum, can improve the behaviour of pupils with SEN and achieve their social integration. These answers confirm that it is indeed necessary to include movement games among the means of action, adapted to the educational needs of pupils with mild forms (which do not involve an accompanying person/teacher travelling during the lesson) of SEN, in order to reduce deviant behaviour during physical education lessons and, at the same time, to develop their psychomotor skills and school integration.

Conclusions

The following conclusions were drawn from the questionnaire administered to PE and sport teachers. A very high proportion - 92% of the respondents had or still have pupils with special educational needs integrated in the classes they teach. The resulting percentage indicates that pupils with special needs have existed and still exist in mainstream schools, that there are a large number of them, and that they are distributed in most of the classes where the teachers of the respondents teach, thus integrating these children into the urban and rural school community.

There are many children diagnosed as having special educational needs who are therefore officially recognised as having disabilities and who therefore require specialized support from the relevant institutions (CJRAE[2]).

Thus, a significant percentage, 97% responded that they would benefit from the selection of adapted movement games according to the school curriculum for pupils with SEN to make the lesson more effective. Therefore, inserting movement games adapted to pupils with SEN in physical education lessons is very useful for teachers teaching this subject.

Seventy-seven per cent of respondents indicated that they had encountered difficulties during lessons, both from pupils with and without SEN, suggesting that the presence of children with SEN in mainstream schools (urban, rural) is not exclusively a disruptive factor in physical education lessons.

Essentially, the difficulties that physical education and sport teachers have frequently encountered with pupils with special educational needs in the classes where they teach are:

restlessness during lessons, attention deficit, concentration disorders, lack of self-confidence, disturbing other pupils, reacting late to their demands.

All these difficulties of pupils with special educational needs (revealed by the questionnaire) show that certain means of action are needed, including movement games adapted to special educational needs, in order to bring about an improvement/correction of these inappropriate behaviours.

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2 - County Centre for Educational Resources and Assistance

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Effects of Manual Therapy in Weight Distribution at Plantar Level in Female Adolescents

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Abstract

Introduction: The proper biomechanical execution of the movements is also essential for maintaining good posture. Since the sacroiliac joint directs the descending body weight of the axial structure, head, and upper extremities downward through the pelvis, across its neighboring soft tissues, and ultimately down the legs, it can be referenced as a highly significant region regarding force distribution to the lower extremities.
Aim: The purpose of this study is to investigate the effects of a 3 months program of manual therapy (soft tissue techniques and "muscle energy techniques"), on weight distribution on plantar level.
Materials and Methods: The participants were 8 female high school students aged between 14 years old and 16 years old. To evaluate the weight distribution, BTS P-Walk platform (BTS, Italy) was used. The participants went through a program based on osteopathic manual techniques for 10 sessions lasting 60 minutes over a period of 3 months. The initial and final results were compared and interpreted statistically using the Paired Samples T Test and multiple statistical indicators.
Results: For the statistical analysis we focused on two pairs of parameters: Left foot load - Right foot load, Forefeet load - Rear feet load., The results showed changes in the weight distribution with bigger movement in antero-posterior plane (8.65%) compared to latero-lateral plane (1.19%). In the same time the changes for the forefeet – rear feet load are statistically significant (P = 0.004).
Conclusions: The study found that the way the weight is distributed at plantar level is changed after the intervention, with a big improvement in the center of gravity shifting anteriorly, all of this showing that the manual therapy can be used as an efficient form of therapy to improve weight distribution at plantar level.

Keywords: posture, manual therapy, weight distribution;

Introduction

The joints, bones, nervous, and muscular systems must be balanced, coordinated, and in harmony for a person to have good posture. The proper biomechanical execution of the movements is also essential for maintaining good posture. Both static and dynamic postural reactions are automatic and adaptable in response to stimuli, motions, injuries, and attempts; they are a result of a person's engagement with their environment [1].

Standing weight distribution is the outcome of a complex interaction between a number of systems, including proprioceptive postural afferents, motor control, kinesthetic memory, and proper joint mobility [2].

Since the sacroiliac joint directs the descending body weight of the axial structure, head, and upper extremities downward through the pelvis, across its neighbouring soft tissues, and ultimately down the legs, it can be referenced as a highly significant region regarding force distribution to the lower extremities [3].

According to Guimarães et al. (2021), it can be inferred that positional asymmetries of the sacro-iliac joints may hinder the ability to maintain orthostatism, which could change how much weight is distributed between the feet as a result. This is because an unbalanced relationship between body parts can lead to increased tension and overload at the support base.[1]

Taking all this into account, a number of different dysfunctions, such as spine deviations or hip disorders, can generate alterations in static and dynamic balance due to the combination of postural proprioceptive afferent processes, motor control, kinesthetic memory, and appropriate joint mobility [4].

Manual therapy is a type of conservative treatment used by physical therapists, chiropractors, osteopaths, and occasionally other healthcare specialists. In musculoskeletal disorders, manual therapy can be utilized as a successful method in alleviating soft tissue, range of motion, and discomfort, as well as improving muscle function [5].

The 14 studies, that were examined by Lotan & Kalichman (2018), discussed manual therapy methods for treating spinal deviations, including manipulation, mobilization, and soft tissue techniques. All case studies revealed a significant post-treatment improvement in the majority of the assessed parameters [6].

Also, specific to body weight distribution, a study by Grassi et al. (2011), which used a specific manual technique – "high-velocity, low-amplitude thrust manipulation", had results that "suggest that sacroiliac joint manipulation can influence peak pressure distribution between feet". Their data revealed a strong correlation between the dominant foot and the foot with greater contact area ($r = 0.978$), as well as between the side of joint restriction and the foot with greater contact area ($r = 0.884$). Weak correlation was observed between the dominant foot and the foot with greater peak pressure ($r = 0.501$), as well as between the side of joint restriction and the foot with greater peak pressure ($r = 0.694$) [7].

Considering the effects of manual techniques, the present study aims to evaluate the changes brought by manual therapy in the way that the normal teenagers distribute weight at plantar level, since very few studies address these issues.

Methodology

Participants

The subjects of this study were 8 female high school students with ages between 14 years old and 16 years old. All the subjects didn't present visible alignment deviations or posture adaptations. The participants (and their legal advisors) gave the written agreement to participate in this study and all the procedures were performed in accordance with the 1964 Helsinki declaration.

Inclusion criteria that were used:

- Children aged 14 - 16 years;
- No medical history related to posture structural deviations;

Instruments

The main instrument used for evaluation was the BTS P-WALK, plantar pressure analysis board, a barosensitive platform that uses over 3000 sensors to measure specific parameters of the lower limb (in standing and walking), and also, parameters that involves the whole-body alignment such as body weight distribution at the plantar level.

To carry out the static assessment, the subject is positioned with the plantar surface over the markings inscribed on the middle of the pressure plate. The subject is instructed to maintain a relaxed position, gaze at a fixed point, and remain still for 30 seconds (acquisition time is 20 seconds). The G-Walk software generates a report which is shown in figure 1.

For this study we will analyse only the distribution of the weight for the participants.

In the example in Fig. 1 we can see 28.5% loading on the forefoot and 71.5% on the hindfoot, 38.6% on the left lower limb and 61.4% on the right lower limb. You can also find the percentage distribution in 4 quadrants (anterior right - 16.3%, posterior right 45.1%, anterior left - 12.2% and posterior left 26.4%), information related to the average and maximum pressure at the level of each plant expressed in kilopascals and the area in square centimetres.

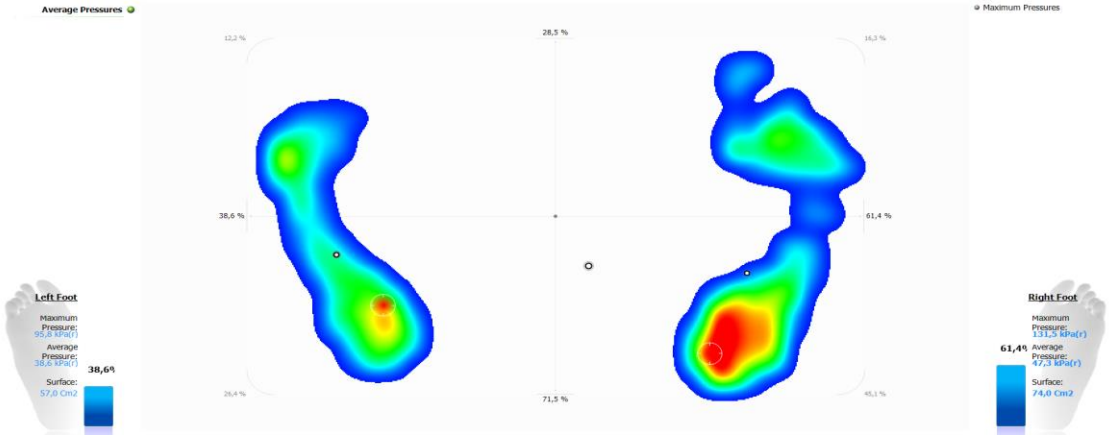

Fig. 1. SEQ Figure * ARABIC 1 G-Walk Report – static plantar pressure evaluation

Procedures

After the initial evaluation the participants went through an original program based on osteopathic manual techniques. Each individual in this group benefited from 10 sessions lasting 60 minutes over 3 months.

For this study we have dominantly used soft tissue techniques, also called myofascial treatment, and "muscle energy techniques" (neuro-muscular techniques). Concretely, 10 soft tissue techniques and 10 muscle energy techniques were used in each session, adapted for each

subject. All of them had as area of treatment the spine at all levels (cervical, thoracic, lumbar and sacral), the pelvic and hip region.

When the final evaluate was completed, the results were compared and interpreted statistically. Also, for each parameter we used the Paired Samples T Test to check if there are values with statistically significance difference.

Results

The participants were re-evaluated and the data was compiled in table format (table 1.) to be statistically processed. For this study we focused on the next 2 pairs pf parameters:

- Left foot load - Right foot load
- Forefeet load - Rear feet load

Table 1. *Evaluation results*

Item no.	Subject	Left foot load (initial)	Left foot load (final)	Right foot load (initial)	Right foot load (final)	Forefeet load (initial)	Forefeet load (final)	Rear feet load (initial)	Rear feet load (final)
1.	D.G.	44.2	47.6	55.8	52.4	51.2	55.1	48.8	44.9
2.	A.H.	33.9	38.4	66.1	61.6	25.4	41.8	74.6	58.2
3.	A.C.	48.3	48.1	51.7	51.9	38.3	44.7	61.7	55.3
4.	N.A.	48.5	42.2	51.5	57.8	37.9	42.7	62.1	57.3
5.	T.G.	35.7	38	64.3	62	31.9	44.4	68.1	55.6
6.	M.H.	49.7	46.3	50.3	53.7	19.6	37.1	80.4	62.9
7.	P.A.	38.6	40.1	61.4	59.9	28.5	31.7	71.5	68.3
8.	A.B.	41.1	48.8	58.9	51.2	23.8	28.3	76.2	71.7

In the table above are presented the results from the initial evaluation next to the final results for each parameter selected. All the numbers are percentages (%) of the total body weight distributed either latero-lateral for the left foot – right foot load pair, or antero-posterior for the forefeet – rear feet load.

In order to be able to interpret the effects of the manual therapy plan on the "left foot load" and "right foot load" parameters, it is necessary to refer to the ideal values, which are 50% loading on the left lower limb and 50% on the right lower limb [8].

Table 2. *Statistical Indicators for "Left Foot Load" & "Right Foot Load" parameters*

	Left Foot Load		**Right Foot Load**	
	Initial evaluation	Final evaluation	Initial evaluation	Final evaluation
Mean	42.500	43.688	57.500	56.313
Std. Deviation	6.1149	4.5218	6.1149	4.5218
Std. Error Mean	2.1619	1.5987	2.1619	1.5987

In table 2, we can identify an increase in the average by 1.19, the initial average being 42.500 and the final 43.688. The standard deviation registered a decrease, from 6.1149 to 4.5218. The increase in the value of the arithmetic means and the approach to 50% underlines the presence of a positive effect generated by the program, from a numerical point of view. In the same time, for

the "right foot load" a decrease in the average by 1.19 is identified, the values being "in the mirror" with those presented in the "left foot load" parameter, considering that these two parameters must always have the sum of 100.

Table 3. *Paired Samples T Test for "Left Foot Load" & "Right Foot Load" parameters*

		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference		t	df	P (significant when < 0.05)
					Lower	Upper			
Left foot		-1.1875	4.4505	1.5735	-4.9082	2.5332	-.755	7	.475
Right foot		1.1875	4.4505	1.5735	-2.5332	4.9082	.755	7	.475

In the paired sample test (table 3), applied to check if statistically significant changes occurred, P = 0.475. Since its value is > 0.05, we consider that the difference in means is not statistically significant.

When it comes to antero-posterior wight distribution older studies have shown: Forefeet load (%) 49.34 ± 2.77 (females) / 50.44 ± 2.78 (males), Rear feet load (%) 50.66 ± 2.77 (females) / 49.56 ± 2.78 (males) [9], while more recent ones present that there was higher load on the rearfoot (left 54.14%; right 55.09%) than on the forefoot (left 45.49%; right 44.26%) [8].

Table 4. *Statistical Indicators for "Forefeet Load" & "Rear feet Load" parameters*

	Forefeet Load		Rear feet Load	
	Initial evaluation	Final evaluation	Initial evaluation	Final evaluation
Mean	32.075	40.725	67.925	59.275
Std. Deviation	10.1413	8.3664	10.1413	8.3664
Std. Error Mean	3.5855	2.9580	3.5855	2.9580

Table 4 shows an increase in the average by 8.65, the initial average being 32.075 and the final 40.725, and the standard deviation which registered a decrease, from 10.141 to 8.366, for the "forefeet load". The increase in the value of the arithmetic mean shows the tendency of the participants to reposition the centre of gravity towards the central area more than on the hind leg, and the decrease in the standard deviation indicates a positive effect, from a numerical point of view. The same results are mirrored by the "rear feet load" indicators.

Table 5. *Paired Samples T Test for "Forefeet Load" & "Rear feet Load" parameters*

		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference		t	df	P (significant when < 0.05)
					Lower	Upper			
Fore-feet		-8.6500	5.8868	2.0813	-13.5715	-3.7285	-4.156	7	.004
Rear feet		8.6500	5.8868	2.0813	3.7285	13.5715	4.156	7	.004

In the Paired Sample T Test made for "Forefeet Load" and "Rear feet Load" parameters (table 5) we found P = 0.004. Taking into account the fact that its value is < 0.05, we consider that the difference in means is statistically significant and thus, the null hypothesis is denied.

Conclusion

In this study, the results show that using manual techniques, specifically soft tissue techniques (also called myofascial treatment), and "muscle energy techniques" (neuro-muscular techniques) influence the way that the weight is distributed at plantar level, with the center of gravity shifting towards the midpoint, with bigger movement in antero-posterior plane (8.65%) compared to latero-lateral plane (1.19%). In the same time, the changes for the forefeet – rear feet load are statistically significant (P = 0.004) while the difference in left foot / right foot load is minor.

The difference in standard deviation for all four parameters from the initial to final evaluation underlines that the results became more focused, especially in the forefeet – rear feet load.

Also, another noticeable element from the evaluations is that all (8 out of 8) participants load more weight on the right foot, while 12.5% (1 out of 8) load more on the forefeet then the rear feet.

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Statistical Study on the Somato-Functional and Motric Profile with Implication in the Individualization of Tennis Training at U14

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Abstract

Introduction: Studying the evolution trends of the game, the specialists of the Romanian Tennis Federation appreciate that, in the future, the value bar of worldwide performances will rise to new heights, to great technical-tactical virtuosity, obviously in the context of perfect physical training. Taking into account the trends of tennis worldwide, it is necessary to update and improve the Romanian concept of competition and training not only at the level of the high performance echelon, but especially at the level of training for children and juniors.
Aim: This paper deals with a current issue, according to which the concept of training for children's competition, valid in performance tennis for this age category, is justified considering the level of consolidation of technical-tactical procedures.
Materials and Methods: The main methods used to fulfill the tasks proposed for the research are the following:Studying specialized literature; Remark; Test method; The experimental method; The statistical-mathematical method of data processing and interpretation; Graphical and tabular method.
Results: The data recorded for each parameter of the specific physical training contribute to the efficiency of the technical-tactical procedures in the execution of attack shots in the game of tennis in the age category 12-14 years.
Conclusions: We believe that all the tools we used provided us with objective data regarding the individual level of motor behavior of U14 tennis players. *Keywords: Specific physical training, Competition, Technical-tactical procedures, Attack shots.*

Introduction

Comparing the individual profile to the "model" allows the coach to make objective applications and select players based on their abilities. [1] Furthermore, the author briefly describes the importance of effectiveness in achieving performance. Motor efficiency is expressed in the level of behavior in situations of high mental and physical stress, being conditioned by several factors. [2] "Sports technique is a process or combination of processes learned through practice to economically and efficiently complete a specific movement-based

task, in other words it is a movement task"[3] By tennis technique we mean all the processes used to play effectively. The serve is used to set the ball in motion at the beginning of each game, also the serve in tennis is a technical process that can allow more points to be won and even decide the victory. [4]

Aim

In this context, within the training process we have proposed the approach of an actuation technology characteristic of the procedures of the attack phase, in line with the prerogatives of obtaining special performances, which optimize the level of technical-tactical training in training and competition at the level of children of the age 12-14 years.

Materials and Methods

1. Studying the Specialized Literature

The study of specialized literature allowed us to establish the topicality and importance of the topic chosen for research.

2. Pedagogical Observation

In order to debate the current issue, the pedagogical observation accompanied the training lessons. At the same time, she contributed to the observance of the principles of sports training and the ways of applying methods and means to improve technical-tactical training.

3. Test Method

The test method was applied during the experimental research in order to objectively highlight the preparation level of the samples submitted to this study. Thus, we selected the following test batteries: specific physical training tests (4 tests);[5]

Test 1: Vertical jump

The testing analyzes the evaluation of the elastic explosive force at the level of the lower limbs. The tennis player performs a high jump, from the spot, with semiflexion, without requiring a starting position or other movement. The upper limbs can help to jump as high as possible. The test is performed twice and the best result is noted.

Test 2: Hexagon

The hexagon test analyzes the assessment of speed and agility, but also the tennis player's ability to start, stop and balance, in a series of very fast movements over small distances, with departure and return in all directions of travel. The hexagon is made of six sides of 61 cm with an angle of 120° between them. The athlete must jump outside each side of the hexagon and return immediately, each time, to the starting point, as in figure 1.

The hexagon test has been included in the battery of fitness tests proposed by the United States Tennis Association (USTA) and the International Tennis Federation (ITF). Consequently, some studies have used the hexagon test as a measure of agility in tennis players. [6]

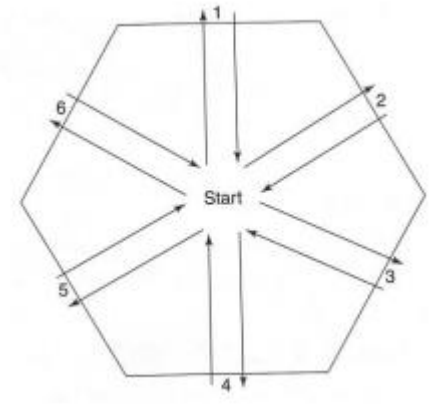

Fig.1. Hexagon test

Test 3: Fans

This test aims to evaluate game-specific movement speed, coordination, but also the ability to accelerate and brake over short distances, in different directions and positions. The subject must sprint, pick up and place each of the five balls, positioned on the field as in figure no. 2. The movement is performed facing the direction of running both on the return and on the return, except for the retreat after picking up the ball no. 3 (from the center), when the run must be performed with the back to the point of depositing the ball. [7]

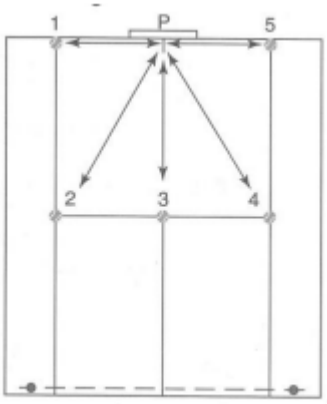

Fig. 2. Pick up and place each of the five balls

Test 4: Lateral movements

This test aims to evaluate the speed of movement by added step but also the ability to stop and change direction. The tennis player, next to the service line, facing the net, runs with an added step to the line of the doubles lane which he touches with his hand, an added step on the opposite side until he touches the line of the doubles lane and returns to the starting point. [8]

4. The Statistical-Mathematical Method of Data Processing and Interpretation

It provides a number of synthetic indicators of statistical distributions, including indicators of central tendency and synthetic indicators of dispersion. Statistical methods help us to explain the probabilistic nature of the phenomena specific to the social sciences, help us to better define our problems, questions, hypotheses and orient our attention and thinking in the process of analyzing the results of a concrete research. [9]

5. Graphical and Tabular Method

We will use this method to highlight the results obtained. The graphic representations will be made through the Microsoft Office program.

Results

We applied the initial and final testing of specific physical training parameters to the research subjects. After analyzing the results of the statistical indicators of specific physical training (vertical jump, hexagon, fans and lateral movements) for the group of girls presented in tables 1, 2, 3 and 4, it can be concluded that the statistical significance of the difference between the means is expressed by t with values between 1.217 and 1.791 at the significance threshold p=0.05, according to table no. 1.

Table 1. Statistical indicators of specific physical training - female

Nr. Crt.	Parameters compare	$\overline{X} \pm DS$		Criteria			
				„Cv”		“t”	“p”
		Initial testing	Final testing	T.I	T.F		
1	Vertical Jump (cm)	23,35 ± 2,105	26,563 ± 1,874	8,304	7,055	**1,217**	>0.05
2	Hexagon (sec)	13,913 ± 0,738	13,313 ± 0,954	5,304	4,462	**1,791**	<0.05
3	Fan(sec)	18,363 ± 1,461	17,213 ± 1,502	7,956	8,726	**1,552**	>0.05
4	Lateral displacements (sec)	15,313±0,824	14,575±1,167	5,381	8,007	**1,461**	>0.05

Both initial and final tests show a normal asymmetry. The spread of values is normal for both tests.

Table 2. Statistical indicators of specific physical training – Lateral displacements/feminine

Nr.crt	Initial T.	Final T.	Lateral displacements -s				
1	25.0	26.0	Number of subjects - N1 –Initial T.	8			
2	22.50	23.50	Number of subjects - N2 –Final T.	8			
3	27.50	28.50	Median - M0 –T.i	15,25			
4	29.0	29.50	Median - M0 –T.f	14,5			
5	23.20	25.40	Asymmetry coefficient - β1 –T.i	0,076	Normal asymmetry		
6	25.50	27.40	Asymmetry coefficient - β2 –T.f	0,064	Normal asymmetry		
7	25.0	26.20	M1 ± DS1 - T.i	15,313	±	0,824	
8	25.10	26.0	M2 ± DS2 - T.f	14,575	±	1,167	
			Scattering of values - M1 ± DS1 - T.i	M1 ± 2DS1	Normal distribution of values		
			Scattering of values - M2 ± DS2 - T.f	M2 ± 2DS2	Normal distribution of values		
			The coefficient of variabitity- CV1 - T.i	5,381	%		Homogeneous value population
			The coefficient of variabitity - CV2 - T.f	8,007	%		Homogeneous value population
			Independent "t" Test	**1,461**			
			Threshold of significance	p>0.05			

Both initial and final tests show a normal asymmetry. The spread of the values is normal for both tests. The values of the coefficient of variability CV1 (5.381%) - for the initial testing and CV2 (8.007%) - for the final testing, highlight a homogeneous population.

Table 3. Statistical indicators of specific physical training - male

Nr. Crt.	Parameters compare	$\overline{X} \pm DS$		Criteria			
				„Cv"		"t"	"p"
		Initial testing	Final testing	T.I	T.F		
1	Vertical Jump (cm)	24,338±1,978	25,525±2,076	8,127	8,133	**1,171**	>0.05
2	Hexagon (sec)	13,263±0,644	12,463±0,597	4,856	4,79	**2,577**	<0.025
3	Fan (sec)	17,1±0,935	15,938±1,414	5,468	8,872	**1,939**	<0.05
4	Lateral displacements (s)	15,025±1,201	14,113±1,124	7,993	7,964	**1,568**	>0.05

Both initial and final tests show a normal asymmetry. The spread of values is normal for both tests.

Table 4. Statistical indicators of specific physical training – Lateral displacements/male

Nr.crt	Initial T.	Final T.	Lateral displacements -s			
1	14.4	13.8	Number of subjects - N1 –Initial T.	8		
2	15	14.2	Number of subjects - N2 –Final T.	8		
3	14.3	13.6	Median - M0 –T.i	15		
4	13	12	Median - M0 –T.f	14,05		
5	15	13.9	Asymmetry coefficient - β1 –T.i	0,021	Normal asymmetry	
6	16	15.1	Asymmetry coefficient - β2 –T.f	0,056	Normal asymmetry	
7	17	15.8	M1 ± DS1 - T.i	15,025	± 1,201	
8	15.5	14.5	M2 ± DS2 - T.f	14,113	± 1,124	
			Scattering of values - M1 ± DS1 - T.i	M1 ± 2DS1	Normal distribution of values	
			Scattering of values - M2 ± DS2 - T.f	M2 ± 2DS2	Normal distribution of values	
			The coefficient of variabitity - CV1 - T.i	7,993	%	Homogeneous value population
			The coefficient of variabitity - CV2 - T.f	7,964	%	Homogeneous value population
			Independent "t" Test	**1,568**		
			Threshold of significance	p>0.05		

Both initial and final tests show a normal asymmetry. The spread of the values is normal for both tests. The values of the coefficient of variability CV1 (8.304%) - for the initial testing and CV2 (7.055%) - for the final testing, highlight a homogeneous population.

Conclusions

At the end of the study, we found the fulfillment of some objectives and formulated useful conclusions for future studies:

The results obtained from the determinations carried out provide clear information on certain parameters such as specific physical training tests, being able to make an objective evaluation and diagnosis of the motor behavior level of the athletes included in the research.

The implementation in the training process of some methods and means through algorithmic systems specific to consolidating and perfecting the shots in the attack phase for children aged 12-14 years, allows with certainty the improvement of technical-tactical training in this age category.

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Body Mass Index, Body Composition and Physical Activity as Predictors of Bone Density in Postmenopausal Osteoporotic Women

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Abstract

Introduction: Osteoporosis (OP) is a condition characterized by a decreased bone mass and deterioration of bone tissue microarchitecture, leading to bone fragility and increased fracture risk.
Aim: The study's aim was to assess body mass index (BMI), body composition and physical activity in the prediction of bone mineral density (BMD) in postmenopausal women.
Materials and Methods: 30 postmenopausal osteoporotic women aged between 46-82 years were included in this study. Participants' demographic data were collected: age, height, weight, body mass index (BMI) and comorbidities. Body composition (total body fat percentage, skeletal muscle mass, visceral fat, basal metabolic rate) using a bioelectrical impedance analyzer) and calcaneal heel ultrasound parameters using a Sonost-3000 (Osteosys) bone densitometer were assessed. Multivariate linear regression with a stepwise procedure was conducted to examine the relationship between the T-score values and age, BMI, body composition and smoking.
Results: A significant model emerged (F (3,17) =7.09, p=0.002), explaining 47.74% of T-scores variance (R2=0.55, adjusted R2=0.47). Age (p=0/0039), percent visceral fat (p=0.01) and smoking (p=0.01) contributed significantly to this model. Variables not included in the model were BMI, body fat and skeletal muscle.
Conclusions: Body composition analysis can predict early bone loss in postmenopausal women, allowing early intervention on decreased BMD and thereby the risk of osteoporotic fractures.

Keywords: *visceral fat, skeletal muscle mass, physical activity, osteoporosis*.

Introduction

Osteoporosis is a condition characterized by a decreased bone mass and deterioration of bone tissue microarchitecture, leading to bone fragility and increased fracture risk.

In 2019, 25.5 million women and 6.5 million men were reported to have osteoporosis in the European Union plus Switzerland and the United Kingdom. Moreover, 4.3 million new fragility fractures were estimated, including 827,000 hip fractures, 663,000 vertebral fractures, 637,000 forearm fractures and 2,150,000 other fractures. The economic burden of this condition and osteoporosis-related fractures, in the EU, were 57 billion euros. Also in 2019, 248,487

osteoporotic fracture-related deaths were recorded. The number of deaths caused by osteoporotic fractures is comparable to or exceeds the number of deaths caused by other diseases, such as lung cancer, diabetes, chronic diseases of the lower respiratory tract [1].

Unhealthy diet, vitamin D deficiency, lower calcium intake, lack of physical activity, smoking, alcohol consumption, overweight and hormonal factors are the main factors that increase the risk of osteoporosis.

It is known that the rapid gain of bone mass occurs throughout childhood, especially during puberty when bones grow rapidly in length, volume, and strength. The peak bone mass is reached in early adulthood and is a major determinant of bone mass in the elderly and a risk factor for later osteoporosis. Therefore, increasing peak bone mass in young persons could reduce the incidence of later osteoporosis or fragility fracture.

The prevalence of osteoporosis increases with age because bone mass decreases with age. Therefore, as a chronic and persistent skeletal condition, it is more common in the elderly, men over 65 and women over 55. However, it is more common in women due to menopause. In this stage, estrogen deficiency increases bone turnover and decreases bone density [2].

Several studies highlighted the beneficial effect of physical activity (PA) on BMD, in osteoporotic postmenopausal women. Thus, over time, women with osteoporosis have been offered different types of PA interventions, including: weight-bearing exercises, flexibility exercise, strengthening exercise for lower extremity and trunk, postural exercise, balance exercise, aerobic resistance exercise, and Pilates method [3-5].

Although numerous studies have shown that obesity is a protective factor in osteoporosis, recent studies have shown that a significant proportion of postmenopausal women with reported fractures are obese [6-8].

On the other hand, an increased percentage of lean body mass support the metabolism and represents a protective factor against bone fractures.

In literature, both positive and negative associations between either lean mass or fat mass and bone mass were reported [8, 9]. Also, both fat mass and lean mass can serve as a predicting factor for BMD [10]. However, several body composition factors have a role in bone density, but the studies show some inconsistencies.

Therefore, the goal of this study is to analyze body mass index (BMI), body composition and physical activity as predictors of bone mineral density (BMD) in postmenopausal women.

Material and Methods

Study Design

A total of 30 postmenopausal women aged between 46 and 82 years were included in this study conducted from March to May 2023.

The inclusion criteria were: women aged >45 years with a menopause duration of at least 1 year; diagnosed with osteoporosis according to the definition of World Health Organization. The exclusion criteria were: history of fractures; inflammatory rheumatic conditions; malignancies; infectious diseases (spondylodiscitis), history of drug therapy in the past year (bisphosphonate, estrogen replacement therapy, and glucocorticoids), vitamin D intake, radiotherapy or chemotherapy, renal failure, primer hyperparathyroidism.

All patients gave their informed consent regarding their participation, agreeing to participate in this study.

Anthropometric and Body Composition Measurement

The participants' demographic characteristics such as age, gender, weight, height and comorbidities were recorded. Weight was measured in kilograms and height in centimeters using a standardized procedure. The BMI was calculated as weight (kg)/height (m^2).

Body composition was analyzed with the OMRON BF511 bioimpedance device. The participants were asked to stand on the device barefoot and hold the thumb electrode for 30 s. The following parameters were calculated by this device: total body fat percentage (BF), skeletal muscle mass (SMM), visceral fat (VF), basal metabolic rate (BMR) and BMI. This device can record the above-mentioned parameters, allows to store them and follow their evolution. It is also equipped with a body composition assessment function that can display recommended levels for body fat, skeletal muscle mass and BMI according to age and gender.

Bone Mineral Density Measurement

BMD was measured using the Osteosys Sonost-3000 bone densitometer. It is a non-invasive and portable device commonly used for bone density screening and assessment. The SONOST 3000 was calibrated daily using according to the manufacturer's instructions to ensure the accuracy of the measurements.

The measurements were obtained from the right calcaneus of all patients at a moderate room temperature, as suggested by the manufacturer. Measurements provided were T-score, Bone Quality Index, Speed of Sound (SOS), and BUA (broadband ultrasound attenuation). BUA (dB/MHz) is the attenuation of sound waves as they pass from the transmitting transducer to the receiving transducer. The SOS (m/s) is the speed the ultrasound signal travels from one transducer to the other. Normal bone has a higher BUA and SOS than osteoporotic bone. Osteoporosis was defined as a T-score ≤ 2.5, low bone mass as T-score between -1.0 and -2.5, and normal as a T score > -1.

Physical Activity Level Measurement (IPAQ-SF)

Physical activity levels of the patients were evaluated with the short International Physical Activity Questionnaire (IPAQ-SF) [11]. The IPAQ-SF records the activity in four intensity levels: sitting, walking, moderate intensity, and vigorous intensity. In order to obtain a total score from the IPAQ we considered walking to be 3.3 METS, moderate physical activity to be 4 METS and vigorous physical activity to be 8 METS. In order to calculate the weekly physical activity (MET·minutes/week) we multiplied the MET value by the minutes of the performed activity and again by the number of days that that activity was undertaken.

The following categories of physical activities emerge from this questionnaire:

- Low activity, i.e., not meeting the criteria of a moderate or intense activities (<600 MET·min/week);
- Moderate activity, meeting any of the following criteria:

a. Three or more days with vigorous activities, at least 20 min each day,

b. Five or more days with moderate activities or walking, at least 30 min each day,

c. Five or more days with any combination of the above-mentioned activities (>600 MET·min/week);

- High activity, meeting any of the following criteria:

a. Three or more days with vigorous activities; at least 1500 MET·min/week,

b. Seven or more days with any combination of vigorous, moderate or walking activities; at least 3000MET·min/week.

Statistical Analysis

All data were centralized in an excel table where statistical analysis was made using the calculation formulas provided by the program. The variables were calculated as a percentage, mean, and standard deviation. Correlation analysis of T-score with age, weight, height, BMI, body fat percentage, skeletal muscle mass (SMM), visceral fat (VF), basal metabolic rate (BMR), ultrasound parameters (SOS, BUA) and IPAQ was done to obtain Pearson's correlation.
Multivariate linear regression with a stepwise procedure was performed using MedCalc Statistical Software version 22.013. We examined the relationship between the T-score and age, BMI, body composition (visceral fat, body fat and skeletal muscles) and smoking.
The criterion for entry into the regression model was $p < 0.05$ and for removal from the regression was $p > 0.1$. The significance level was set at $p < 0.05$ for all tests.

Results

Table 1 shows anthropometric, body composition components and ultrasound bone measurements. The mean age was 65.5 ± 12.08 years and the mean BMI 26.11 ± 6.94 with the mention that most women were overweight. The most common comorbidity was hypertension (63%) followed by obesity (32%), chronic ischemic heart disease (26%) and smoking (26%). 80% of the women included in this study reported a low physical activity level and only 20% were classified as having a moderate physical activity level.

Table 1. Descriptive statistics of anthropometric, body composition and ultrasound parameters

	Mean	**Standard deviation**
Age (years)	65.5	12.08
Weight (kg)	69.26	19.31
Height (cm)	162.74	6.61
BMI (kg/m2)	26.11	6.94
Body fat (BF) (%)	35.46	8.30
Visceral fat (VF) (%)	8.58	2.52
Skeletal muscle mass (SMM) (%)	26.97	3.50
Basal metabolic rate (MR) (Kcal)	1427.26	218.94
T score	- 2.79	0.32
SOS (m/s)	1416.43	343.40
BUA (dB/MHz)	52.10	16.44

Table 2. Correlation between the T score and other studied parameters (Pearson test)

T	**BF**	**VF**	**SMM**	**BMR**	**SOS**	**BUA**
r	-0.05	-0.32	0.11	0.25	0.04	0.49
p	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01

The relationship between T-score, body composition components and ultrasound parameters, was investigated using Pearson correlation coefficient (Table 2).

A multivariate linear stepwise regression was performed to examine the relationship between T score and the other variables (Table 3). Only those variables that were significant in the correlation analysis were entered into the regression. A significant model emerged (F(3,17)=7.09, p=0.002), explaining 47.74% of T-scores variance (R2=0.55, adjusted R2=0.47). Age (p=0/0039), percent visceral fat (p=0.01) and smoking (p=0.01) contributed significantly to this model. Variables not included in the model were BMI, body fat and skeletal muscle.

Table 3. Summary of stepwise regression analysis of T-score

Predictors	B	T	p-value	R^2	Adjusted R^2
Age	-0.01	-3.33	0.003	0.55	0.47
Visceral fat (%)	-0.05	-2.64	0.01		
Smoking	-0.36	-2.85	0.01		

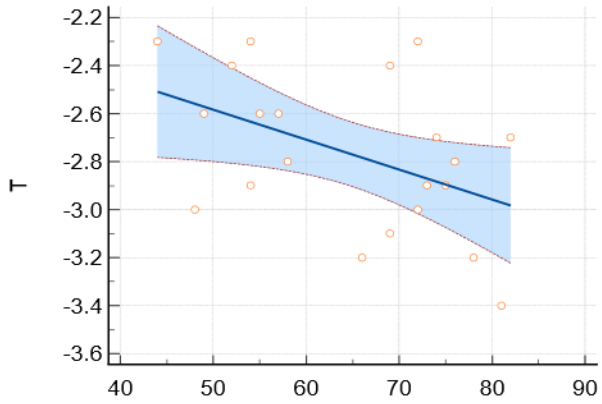

Fig. 1. Regression variable plots age versus T-score

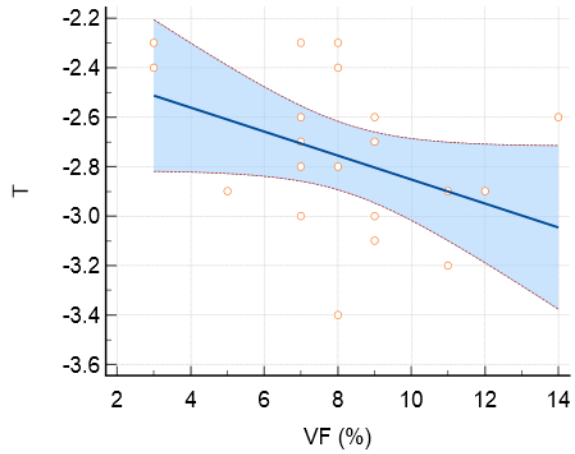

Fig. 2. Regression variable plots visceral fat versus T-score

Discussion

Osteoporosis, similar to other inflammatory rheumatological diseases, is associated with impaired quality of life and disability [12,13]. Our study of 30 postmenopausal women showed that most of them were overweight (63%) with a mean T score of -2.7. Previous studies show that a higher body mass index was associated with high BMD and demonstrate that overweight and obesity are protective factors against developing osteoporotic fractures [14]. This protective effect of fat on bones could be explained by the intervention of hormonal factors such as serum leptin and insulin, or estrogen levels secreted by adipose tissue [15]. However, it was recently shown that high body fat percentage influence negatively the bone health by lowering BMD [16]. This finding is also reinforced by epidemiological data studies suggesting that fracture risk may be increased in obese individuals.

Quantitative ultrasound (QUS) measurement of the calcaneus has been suggested as an alternate method in assessing BMD in clinical practice as it is relatively inexpensive, repeatable, and easy to perform in contrast to DXA which is an expensive investigation and not always available. Therefore, it is widely used for screening in osteoporotic women. Several studies confirm that DXA examinations are significantly comparable to QUS measurements at the calcaneus [17].

In the present study, T score measured by QUS was positively, but weakly, correlated with BMR (r= 0.25), BUA (r= 0.49) and negatively correlated with visceral fat (r= -0.32). Multiple regression analysis showed that visceral fat percent, age, and smoking, were the only contributing factors (negative predictors) to BMD, respectively T score, in postmenopausal women.

Our findings are in conjunction with Jafri L et al., who reported that overall body fat percent and visceral fat percent were the only significant negative predictors to the calcaneal heel ultrasound parameters [18]. Another study conducted by Zhang P et al., reported that visceral adiposity was inversely associated with lower trabecular and cortical BMDs and muscle attenuation in both men and women [19]. Moreover, this association was also confirmed by imaging techniques, such as quantitative computed tomography (CT), suggesting that visceral adipose tissue is strongly associated with lower BMD and compromised bone quality.

Some researchers have explained that the adverse effects of obesity on bone health are mediated by the secretion of inflammatory cytokines released by visceral fat, and these cause increased bone resorption and decreased BMD [20].

On the other hand, the visceral fat is positively correlated with the vertebral bone marrow and the latter inversely associated with IGF-1 and BMD. This suggests that the negative effect of visceral fat on bone health may be mediated by IGF-1 as an important key regulator in the fat-bone linkage [21].

Thus, we can state that there is a connection between bone and fat, and that the possible pathophysiological mechanisms underlying this association are still under investigation.

Conclusion

Body composition analysis can predict early bone loss in postmenopausal women, allowing early intervention on decreased BMD and thereby the risk of osteoporotic fractures.

Therefore, it is recommended that postmenopausal women with a high percentage of visceral fat undergo early screening for BMD loss and take the necessary therapeutic interventions to prevent osteoporotic fractures

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Assessing Muscle Fatigue: A Review of Training Protocols in Murine Models

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Abstract

Introduction: The training protocol used in murine model studies provides a valuable starting point for developing an adapted training model for athletes to prevent and manage muscle fatigue.
Aim: The objective of this review study is to analyze current research in this field to determine the type of training regimen in murine models that contributes to the prevention of muscle fatigue and to design a new training protocol for use in a subsequent study.
Materials and Methods: Using the following databases: PubMed, ResearchGate and Google Scholar and the following keywords: murine models, muscle fatigue, training protocols; we identify articles relevant to our study. To ensure the quality and relevance of the selected articles, we applied the following inclusion criteria: articles published in English, available in full text, and a main focus on muscle fatigue resulting from physical activity in murine models. In addition, we excluded articles that did not describe the training protocols used, articles that presented only abstracts or that lacked explicit details of the training protocol. This systematic approach resulted in the identification of 40 articles that met our inclusion criteria.
Results: We selected 20 articles meeting both inclusion and exclusion criteria. The findings reveal that laboratory animals subjected to a training protocol exhibit initial signs of fatigue at a later stage compared to the control group. Furthermore, as a result of this comprehensive review study, we formulated an alternative training protocol to be implemented in future research.
Conclusions: Effective training protocols delay fatigue, especially in the murine model. This study highlights the importance of personalized training in enhancing performance.

Keywords: murine models, muscle fatigue, training protocol.

Introduction

Muscle fatigue involves a decrease in the muscle's ability to generate force or power following an effort. It is often manifested by a reduction in the force of maximum voluntary contraction after sustained physical activity. (Edwards In recent years, there has been a proliferation of various training protocols aimed at inducing and assessing muscle fatigue in mice, each with its own set of advantages and limitations. These range from direct muscle stimulation to voluntary wheel running, highlighting the complexity of the methods available.

This article aims to provide a comprehensive review of training protocols used to assess muscle fatigue in murine models. By analyzing the advantages and disadvantages of each

method, this review hopes to guide researchers in selecting the most appropriate protocol for their experimental needs and facilitate a deeper understanding of the complexity surrounding muscle fatigue.

Materials and Methods

Data Collection

Using the following databases: PubMed, ResearchGate and Google Scholar and the following keywords: murine models, muscle fatigue, training protocols; we identify articles relevant to our study. To ensure the quality and relevance of the selected articles, we applied the following inclusion criteria: articles published in English, available in full text, and a main focus on muscle fatigue resulting from physical activity in murine models. In addition, we excluded articles that did not describe the training protocols used, articles that presented only abstracts or that lacked explicit details of the training protocol. This systematic approach resulted in the identification of 40 articles that met our inclusion criteria.

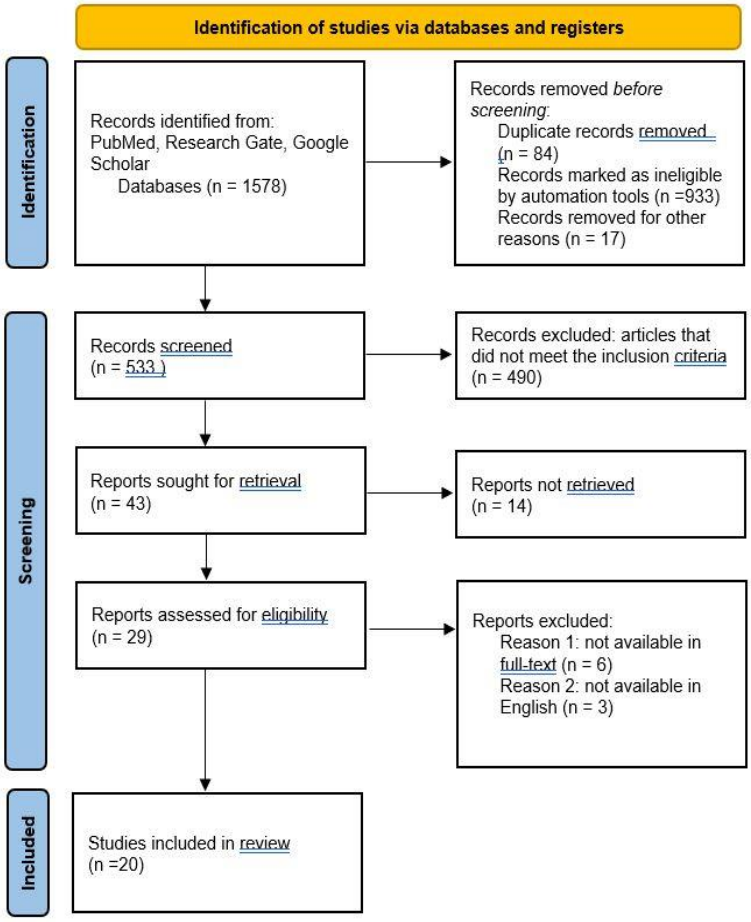

Figure 1. Prisma flow diagram

Results

From the diagram above (figure 1), a total of 1578 articles were identified. Articles published between the years 1990-2000 (n= 3), 2000-2010 (n= 9), 2010-2020 (n= 8). Some studies used supplements (n= 6). Others used the treadmill (n= 17), ladder (n= 1), swimming (n= 2). After the inclusion and exclusion criteria, a total of 20 articles were included in the review study.

Table 1. Articles used in the review

No. articles	Target group	Training method	Duration of training protocol
Coqueiro et al. (2017) [1]	40 adult male Wistar rats	climbing a vertical ladder	6 weeks
Chang et al. (2020) [2]	40 rats divided into 5 groups	treadmill running exercise	6 weeks
Contarteze et al. (2007) [3]	41 Wistar rats divided into 5 groups	treadmill running	10 consecutive days
Kunstetter et al. (2017) [4]	Adult male Wistar rats	treadmill running	6 weeks
Carvalho et al. (2004) [5]	17 female Wistar rats	treadmill running	6 weeks
Soya et al. (2007) [6]	Adult male Wistar rats	treadmill running	2 weeks
Bredahl et al.(2016) [7]	20 Wistar rats	treadmill running	10 weeks
Verger et al. (1992) [8]	34 male Wistar rats	treadmill running	4 weeks
Gomez-Barroso et al. (2022) [9]	male Wistar rats	treadmill running	8 weeks
Cordeiro et al. (2012) [10]	Male adults Wistar rats	treadmill running	5 days
Langfort et al., (1996) [11]	24 male Wistar rats	treadmill running	3 running test
Pilis et al., (1993) [12]	11 male Wistar rats	treadmill running	7 consecutive days
Ohiwa et al. (2007) [13]	adult male Wistar rats	treadmill running	2 weeks
Nishijima & Soya (2006) [14]	Wistar rats	treadmill running	3 weeks
Hasegawa et al. (2005) [15]	male Wistar rats	treadmill running	3 weeks
Saito & Soya (2003) [16]	adult male Wistar rats	treadmill running	10 days
Gobatto et al. (2001) [17]	male Wistar rats	swimming exercises	6 weeks
Rogero et al. (2006) [18]	Wistar rats	swimming exercises	6 weeks
Ju et al. (2013) [19]	18 female Wistar rats	treadmill running	20 sessions
Xu et al. (2016) [20]	24 Wistar rats	treadmill running	12 weeks

Discussions

Analysis of muscle fatigue in murine models highlights the diverse range of training protocols adopted over the years. While treadmill exercise is predominant, the inclusion of modalities such as swimming and stair climbing suggests the breadth of techniques available. The occasional use of supplements in some studies introduces potential variability in results. As research in this area continues, standardisation of approaches, while tailoring them to the specific needs of studies, will be of major importance.

Building on insights from prior research, as referenced in the preceding table, we have designed a six-week training protocol. This regimen incrementally elevates both intensity and workload. It's noteworthy that the program begins with an adaptation phase in 'Week 0'. The subsequent seventh week is earmarked for evaluating the murine model. Delving into specifics, the protocol initiates at a speed of 2 m/min. This pace escalates to 18 m/min by the sixth week, and impressively peaks at 20 m/min during the test day. The exercise duration also varies, starting at a modest 10 minutes and extending up to an hour

Table 2. Six-weeks exercise intervention proposed protocol

Week	Speed (m/min.)	Time (min./day)	Aim
0	2-3	10-15	Wheel habituation
1	5	20	Adaptation
2	5-10	25-40	Progressive increase
3	10-15	45-60	Progressive increase
4	15-20	55-60	Progressive increase
5	20	60	Constant intensity
6	10-18	10-40	Test preparation
7	the rat runs to exhaustion 20 m/min.		Test

Conclusions

In conclusion, effective training protocols play a key role in delaying fatigue, especially in murine models. This research highlights the significance of tailoring training to individual needs, reinforcing its potential to optimise performance.

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Adult-Teenagers Opinion Regarding Adaptogens Role in Fatigue, Before/After Attending a School Course on This Topic

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Abstract

Beckground: Adaptogens (ADP) are known to be useful in stress modulation, including fatigue modulation.
Aims: The objective was to evaluate adult-teenagers (A-TNG) opinion before/after a school course (SC) regarding the adaptogens role in fatigue (ADP-F).
Methods: A number of 103 A-TNG voluntarily attend the one-day SC, carried out in the "week otherwise" of the school program. A-TNG answered a detailed questionnaire before/after the SC, which included items related to: stress; sports and types of sports; ADP - what they are, types, role for health; connection between ADP and stress; connection between ADP and fatigue.
Results: For all evaluated A-TNG, it was the first time they attended a SC on the topic of ADG and their role in fatigue. Most of them have indicative information regarding stress and practice a form of fatigue, but they did not have any information regarding what ADP represents and their role in stress and fatigue. The post-course A-TNG answers proved that they accumulated a lot of information presented during the SC, about the role of ADP in fatigue. Most of the A-TNG participants were enthusiastic about the SC topic and found it useful for their education.
Conclusions: To our knowledge, this is the first course addressed to A-TNG that refers to ADP and their role in fatigue. The active participation of A-TNG in SC, as well as the accumulated information during the SC, prove the usefulness of the proposed theme in A-TGN education. We suggest that topics from the field of ADP, stress and fatigue to be more frequently addressed in the future school information of A-TNG.

Keywords: adult-teenagers, adaptogens, stress, fatigue

Introduction

The problem of increasing non-specific resistance of an organism to unpleasant influences of different origin is of great importance. In this sense, some effective pharmacological preparations are known to increase the resistance of an organism. Among them, medicinal plants with corroborative action, including adaptogens, were predominant in the recipes for the treatment of

some diseases. Adaptogens, in moments of increased stress, normalize the body's physiological process and help the body adapt to changes [26]. This article is a continuation of previous research of the authors, regarding the topic of Ginseng [7][8][9][10].

Aims

The objective was to evaluate adult-teenagers (A-TNG) opinion before/after a school course (SC) regarding the adaptogens role in fatigue (ADP-F).

Methods

A number of 103 A-TNG voluntarily attend the one-day SC, carried out in the "week otherwise" of the school program. A-TNG answered a detailed questionnaire before/after the SC, which included items related to: stress; sports and types of sports; ADP - what they are, types, the role for health; the connection between ADP and stress; the connection between ADP and fatigue.

1. What is stress?
2. What sports and types of sports do you know/ practice/ would like to practice?
3. What is the connection between sports and fatigue?
4. What are adaptogens?
5. How many types of adaptogens are/do you know?
6. What health roles do adaptogens have?
7. What composition do adaptogens have?
8. How adaptogens work?
9. What is the connection between adaptogens and stress?
10. What is the connection between adaptogens and fatigue?

Results

1. For all evaluated A-TNG (100%), it was the first time they attended a SC on the topic of ADG and their role in fatigue.
2. Most of them practice a form of sport: individual (fitness 31%, tennis 4%, swimming 19%, skiing 13%, skating 4%); team (football 49%, basketball 10%, volleyball 13%)
3. Most of them had before the SC indicative information regarding: stress (53%); the connection between sports and fatigue (51%);
4. Most of them did not have before the SC, any information regarding: what ADP represents (94%) and ADP role in stress and fatigue (94%).
5. The post-course A-TNG answers proved that they accumulated a lot of information presented during the SC, about: stress (91%), ADP (71%) and the role of ADP in fatigue (94%).
6. Most of the A-TNG participants were enthusiastic about the SC topic and found it useful for their education (94%).

The conducted study was based on the following information regarding adaptogens.

Concept of Stress and Adaptogenes

Stress is a condition resulting from external physical or mental overload. Adaptation to stress, being associated with the interactions of numerous mediators of the nervous, endocrine and

immune systems and modulated at all levels of organization - cellular, regulatory, whole organism systems [5], it is highly unlikely that the various stress protectors have the same mechanism of action.

Adaptogenes – Definition

Adaptogens were originally defined as drugs that improve the "state of non-specific resistance" to stress [14] [17]. This definition implies that an organism has different levels of resistance to stress, associated with the central nervous system (CNS) and sympathetic, the endocrine system (hypothalamic-pituitary-adrenal axis - HHS) and the non-specific immune system - innate immunity (antimicrobial enzyme system, non-specific cytokines, the complement system, phagocytic cells and natural killer cells). However, this representation is related to a physiological state, i.e., stress, and not to a specific disease. The term "adaptogen" was coined in the middle of the 20th century by the Russian scientist Lazarev [1] to describe medicinal plants that can improve the so-called "state of non-specific resistance" of an organism to stress. Further studies conducted with numerous herbal preparations have shown that only a few herbs actually fulfill the postulated requirements for adaptogens. For example, in 2005 it was noted that only Schizandra chinensis, Eleutherococcus senticosus and Rhodiola rosea were found to fully comply with the specific definition of an adaptogen [19]. There are also further definitions given to adaptogens: herbal preparations that can increase resistance to stress; a class of metabolic regulators that increase the body's ability to adapt to environmental factors and avoid damage caused by these factors.

Adaptogens - Main Characteristics

1. The first characteristic. One of the most important indicators of the action of adaptogens is their ability to increase efficiency both after a single action (stimulant action) and after prolonged administration (tonic action). Over time, data were obtained regarding the increase in the physical and mental efficiency of humans after single or prolonged administration of preparations from (alphabetically): Panax ginseng [1], Rhodiola rosea [32] and Shizandra chinensis.

2. The second characteristic refers to the lack of specificity of the action of adaptogens, in that they have the ability to increase the body's resistance to various adverse physical factors. Much evidence for this type of general defense action has been obtained for (alphabetical): Eleutherococcus senticosus, Panax ginseng, Rhodiola rosea [1].

3. A third and most important characteristic of an adapogen is the normalizing action that occurs regardless of the direction of previous pathological changes. For example (alphabetical): Eleutherococcus senticosus [1], Panax ginseng, Rhodiola rosea [32].

Adaptogens – Composition

The active components of anti-stress and adaptogen plants can be divided into three main groups, namely, tetra/penta cyclic terpenoids, phenyl- and phenylethylpropanoids and their derivatives, as well as oxylipins. Based on the chemical nature of their active principles, some indication of the possible mechanism of action of these herbs can be deduced. The mild stress-protective activity of Ginseng saponins is thought to be mediated by blocking the action of

ACTH in the adrenal glands [12]. Rhodiola rosea and Schisandra chinensis accumulate compounds that may play an active role in the stress response [15]. Eleutherococcus senticosus contains both types of biologically active compounds [31].

Adaptogens - Mechanism of Action

The beneficial protective effect of adaptogens is related to the regulation of homeostasis through several mechanisms of action associated with the HHS axis and the control of key mediators of the stress response [23]. Adaptogens are thought to act as "metabolic regulators that increase an organism's ability to adapt to environmental stressors and prevent damage to the organism by these stressors" [22] at two levels of regulation:

a) *At the whole-body level*, they support homeostasis and neuroendocrine regulation of the hypothalamic-pituitary-adrenal (HPA) axis [20] involving stress hormones – cortisol [16], neuropeptide Y (NPY), [21]) and other mediators of the stress response, including nitric oxide [18] and heat shock proteins 70 (Hsp70) [21].

b) *At the cellular level*, they modulate gene expression of key intracellular mediators involved in stress-induced signal transduction pathways [24].

Adaptogenes - Fatigue Modulation Effects

Rhodiola Rosea (RR)

Numerous systematic studies have concluded that the standardized extract of RR is significantly beneficial in stress-induced fatigue [30]. In randomized controlled trials in healthy adults, RR had anti-fatigue and cognitive function-enhancing effects under stressful conditions [28].

a) After taking an RR extract, 170 mg once a day, 2 weeks, mental fatigue, perceptual and cognitive functions such as associative thinking, short-term memory, calculation and concentration ability, as well as the speed of audio-visual perception were significantly improved in the group treated for 2 weeks [3].

b) After administration of an RR extract, 50 mg 2 times a day, for 20 days, significant improvement in physical fitness, mental fatigue, neuromotor tests and general well-being was found compared to the control [29].

c) After administration of an RR extract, 355 mg in a single dose, a significant anti-fatigue effect was produced compared to the control [28].

Eleutherococcus Senticosus

We exemplify through a few studies carried out:

After administration of an ES extract, 2.24 for 2 months, compared to control, a significant improvement in fatigue was found in subgroups of patients with moderate fatigue and a history of fatigue less than 5 years old [6].

After the administration of an ES extract, in an unspecified dose, compared to placebo, a significant reduction of the cardiovascular response to mental stress was found [4].

Schisandra Chinensis (SC)

We exemplify through a few studies carried out:

The tonic effect was observed in tired subjects who were subjected to ergographic tests while

cutting wood (for 5 minutes with a frequency of 45 movements / min): work capacity increased from 27.5 kg / m (control) to to 77 kg / m in the treated group [13].

SC fruits are famous in traditional Chinese medicine to treat all types of fatigue [2].

Panax Ginseng (GS)

We exemplify through a few studies carried out:

Following administration of a GS extract, 200 mg as a single dose, compared to placebo, significantly improved task performance and significantly reduced subjective mental fatigue during sustained mental activity [27].

After administration of a G extract, 200 mg as a single dose, compared to placebo, speed of attention, speed of recall and "secondary memory" were significantly improved 4 hours after administration [11].

Thus, GS is beneficial also in stress-induced fatigue [33].

Conclusions

Adaptogens are herbs that meet certain action requirements and improve an individual's ability to cope with stress. To our knowledge, this is the first course addressed to A-TNG that refers to ADP and their role in sports. The active participation of A-TNG in SC, as well as the accumulated information during the SC, prove the usefulness of the proposed theme in A-TGN education. We suggest that topics from the field of ADP, stress and sports to be more frequently addressed in the future school information of A-TNG.

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Prevention of Postural Deficits Induced by Desk Work Through Alternating the Support Surfaces

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Abstract

Aim: The aim of this study is to prove the importance and benefits of a physical therapy program for prevention and treatment of degenerative diseases of the spine. The study focused on adults involved in work activities that require maintaining a sitting position at the office. This study included 13 subjects with the age between 26 to 48 years old.
Materials and Methods: To prevent musculoskeletal disorders that occur during office work, our research team proposes the alternation of the support surface. This technique is based on alternating anatomical topographic regions of support on the chair during office working hours and requires the use of a specially designed chair to support the body on other than the usual support surfaces. The methods used for evaluation were joint and muscle balance as well as the visual analogue scale of pain, and the evaluation data provided by the GPS 600 system.
Results: At the end of the 30 days of intervention, all subjects had relief of symptoms and the alignment of the spine was significantly corrected.
Conclusions: The treatment using the Global Postural System GPS 600 combined with physical therapy is important to prevent degenerative diseases of the cervical spine both for the effect on the joints and for the general effect on postural balance.

Keywords: support surface, work posture, prevention

Background

Sitting in the same position for a prolonged period contributes to countless health problems like lumbar and cervical pain, circulatory and renal diseases. The muscles which support the body's posture suffer a prolonged state of contraction, which leads to a decreased efficiency in the transport of sugars and oxygen to the dynamically contracted muscles and this leads to an accumulation of waste products in the muscles, like carbon dioxide and lactic acid. Those changes can lead to muscle spasms and muscle fatigue [1]. The pelvis tilted to the maximum in a stable, prolonged sitting position, can induce low back pain due to unbalanced muscle activities [2]. While sitting, the pelvis rotates back, and the lumbar lordosis is flattened. At the same time, it increases the load on the intervertebral discs and on the spine. Sitting in an inclined position is known to increase disc pressure even further and to aggravate chronic low back pain [3]. Tilting forward and the lower tilt of the chair can increase lordosis, but subjects give a high degree of comfort to adjustable seats, which allow changes in position [4]. Static sitting is thought to be related to low back pain. Among the various regular seating positions, the reclining sitting was suggested to cause viscoelastic creep. This, in turn, can compromise torso muscle activity and

proprioception and increase the risk of low back pain [5]. Muscle activity in specific postures that alter the curves of the spine and sagittal balance in sitting, may differ between people with and without a history of back pain [6]. The musculoskeletal changes caused by maintaining a prolonged sitting at the desk posture were researched by our team and published in a study in 2019[7]. Our clinical findings of head protrusion or anteriorization were confirmed by postural analysis.

Aim

The aim of this study is to prove the importance and benefits of a physical therapy program for prevention and treatment of degenerative diseases of the spine using the technique of alternating support surfaces to subjects that work in a sitting position for six hours per day and to determine the improvement of postural alignment using posturography pre and post intervention.

Material and Methods

Subjects

The study focused on adults involved in work activities that require maintaining a sitting position at the office. This study included 13 subjects with the age between 26 to 48 years old. The sample size was n=13 randomly selected individuals according to the following inclusion criteria: men and women aged 20 to 50 years who work in a sitting position for 6 to 8 hours per day. All subjects experienced pain or discomfort in the lower back and/or cervical region.

For this study we have the approval of the Ethics Commission for conducting the research.

Materials

For this study we modified 13 massage chairs to be used by our subjects during the intervention in their workplace as an alternative to the usual chair they had in the office. The alternative chair (AC) is designed to support the body in anatomical regions other than those on which the support is made when a normal chair is used to provide the possibility of alternating the support surfaces. The alternative chair is adapted from a chair that was usually used for massage in the sitting position, with the face support piece removed. It is configured and can be adjusted according to the subject.

Research Protocol

The period of the research was 30 days from January to February 2022. The tests were developed at the HC Kinetic practice, and the intervention with the alternative chair was made at the workplace of each subject. The subjects received from the HC Kinetic office chairs that were usually used for massage in the sitting position, with the face support piece removed. Since this chair offers the possibility to support the body weight on opposite surfaces than a usual chair, we name it the alternative chair.

The tests used in the study were: pain scale; postural analysis, and the ground-level index test. The determined parameters were pain scale (PS) index measured in units on a scale that indicates the pain intensity from 1 to 10, head anteriority (HA) measured in centimeters, center of gravity (CG) projection anteriorization measured in centimeters, and ground-level (GI) index also measured in centimeters.

Postural analysis was performed with the Posturograph or Global Postural System (GPS) which is an advanced postural analysis system that uses noninvasively diagnostic and evaluation techniques and methods in the field of medical recovery. Postural analysis is performed from the front, back and profile and can diagnose the deficiencies of the spine in the sagittal or frontal plane (scoliosis, kyphosis, hyperlordosis).

The intervention consisted of using the technique of alternating the body's support surfaces by using the reverse sitting for about half of the working time. The use of the reverse sitting chair was recommended for at least 3 hours during the work program, four consecutive weeks.

Results

Pain decreased significantly in all 13 subjects as follows: in 15% of subjects, it decreased by 5 units; in 46% of subjects, it decreased by 4 units; in 23% of subjects, it decreased by 3 units; in 15% subjects it decreased by 2 units.

Head anteriority was modified as follows: in 46% of subjects head anteriority was reduced between 0.0-2.0 cm; in 30% of subjects, head anteriority was reduced between 2.1-4.0 cm; in 15% of subjects, head anteriority was reduced between 4.1-5.0 cm; in 7% of subjects, head anteriority was reduced between 5.1-6.0 cm.

The ground-level index changed as follows: in 7% of the subjects, it changed by 7 cm; for 30% of subjects, it changed between 7-13 cm; in 61% of subjects, it changed between 14-17 cm. The ground level index test values for 12 of 13 subjects improved between 10-17 cm, indicating increased mobility of the lumbar spine and increased flexibility of the lumbar tissues in 90% of the subjects tested.

Statistical Analysis

The descriptive analysis of determined parameters is shown in Table 1, Fig.1, and Fig.2.

Table 1. Descriptive analysis of the parameters

	N	Minimum	Maximum	Mean	Std. Deviation
HA initial	13	2.30	19.20	9.37	4.07
HA_final	13	1.40	16.10	6.74	3.80
ACG initial	13	.50	6.00	3.33	1.69
ACG final	13	.50	4.00	2.21	1.31
PS initial	13	5.00	8.00	6.61	1.04
PS final	13	2.00	5.00	3.00	.91
GI initial	13	12.00	20.00	16.76	2.61
GI final	13	.00	6.00	3.23	1.87
Valid N	13				

Legend: pain scale (PS) index measured in units, head anteriority (HA) measured in cm, center of gravity (CG) projection anteriorization measured in cm, and ground-level (GI) index measured in cm.

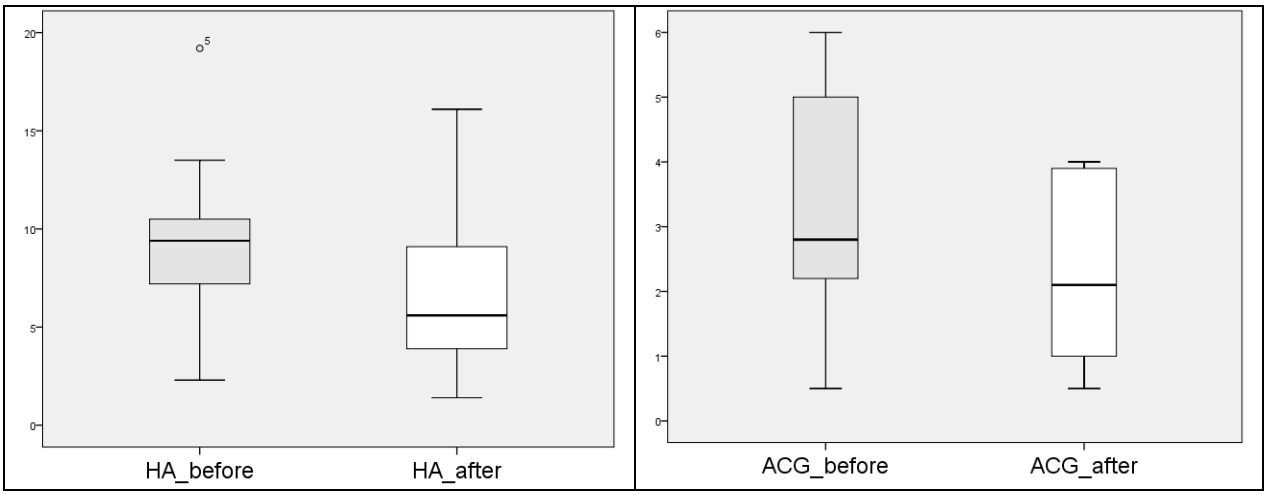

Fig.1. The descriptive analysis for HA (left) and ACG (right)

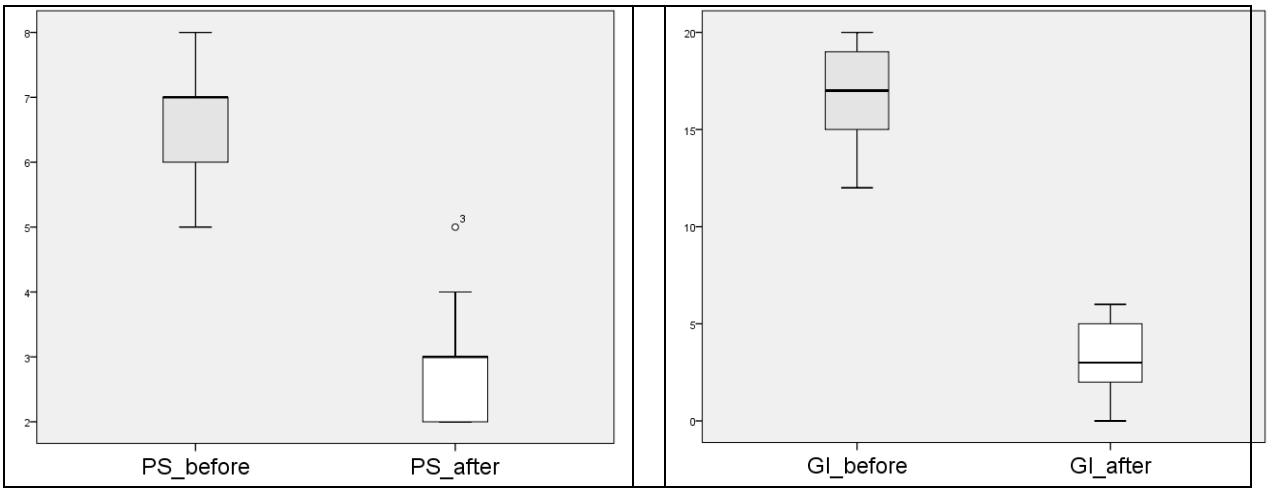

Fig.2. The descriptive analysis for PS (left) and GI (right)

The comparative analysis for studied parameters is shown in Table 2, and Table 3.

Table 2. The comparative analysis for studied parameters

		Paired Differences					t	df	Sig. (2-tailed) p-value
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
Pair 1	HA initial, HA final	2.63	1.63	.45	1.64	3.61	5.81	12	.000
Pair 2	ACG initial, ACG final	1.12	.70	.19	.69	1.55	5.72	12	.000
Pair 3	PS initial, PS_final	3.61	.96	.26	3.03	4.19	13.56	12	.000
Pair 4	GI initial, GI final	13.53	2.60	.72	11.96	15.11	18.76	12	.000

Table 3. The paired comparative analysis for studied parameters

		Paired Differences					t	df	Sig. (2-tailed) p-value
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
Pair 1	HA initial, HA_final	2.63	1.63	.45	1.64	3.61	5.81	12	.000
Pair 2	ACG initial, ACG final	1.12	.70	.19	.69	1.55	5.72	12	.000
Pair 3	PS initial, PS final	3.61	.96	.26	3.03	4.19	13.56	12	.000
Pair 4	GI initial, GI final	13.53	2.60	.72	11.96	15.11	18.76	12	.00(0

Results Interpretation

The most important results are those showing that pain decreased in all subjects. In 8 of 13 subjects, pain decreased by 50%. The anteriority of the head changed in all the subjects, which means that the sitting position on the chair alternating the support points is also beneficial for the muscles of the cervical spine and the entire cervical muscle belt. In 10 subjects out of 13, the anteriority of the head was reduced by up to 4 cm. The anteriority of the center of gravity projection decreased, which means that the standing stability improved. Alternating the support points in the sitting position on the chair, leads to an improved condition with the anterior muscle chain working in balance with the posterior muscle chain. The values of the ground level-index test for 12 subjects out of 13 improved between 10 to 17 cm, which indicates an increase in the mobility of the lumbar spine and an increased flexibility of the tissues in the lumbar area in 90% of the test subjects.

Discussions

The method proposed by us, which includes the alternation of the supporting surfaces, can be a method of prophylaxis of the muscular-skeletal injuries produced by the office position.

Other authors had similar observations of the postural deficits affecting office workers. Kocur et al. studied female office workers with moderate neck pain and found an increased anterior positioning of the cervical spine and stiffness of upper trapezius myofascial tissue in sitting posture [8]. The most affected body regions that suffer from musculoskeletal symptoms among computer users are the neck, lower back, and shoulders [9]. To correct the deficient posture of the head and neck, and musculoskeletal disorders that occur during desk work, Horton et al. (2010) used a lumbar support, and inclination of the seat backrest at an angle of 110 ° [10]. Other authors used different types of adjustable chairs [11], or chairs with sensors and vibrotactile feedback to correct the posture at the desk and to prevent postural deficits such as anterior tilt of the head or slouching that are induced by work posture [12]. Other studies used monitors like thigh-worn devices to measure motion and posture in office-based workers [13]. Plessas et al. [14]. studied the role of ergonomic saddle seats in the prevention of musculoskeletal disorders.

Limitations of the Research

A special aspect of this study is that the materials used were modified massage chairs. Although these chairs are very well known and used by therapists, they are not used in other jobs that involve prolonged sitting. For this reason, it was quite difficult to implement our prophylaxis program to subjects willing to participate and use such a chair in the office.

Conclusions

The head anteriority and the anteriority of the center of gravity projection decreased statistically significantly after the intervention. The pain scale index decreased statistically significantly after the intervention.

The ground level-index test improved after the intervention, which indicates an increase in the mobility of the lumbar spine and an increased flexibility of the tissues in the lumbar area.

The method of treatment and prophylaxis by alternating support points during the sitting position, proposed by us in this study had positive effects. Alternating the areas of support in the seated position improves the balance between the activity of the anterior and posterior muscle chains.

Conflict of Interests

No conflicts. All members of the research team made an equal contribution to the realization of this article.

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Innovative Methods of Optimizing Sports Behavior in Taekwondo

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Abstract

Introduction: Athletes are prone to worry and increased stress, especially at the competitive level, and taekwondo, being a contact sport, intensifies these feelings and experiences, limiting practitioners from reaching their full potential.
Aim: The current study sought to identify a psychological training strategy that could assist taekwondo practitioners in overcoming these difficulties and achieving the greatest results. The goal was to lower taekwondo athletes' stress and anxiety in order to improve their performance.
Materials and Methods: This study proposed and tested mindfulness and the Jacobson progressive muscular relaxation technique on different groups of athletes for three months. This problem is not adequately covered in the specialized literature, and taekwondo research is extremely restricted. Mindfulness is a stress-reduction approach that involves self-regulating excitement in response to stressful situations or symptoms, increasing individuals' attention to breathing and physical sensations, and allowing awareness of internal and external stimuli. By progressively inhibiting muscle tension, the progressive muscle relaxation method suggests a method to minimize mental stress and associated processes. Salivary cortisol, heart rate, and the STAI anxiety scale were utilized to quantify stress and anxiety.
Results: Both strategies improved the individuals' condition as compared to the control group, although the mindfulness technique demonstrated the highest improvement in the observed parameters by decreasing the parameters.
Conclusions: The present study did not have statistically significant results; however, it was observed that both methods brought positive changes to the athletes. I believe that these results can be a starting point for future research in the field, as the mindfulness technique can be implemented on a large scale among taekwondo athletes.

Keywords: stress, anxiety, taekwondo, performance

Introduction

Stress and anxiety are problems that we face more and more these days, the lifestyle we lead constantly puts us in front of different types of trials, which we overcome or not, but which leave their mark on us. The daily demands associated with modern life cause arousal and can lead to psychological stress and the activation of the “fight-or-flight stress response” [1]. Persistent activation of this response can be associated with the emergence of psychological disorders, such as be anxiety and depression as stated by Iwata and his collaborators in a study carried out in 2013 [2].

Another study shows the positive effects of mindfulness intervention on depression and anxiety. However, there is still no parameter to be evaluated to determine how they are influenced and for what period. [3]

Anxiety represents an adaptive emotional reaction to the environment, which can turn into a pathological form when it becomes disproportionate to the stimulus, persists beyond normal limits, thus affecting academic, professional, social or interpersonal functioning. This is the most common and primitive emotional reaction that mammals have and is perceived as an alarm signal about a danger, often unknown, thus being different from fear, where the threat is well defined and concrete [4].

According to the National Institute of Mental Health, anxiety can be occasional, becoming part of the individual's daily life, but which can worsen because it does not disappear over time, its symptoms interfering with daily activities, or it can be generalized, involving a persistent feeling of anxiety and horror. The symptoms of generalized anxiety disorder are the feeling of restlessness, fatigue that sets in quickly, difficulty concentrating, irritability, unexplained headache, muscle, stomach pain, difficulty in controlling the feeling of worry, sleep disorders [5].

Cortisol is increasingly included in research to demonstrate the effectiveness of mindfulness intervention. However, the association between them has not yet been rigorously evaluated according to a meta-analysis [6].

Mindfulness has been presented to clinicians as a safe and effective technique to reduce stress and anxiety in various patient populations, being initially developed by Kabat-Zinn in the 1970s who defined this technique as the way to pay attention in a especially intentionally, in the present moment and without judgment. It appears to have neuroendocrine, immunological and neuroplastic effects, although it has not yet been fully investigated [7].

Mindfulness is a stress reduction program by self-regulating arousal to stressful circumstances or symptoms. It can increase individuals' attention to breathing and bodily sensations, allowing awareness of internal and external stimuli [8]. Researchers have found that mindfulness can reduce symptoms of depression, anxiety, stress, and fear of recurrence, along with physical symptoms of fatigue and pain, improving sleep at the same time [9],[8],[10],[11]. Mindfulness classically consists of three types of meditation, namely breathing awareness, body awareness and dynamic yoga movements (conscious movements) [12].

It was observed, through a meta-analysis of research in the field, that performing mindfulness exercises independently, without a complex, therapeutic framework, has beneficial effects, bringing relief to anxiety and depression. This fact is due to the attempt of specialists to include mindfulness in routine therapy, even without much guidance or personal experience. [13]

Aim

The premises from which I started with this research were that by using techniques aimed at the psychological preparation of athletes, the stress and anxiety of taekwondo practitioners can be alleviated, at the time of this research there were no existing articles analysing this topic.

The general objective of the paper is to highlight and interpret the changes or the lack thereof on the tested parameters (salivary cortisol level, heart rate and anxiety level) in the case of both techniques, being also the hypotheses of the research through which I wanted to bring an addition to the field of activity or at least a starting point for future research. It is known that performance sport is a stressful environment, both physically and mentally. The trainings are of

high intensity, regular, and the rest periods are reduced, because the aim of the athletes is to be the best in their field, and this is seen according to the results obtained during the competitions.

Materials and Methods

This study aimed to measure two parameters, namely stress and anxiety. Stress was quantified by salivary cortisol level and heart rate, and anxiety, using two questionnaires, one measuring trait anxiety and the other state anxiety (STAI Anxiety Questionnaire).

In this preliminary study we had 36 subjects, taekwondo practitioners, aged between 14 and 16 years, from two clubs in Iaşi affiliated to the Romanian Taekwondo Federation and they were divided into three groups, one control, one that I applied the mindfulness method and one that I used the Jacobson progressive muscle relaxation method.

The criteria for the selection of athletes were age and competitive level (they have at least one competition and one year of practice). The groups were formed according to the results they obtained in the STAI anxiety questionnaire as a trait so that the groups were homogeneous in terms of their tendency to be anxious.

Cortisol levels were analysed from the samples taken in the afternoon, between 16-20. At the beginning of the testing period, the subjects were trained on how to handle and collect saliva samples. The collection took place before training, the subjects were not allowed to consume liquids or food and to brush their teeth 30 min before the sampling. The container used for sampling is called the Salivette Cortisol, which contains a swab inside that the subjects had to hold in the oral cavity for 2 minutes and put back without touching it with their hands in order not to contaminate the sample.

Among the most important physiological effects that cortisol has are the increase in blood glucose (by stimulating gluconeogenesis) and the anti-inflammatory and immunosuppressive action. Free cortisol in blood (the biologically active form) is in balance with salivary cortisol, the latter not being affected by the amount of secreted saliva. Thus, an increase in cortisol in the blood will be observed within a few minutes through changes in the saliva. [14]

To determine the athletes' stress level, we measured along with salivary cortisol and heart rate, using a Lk87 digital pulse oximeter, which is a portable, comfortable and non-invasive device that can be positioned on the index, middle or ring finger according to the instructions of use of the device. It measures oxygen saturation, being a parameter for evaluating respiratory function, and heart rate, which represents the number of cardiac cycles in a unit of time, its normal values at rest, for research subjects, being between 60 and 100 beats per minute.

The STAI anxiety questionnaire comprises 40 questions, divided in such a way that the first 20 questions give us information on the current state of anxiety, and the last 20 on the subjects' tendency to be anxious.

The methods we proposed for this pilot study were mindfulness and the Jacobson progressive muscle relaxation method, applied to different groups of athletes, and in order to highlight the effects of these methods on the groups, we also used a control group.

The mindfulness technique was applied at the end of each training, over a period of 3 months, with 3 trainings per week. The psychologist with whom I collaborated in carrying out this research was the one who explained and trained the subjects in order to implement the technique, so that in the end the subjects manage to acquire it and obtain the necessary skills to apply it on their own and outside of training hours Technique of The mindfulness used in this research was

The Wheel of Awareness created by Dr. Daniel Siegel as a way to become aware of everything we can become aware of [15].

This tool is used by visualizing a wheel that has a central hub, an outer rim and four spokes. This is, in fact, a metaphor for the way the mind is structured, thus the hub representing the experience of awareness, and the quadrants everything we can become aware of (sensorial - hearing, sight, smell, taste, tactile; corporal - we can feel physically mentally -emotions, thoughts, memories and the relationship with the environment), aiming to cultivate a complete sense of connection and self-awareness towards the outside world. [7]

The progressive muscle relaxation method proposes a method by which mental stress and associated processes are reduced, through the progressive inhibition of muscle tension. This technique involves active muscle contraction in a segment, focusing attention on the feelings generated, thus trying to create a connection between physical and emotional relaxation; more precisely, through muscle relaxation the phenomena associated with psychological stress can be alleviated. One explanation for this phenomenon is that progressive muscle relaxation improves cognitive functions, as subjects learn a sense of greater control and new ways of thinking, although the exact physiological mechanism of this method is not yet fully understood [16],[4]. The most common use of the method is in anxiety disorders and anxious symptoms that accompany certain diseases. [4]

Results

The subjects were tested initially, before starting to apply the methods for each group and finally, three months after starting the techniques.

The results obtained by the athletes of the group on which we applied the mindfulness method showed a decrease in the values in the case of state anxiety, salivary cortisol, and heart rate, thus bringing an improvement in the states we were looking for. It was observed that there was an improvement of 2.66 points in anxiety, even though they as a group scored quite high in trait anxiety compared to the other two groups, in other words, this group was most prone to anxiety. The best improvement was in salivary cortisol, with the mean decreasing by nearly 7 nmol/L, the best improvement among the three groups.

There were also decreases in the values obtained at the level of this group, the one on which the Jacobson progressive muscle relaxation technique was applied, but they were not as significant, although they had the average of the values obtained at the level of the questionnaire anxiety as the lowest trait, thus being the group least prone to anxiety. We achieved an improvement of 2.083 points in the level of anxiety as a state, in the level of salivary cortisol only 1.202 nmol/L and the heart rate also 1.5 beats per minute as in the first group. These results can lead us to the thought of a possibility by which this method can bring relief to the stress and anxiety of athletes, but maybe applied for a longer period of time.

Although the results of the two groups were not statistically significant, compared to the control group, there was an improvement in the case of both applied methods.

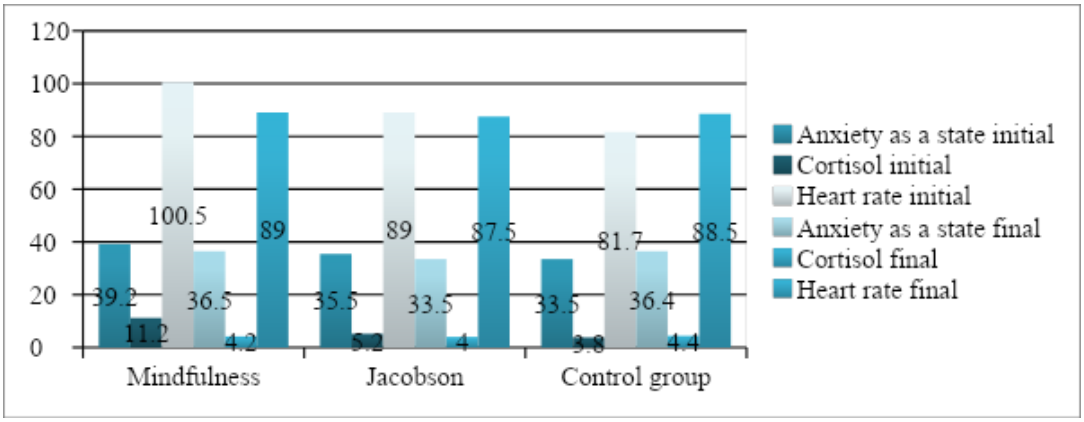

Fig.1. Graphic representation of the initial and final results for the three groups.

Discussion

It has been observed that the moments when cortisol is secreted as an acute response can be beneficial for the body, while its chronic increases can cause harmful effects [8]. Cortisol is one of the most frequently measured parameters as a measure of overtraining and stress, prolonged periods of increase or decrease in its level can affect sports performance [17].

Lengacher and his collaborators [8] concluded that the application of the mindfulness method causes an immediate reduction in salivary cortisol, thus reducing the stress of the individual, but they could not determine the period of time in which this improvement persists. They also observed that subjects who initially had an increased level of salivary cortisol showed a significant decrease compared to those with low levels, a fact that was also observed in our study. In contrast, O'Leary & colleagues [6] conducted a meta-analysis of randomized clinical trials that did not have statistically significant results of long-term stress reduction in response to the application of the mindfulness meditation method.

Conclusions

Although there are many studies in the field that have concluded that stress and anxiety can be reduced by applying mindfulness techniques, there are also studies that did not have statistically significant results.

The present study did not have statistically significant results; however, it was observed that both methods brought positive changes to the athletes, the more obvious improvements being in the case of the mindfulness method. This method attracted the attention of athletes through the application technique, being an easy method to put into practice, even without the presence of a specialist. Another positive feedback from the practitioners was the feeling they felt at the end of each session.

I believe that these results can be a starting point for future research in the field, as the mindfulness technique can be implemented on a large scale among taekwondo athletes, but also in the case of other sports that create high levels of anxiety and stress in athletes.

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Effective Strategies and Behaviours in Professional Football Coaching

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Abstract

Introduction: Professional coaches' perception of effective coaching may be different from evaluating the coaches' own competencies or effectiveness. "What" does a coach do to be considered effective? "Why" are these factors considered effective? "How" are these factors considered effective? These questions were the starting point for understanding what professional coaches do, how they behave and perceive the effectiveness of certain strategies.
Aim: The aim of this research is to create a questionnaire that allows to investigate the behaviours that coaches have with the environment in which they operate in order to identify the perceptions and strategies of effective coaching training in the context of professional sport.
Materials and Methods: We used an observation grid in real contexts by exploiting twenty years of experience in direct contact and interacting with the category under investigation, discussing their interpretations from their point of view. Using a qualitative "direct observation" approach, 16 coaches were observed in the places of interaction normally experienced by the staff of a football team.
Results: The results indicate that an effective coach possesses specific personal attributes as well as an overall philosophy or direction for the team. Extrapolating the behaviours and interactions they have with the environment in which they operate has allowed us to formulate a questionnaire to investigate them.
Conclusions: The effective coach uses their unique leadership, player management, communication and planning skills to create and maintain the right team environment to ensure that everyone involved in the team is "working in the same direction". Furthermore, the effective coach uses these skills to ensure a personal balance that allows him to amplify relationships with others. The interaction of all these features leads to the main goal of player development, improvement of player performance and winning matches.

Keywords: coach, effective coaching, professional football.

Introduction

Professional coaches' perception of effective coaching is different from evaluating the coaches' own competencies or effectiveness. "What" does a coach do to be considered effective? "Why" are these factors considered effective? "How" are these factors considered effective? These questions were the starting point for understanding what professional coaches do and how they behave, as well as why they perceive the effectiveness of certain strategies.

Specifically, this research project investigates the perception of effective coaching and coaching behaviours observed in the professional sports sector, with particular reference to a team sport - football. The study aims to provide a comprehensive description and interpretation of the participants' feelings, thoughts, emotions and beliefs regarding these experiences. Through qualitative research we attempt to capture the individual's point of view, examining the constraints of everyday life to ensure rich descriptions of the social world [1]. Subsequent research, of a quantitative nature, will emphasize the measurement and analysis of the causal relationships between the variables.

Traditionally qualitative research has engaged in emic, idiographic, case-based positions, which direct their attention to specific details of particular cases [1]. This style of research is used by evaluating words, statements and other non-numerical channels such as observation that generate data from the participant's point of view.

In our case we chose to observe specific behaviours in which participants create their own definitions of effectiveness. This type of research was chosen rather than research that focuses on predetermined definitions that require participants to rate their beliefs on a scale. As such, a qualitative paradigm guided the research framework, in order to address the research question and areas of interest outlined in previous research [2].

Aim

The aim of this research is to create a questionnaire that allows us to investigate the behaviours and interactions that coaches have with the environment in which they operate to interpret perceptions and analyse coaches' training strategies regarding effective coaching in the context of professional sport. The objective of the questionnaire will be to quantify what, how and why certain qualities represent effective coaching.

Since we know that interpretive research explores and discovers meanings and values while also identifying and explaining any emerging concepts [3], [4], we can consider it a suitable approach for research on perceptions of effective coaching. On the contrary, a positivist approach, which follows the methods of natural sciences through detached and presumably value-free observation, with the aim of identifying the universal characteristics of humanity and society [3], [4], we do not consider it suitable for our research project.

In support of this thesis, several authors [5], [6] argue that the aim of interpretivism is to understand experience from the point of view of those who live it. An interpretative approach is therefore the right strategy to grasp the most important concepts regarding effective coaching. A positivist approach may not capture such concepts [7]. Ultimately, the interpretivist approach shaped this research project by trying to interpret concepts of cultural, historical and social derivation which in turn are the result of individual interpretations and perceptions of effective coaching by the participants.

The key to determining perceptions of what makes a coach effective is understanding why and how professional coaches implement these strategies. In this sense Crotty [8] describes phenomenology as part of the theoretical perspective associated with interpretive research. In the context in which the aim is to investigate complex issues such as the perception of an effective coach, as well as the relationships that a coach has with the player and with the team environment, it was considered that combining phenomenological and theoretical approaches founded was the appropriate way to explore each individual's experiences. This is because they

help both generate theories about what effective coaches do and provide information about how and why they perform certain actions.

In particular, phenomenology examines how people give meaning to their experiences, providing greater potential and detailed insight into effective coaching. Research with players and coaches [5], [9] indicates that such an approach analyses a particular experience and the complexity of the structures associated with it from the perspective of participant or people involved. Consequently, a phenomenological inquiry directs us to analyse participants' personal experiences regarding their perception of the research topic. This phenomenological strategy allows coaches and players to express their opinions based on personal accounts.

Materials and Methods

We used an observation grid in real contexts by exploiting twenty years of experience in direct contact and interacting with the category under investigation, discussing their interpretations from their point of view. Using a qualitative "direct observation" approach, 16 coaches were observed in the places of interaction normally experienced by the staff of a football team.

The methodological framework outlined by Yin [10] is the basis of the multidimensional case study method of the present study. The paradigm most suitable for our research is the one that emphasizes the interpretative and subjective dimensions of the phenomena [11]. The case study method presents situations that are not always prevalent in numerical analysis because they investigate complex, dynamic, and evolving interactions of events, human relationships, and other factors unique to specific situations [11]. This methodology allows the researcher to discover contextual conditions and significant characteristics relevant to the phenomenon under investigation. This is because the research focuses on dynamic situations and people by examining the meaning of events rather than the frequency of the events themselves, as in quantitative research [10]. In a qualitative approach, specifically with direct observation, researchers strive to understand what it means to be in a particular situation, providing the lived experiences and modus operandi of the participants in a particular situation. Furthermore, such a study methodology generates a holistic understanding of the life events and relationships of a particular group, individual or sports team [10], [7].

A multidimensional approach is useful in our case to evaluate a coach's knowledge and his practical application of coaching skills. Studying the components of effective coaching in a practical scenario provides great clarity regarding the similarities and differences exhibited between different coaches on different teams. Yin [10] argues that case study research allows perceptions of important events and situations to speak for themselves. This is a characteristic that we consider important and this is the reason why this research, where we create a questionnaire, is focused on qualitative research using observation techniques.

The literature tells us that the purposive sampling technique is recommended for this type of research [12]. Purposive sampling, also known as criterion-referenced sampling, involves selecting participants because they serve a purpose for the researcher's goals and cover contextual conditions that are highly relevant to the area of study [11], [10], [12]. This approach is also known as criterion-based sampling. For this reason, it was important to select the most appropriate participants who could provide detailed insights into particular experiences within the coaching process and to have collaborated on my part as an athletic trainer with them for a

competitive season. With some participants, the collaboration was even longer, and that constitutes a big advantage.

The present research sampled participating coaches from ongoing professional competitions (e.g., national leagues) rather than one-off events (such as Olympic Games and World Championships) to gain insights into the topic of effective coaching in this context.

It is essential to include not only coaches but also players in the research process in order to gather a holistic account of effective coaching [13], [14]. In fact, Smoll and Smith already in 1989 argued that coaches have a limited awareness of the frequency with which they adopt certain behaviours and that players often provide more accurate descriptions of the coach's behaviours [15]. Consequently, the direct qualitative observation of the coach and the resulting questionnaire of this research is only the first step, which will be followed by quantifying, through the questionnaire itself, the practical reality of the coach and examining it from another key point of view - the player' s.

The sample of the present study includes male coaches who currently work with teams competing at the national championship level in different categories in different countries. The purpose of this research was to gain insight into the perceptions of professional coaches. I deliberately did not consider experience as a parameter for choosing the sample nor to consider the vast range of gaming or training experiences (for example 10 years or 10,000 hours) as a basis for validating the opinions of "expert" participants [16], [17] This is because some coaches who are considered elite (e.g., coaches who have played in high-performance contexts), or successful (e.g., have won championships) or effective at the national championship level may not have the “necessary” metrics to achieve high levels of competence as defined by previous research [14].

Discrete methods such as non-participant observation [7] allow the researcher to observe the phenomenon directly in real time, in the natural environment. Even more so, my role as an athletic trainer, being part of the technical staff of the coach being observed and consequently having personal knowledge of him, allows me to observe the phenomenon from a preferential view, identifying specific behaviours that could not be identified by other methods (e.g. survey research). Additionally, observations allow researchers to discover things that participants may not talk about freely in interview situations. Observation techniques also gather information about the observed context [18] and as a result I was able to collect data based on what professional coaches do, or how they potentially act, in a way that they believed to be effective. Observational data allows me to visualize both coach and player reactions to activities during training and how both parties communicated, providing useful additional evidence to the perceptions of coaches involved in the study.

Because I was interested in broad descriptions of actions taking place in environments where meetings, practices, and competitions took place, semi-structured observations were most suitable [19], [20], [21] Not wanting to wait for something to happen before deciphering its meaning, using unstructured observations, this type of semi-structured observation technique directed my field notes, while at the same time allowing me flexibility in the research process, a condition that is lacking in structured observations. In this context the semi-structured observations gave the opportunity to outline detailed descriptions of all events in the observed context rather than focusing on rigorous elements given by a structured programme.

The observations focused mainly on the first three of the following four settings:

1) Physical – Physical environment;
2) Human – Characteristics of individuals or groups;

3) Interactional – Interactions and pedagogic style and;
4) Program – Resources [11].

Naturally, the fourth point has not been completely overlooked, considering the organization of the program and the resources available to be of fundamental importance in high-level sport. A point which, however, I was previously aware of, being part of the technical staff, and called into question in its implementation during the planning phase.

Results

The results indicate that an effective coach possesses specific personal attributes as well as an overall philosophy or direction for the team. Extrapolating the behaviours and interactions they have with the environment in which they operate has allowed us to formulate a questionnaire to investigate them. Please follow the following link to view the complete questionnaire: https://forms.gle/KkUjmRmfdQFqExgW9.

Conclusions

The effective coach uses their unique leadership, player management, communication and planning skills to create and maintain the right team environment to ensure that everyone involved in the team is "working in the same direction". Furthermore, the effective coach uses these skills to ensure a personal balance that allows him to amplify relationships with others. The interaction of all these features leads to the main goal of player development, improvement of player performance and winning matches.

The qualitative research of "direct observation", while on the one hand it can be an optimal method for understanding the actions under study in the cultural and environmental context of the participants, is a method subject to researcher bias, having to interpret the actions and reactions of the participants. In fact, the researcher's results can be influenced by his beliefs, his values and his deductions.

However, having as much information as possible on what professional coaches do, understanding if there are differences with respect to the category they coach, identifying what makes them effective in what they do in their daily roles, we are convinced is the basis of knowledge. This knowledge makes interpersonal relationships within the staff directly effective with the belief that an aware environment can also indirectly improve sporting results.

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Assessing Athletic Performance of Youth Female Basketball Teams in Cluj County and the Pursuit of the 'Average' Player: A Comparative Analysis

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Abstract

Introduction: This research explores the physical performance of youth female basketball teams in Cluj County, Romania, aiming to identify the "average" player and discern potential differences between teams.
Hypothesis: We hypothesized that while physical attributes like height, arm span, and weight would exhibit minimal variation, significant differences would emerge in cardiovascular endurance, agility, and sprint speed among the teams.
Subjects: The study comprised 52 female participants aged 13 to 15, representing four distinct basketball teams in Cluj County: Universitatea Cluj, Smart Cluj-Napoca 1, Smart Cluj-Napoca 2, and LAPI Dej.
Methods: Data on height, arm span, weight, Beep Test, Shuttle Run, Speed Over 20 Meters, and T-Test scores were collected and analyzed. Statistical tools including ANOVA and Bonferroni post hoc tests were employed to compare and interpret the results.
Results: While physical attributes showed minimal variation, significant differences were observed in cardiovascular endurance, agility, and sprint speed among the teams. These findings underscore the importance of tailored training and development strategies. **Conclusion:** This research highlights the significance of customizing training regimens and player development plans to leverage team strengths and address specific areas of improvement. It contributes to the ongoing dialogue on optimizing youth female basketball performance in Cluj County.

Keywords: Youth Female Basketball, Physical Performance, Team Differences, Cardiovascular Endurance, Agility

Introduction

Youth female basketball represents a dynamic and evolving facet of sports participation, offering young athletes an opportunity to develop their skills, teamwork, and physical fitness [1,2]. In the heart of Romania, Cluj County serves as a thriving hub for youth basketball, providing a platform for emerging talents to hone their abilities and aspire to excellence. This article embarks on a journey to explore the athletic performance of youth female basketball teams within Cluj County, with a specific focus on understanding the characteristics of the "average" player.

Through a comprehensive analysis of performance parameters and a comparative examination of different teams within the region, we aim to unravel the nuances that shape the athletic landscape in this vibrant community [3,4]. Basketball is a sport that demands a unique blend of physical prowess, tactical intelligence, and teamwork [5]. While each player possesses distinctive strengths and weaknesses, there exists an idealized concept of the "average" player, a player who embodies the balanced qualities required to excel in this sport [6,7]. Investigating the performance metrics of Cluj County's youth female basketball players, we endeavor to define and quantify this notion of the "average" player, shedding light on the qualities that contribute to success on the court [8]. Moreover, this research extends its purview to explore the disparities and commonalities between various basketball teams operating within Cluj County. These differences may stem from coaching philosophies, training regimens, or even the demographics of the players themselves. By delving into these divergences, we aim to uncover potential factors influencing performance outcomes, providing valuable insights for coaches, players, and sports enthusiasts alike [10,11,12].

Hypothesis

The athletic performance of youth female basketball players in Cluj County varies across different teams, and by analyzing key performance parameters, it is possible to identify common characteristics associated with the 'average' player. These characteristics may serve as valuable insights for optimizing training programs and player development strategies in the pursuit of enhanced team performance and individual excellence in the sport.

Subjects

The study encompassed a diverse group of female participants, all of whom fell within the age range of 13 to 15 years old. These young athletes were members of four different basketball teams, each team representing a unique facet of Cluj County's youth basketball community. Here's a breakdown of the participants based on the respective teams: Universitatea Cluj (15 players): This team consisted of 15 female players, each with their distinct set of skills and attributes, contributing to the rich tapestry of talent within Cluj County's basketball scene. Smart Cluj-Napoca 1 (11 players): Eleven dedicated young female athletes comprised Smart Cluj-Napoca 1, reflecting a focused and determined group of players within the county. Smart Cluj-Napoca 2 (14 players): Smart Cluj-Napoca 2 fielded a team of 14 female players, demonstrating the depth of talent and enthusiasm for basketball in the region. LAPI Dej (12 players): LAPI Dej's team included 12 committed young athletes, adding another dimension to the study's exploration of the county's youth basketball landscape This study aimed to illuminate the characteristics that contribute to success in the sport, ultimately benefiting not only the players themselves but also coaches, trainers, and the broader basketball community. All participants and their legal guardians, in the case of minors, were provided with a comprehensive written informed consent form, which detailed the objectives, methods, potential risks, benefits, and the voluntary nature of their participation in the study. The informed consent form included contact information for the research team, and participants and their guardians were encouraged to ask questions and seek clarification regarding any aspect of the research before providing their consent. Measurements and tests, Height *and Weight Measurement***:** *Arm Span Measurement***:**

*Speed Over 20 Meters***:** *T-Test (Basketball Specific Test): Shuttle Run (Basketball Specific Over the Whole Court): Beep Test (Multi-Stage Fitness Test).*

Methodology

Participants were recruited from the four selected youth female basketball teams in Cluj County, and informed consent was obtained from both participants and their legal guardians. Height, weight, and arm span measurements were collected using standardized procedures. Speed over 20 meters, T-test, Shuttle Run, and Beep Test were administered in controlled settings, with participants adhering to standardized protocols. Data collected from the assessments were analyzed using statistical methods to calculate mean values, standard deviations, and other relevant statistical measures. This allowed for the comparison of performance parameters both within and between teams. A comparative analysis was conducted to identify any significant differences in the measured parameters between the different teams. This provided insights into how various factors might influence athletic performance.

Results

Table 1. Descriptive statistics for all parameters (average values)

	N	Mean	Std. Deviation
Height	52	164,83	2,13
ArmSpan	52	163,38	7,66
Weight	52	56,21	10,81
BeepTest	52	8,00	1,55
ShuttleRun	52	25,80	1,71
Speed20m	52	3,37	0,26
T_Test	52	6,94	0,82
Valid N (listwise)	52		

Based on the collected data, we can construct a profile of the "average" youth female basketball player in Cluj County (Table 1). Here is an interpretation of the data: **Height (Mean: 164.83 cm):** The average player in Cluj County is approximately 164.83 centimeters tall, which is fairly consistent with the expected height range for players in this age group. **Arm Span (Mean: 163.38 cm):** The arm span of the average player is approximately 163.38 centimeters, indicating that they have a reach slightly less than their actual height, which is typical for basketball players **Weight (Mean: 56.21 kg):** The average player weighs around 56.21 kilograms. This weight provides a healthy balance for the height and arm span, suggesting that these players have a good balance of strength and agility. **Beep Test (Mean: 8.00):** The average performance on the Beep Test, a measure of cardiovascular endurance, is 8.00. This suggests that the average player has a moderate to good level of aerobic fitness, a crucial component for maintaining high-intensity performance during basketball games. **Shuttle Run (Mean: 25.80 seconds):** The average time for completing the Shuttle Run, a test of agility and endurance, is approximately 25.80 seconds. This indicates that the average player can navigate the court in a reasonably quick time, an essential skill in basketball.

Speed Over 20 Meters (Mean: 3.37 m/s): The average speed of 3.37 meters per second over 20 meters indicates that the players have a good burst of speed, which is valuable for fast breaks and defensive plays. **T-Test (Mean: 6.94 seconds):** With an average time of 6.94 seconds on the T-Test, a measure of agility and quick direction changes, the average player demonstrates solid agility and the ability to pivot and change direction efficiently on the basketball court. The "average" youth female basketball player in Cluj County is characterized by a balanced physique, moderate cardiovascular endurance, good agility, and a solid combination of height and arm span. This profile provides valuable insights into the physical attributes and performance levels of players in the region, which can be used for player development and team training strategies.

Table 2. Results for the ANOVA test

	Sum of Squares	df	Mean Square	F	Sig.
Height	15,62	3	5,21	1,156	,336
ArmSpan	407,01	3	135,67	2,519	,069
Weight	465,09	3	155,03	1,355	,268
BeepTest	61,50	3	20,50	16,007	,000
ShuttleRun	87,39	3	29,13	22,684	,000
Speed20m	1,77	3	0,59	15,899	,000
T_Test	26,88	3	8,96	57,520	,000

The ANOVA results provide valuable insights into the differences in various performance parameters among the different basketball teams in Cluj County (Table 2). Height: ANOVA ($F = 1.156$, $p = 0.336$) showed no significant height differences among teams, suggesting variations are due to chance. Arm Span: ANOVA ($F = 2.519$, $p = 0.069$) indicated a potential trend in arm span differences, not statistically significant, further investigation needed. Weight: ANOVA ($F = 1.355$, $p = 0.268$) revealed no significant weight differences among teams, likely due to chance. Beep Test: ANOVA ($F = 16.007$, $p < 0.001$) highlighted significant cardiovascular endurance differences among teams, requiring post-hoc tests for specifics. Shuttle Run: ANOVA ($F = 22.684$, $p < 0.001$) showed substantial agility and endurance differences among teams, further analysis needed. Speed Over 20 Meters: ANOVA ($F = 15.899$, $p < 0.001$) found significant sprint speed variations among teams, post-hoc tests can identify contributing teams. T-Test: ANOVA ($F = 57.520$, $p < 0.001$) revealed highly significant agility and quick direction changes among teams, further analysis can pinpoint standout teams. The ANOVA results show that there are statistically significant differences in Beep Test, Shuttle Run, Speed Over 20 Meters, and T-Test scores among the different basketball teams in Cluj County. These findings highlight areas where specific teams excel or face challenges in terms of physical performance, potentially informing training and development strategies for each team. While differences in height, arm span, and weight did not reach statistical significance, they still contribute to the overall profile of each team's players.

Table 3. Results for the Bonferroni post hoc test

Dependent Variable	(I) Group	(J) Group	Mean Difference (I-J)	Std. Error	Sig.
BeepTest	1	2	-2,50000*	0,438	,000
		3	-0,845	0,449	,395
		4	-2,40714*	0,421	,000
	2	3	1,65455*	0,472	,006
		4	0,093	0,445	1,000
	3	4	-1,56169*	0,456	,008
ShuttleRun	1	2	1,69667*	0,439	,002
		3	-1,201	0,450	,062
		4	2,12357*	0,421	,000
	2	3	-2,89758*	0,473	,000
		4	0,427	0,446	1,000
	3	4	3,32448*	0,457	,000
Speed20m	1	2	,29433*	0,075	,002
		3	0,086	0,076	1,000
		4	,45648*	0,072	,000
	2	3	-0,209	0,080	,075
		4	0,162	0,076	,224
	3	4	,37078*	0,078	,000
T_Test	1	2	1,24300*	0,153	,000
		3	1,09376*	0,157	,000
		4	1,89110*	0,147	,000
	2	3	-0,149	0,165	1,000
		4	,64810*	0,155	,001
	3	4	,79734*	0,159	,000

Discussion

The present study sought to assess and compare the physical performance of youth female basketball teams in Cluj County, shedding light on the characteristics of the "average" player and identifying potential differences between teams. The comprehensive analysis of height, arm span, weight, Beep Test, Shuttle Run, Speed Over 20 Meters, and T-Test scores has yielded intriguing insights into the state of youth female basketball in the region.

Physical Attributes

Our analysis of height, arm span, and weight revealed no statistically significant differences among the teams. This suggests that the physical characteristics of players, in terms of these parameters, are relatively consistent across the county. It is important to note that these factors, although not significantly varying, still contribute to the unique makeup of each team's players. A balanced and diverse player composition in these attributes may be a desirable trait for achieving success on the court.

Cardiovascular Endurance and Agility

In contrast, the Beep Test, Shuttle Run, and T-Test results revealed noteworthy differences among the teams. These findings indicate that cardiovascular endurance and agility are areas where distinct team dynamics come into play. The Beep Test, a measure of cardiovascular fitness, showcased significant differences among the teams. This highlights the importance of tailored conditioning programs to enhance endurance and endurance-based performance.

Similarly, the Shuttle Run results unveiled significant disparities in agility and endurance among the teams. Agility and quick direction changes are fundamental skills in basketball, and teams with superior shuttle run performance may possess a competitive edge in game situations. The T-Test results further emphasized the significance of agility and quick direction changes, with substantial differences noted among teams.

Sprint Speed

The Speed Over 20 Meters results were also notable, revealing significant variations in sprint speed among the teams. Speed is an asset in both offensive and defensive aspects of basketball, and these findings suggest that certain teams have players with superior burst and acceleration. Developing strategies that harness this speed advantage could prove beneficial for these teams in competitive play.

Implications for Player Development

These findings have several practical implications for player development and team training strategies. Firstly, teams should consider tailored conditioning programs to address specific areas of improvement, such as cardiovascular endurance, agility, or sprint speed, based on their performance profile. Secondly, coaches and trainers can use these insights to customize player development plans. For instance, players with strong cardiovascular endurance may benefit from conditioning regimens focused on maintaining peak fitness levels throughout the game. Meanwhile, players with exceptional agility could undergo specialized agility training to further enhance their quick directional changes and court navigation skills. Thirdly, team selection and recruitment strategies can be refined based on the desired team composition. Understanding the unique strengths and weaknesses of players in these physical parameters can guide teams in building well-rounded rosters.

Limitations and Future Directions

It is essential to acknowledge the limitations of this study, including the relatively small sample size and the focus on physical attributes and performance parameters. Future research could explore additional factors, such as skill proficiency, tactical knowledge, and teamwork, to provide a more comprehensive understanding of team dynamics.

Conclusion

This research offers valuable insights into the physical performance of youth female basketball teams in Cluj County. The findings underscore the significance of tailored training programs and player development strategies to address specific performance areas. By leveraging these insights, teams can enhance their competitive edge and nurture the next generation of basketball talent in the region.

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From Traditional Casts to Innovation: Comparing Plaster Cast Methodologies in 3 Leading Romanian Hospitals (Class I) and a Novel Approach

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Abstract

In public healthcare, the effective immobilization of the hand is a critical concern. Traditional methods for hand immobilization, although widely practiced, may have limitations in terms of customization and cost-effectiveness. In contrast, 3D printing technology has emerged as a promising avenue for producing tailored orthoses. This article delves into a comparative analysis of these methodologies, evaluating their effectiveness, cost-efficiency and potential implications for the field of public health. Through a cross-sectional study, we aimed to evaluate and compare the hand immobilization methods used in three reference hospitals in Romania with a proposed methodology. We compared the medical units using a set of ten criteria, to analyze in perspective, the data discovered regarding the immobilization methods. Thus, we studied the Emergency Department (ED) of three hospitals classified I by the Classification of hospitals according to competence, posted by the Ministry of Health, respectively in a private practice clinic. Following this research, we identified similar characteristics for: production time, choice of materials, materials costs, weight of the final device, compartmentation of the setting, set of equipment for the three Hospitals while the 3D printed orthoses registered other characteristics. All four units included in this study have a tendency regarding the immobilization technique and depend upon access to electricity and internet. We consider that for the long time needed to develop a 3D printed splint, this method is not yet feasible for an ED environment, given the fact that plaster cast needs lesser time, which is essential for emergencies management. On the other hand, for the advantages that it provides, such as low costs, being lightweight, etc., we consider that 3D printed hand orthoses are a valid alternative for plaster cast in later stages of treatment.

Keywords: plaster cast, 3D printed, hand, orthoses, hospital care

Introduction

Almost 90% of the total number of fractures of the hand are not treated surgically, but are addressed by techniques of reduction, immobilization by splinting and mobilization in the shortest possible time [7]. Hand injuries account for 20% of all hospital Emergency Department (ED) admissions in the UK, costing the healthcare system an estimated £100 million annually. Moreover, the functional impairments that can occur in the hand following a trauma or an injury can cause the patient to be absent from work for a long time, resulting in reduced productivity that appears to affect the UK economy by another £600 million [1], [3]. The initial assessment and management of such a case in the ED of a hospital is usually carried out by so-called "junior" staff, e.g., resident doctors, assistants, etc., many of whom do not have sufficient training, they have limited to no experience in the field of hand fractures or immobilization techniques [8]. In a retrospective study conducted to determine the total number of hand splints prescribed in the Department of Physical Medicine and Rehabilitation of the General Hospital of Vienna from 1992-1998, a number of 1972 patients treated with this method were discovered [6].

Aim

The aim of this study is to evaluate and compare the hand immobilization methods used in three reference hospitals in Romania with a proposed methodology. The main objectives of this study include: to compare the casting immobilization techniques used in the four medical units focusing on the procedures, materials and technologies used etc.; to evaluate the efficiency of casting in the stabilization of the hand in order to identify development opportunities.

Materials and methods

The present work is a cross-sectional, observational study that aimed to collect data regarding the plaster application technique, choice of materials, the time required for the immobilization application, particularities regarding to the staff, the infrastructure and the logistics of the compartment where the immobilization is carried out, as well as any other data discovered on the spot that could be of interest for the analysis, in order to compare the data obtained from within the Emergency Department (ED) of the three hospitals classified I by the Classification of hospitals according to competence, posted by the Ministry of Health, with the data from our own methodology [9]. The on-site observational study in the hospital premises took place in 2023 and was carried out at the Emergency Department (ED) of the three hospitals, in the plastering room, where the on-call physicians from the Orthopedics department and the assistants worked.

Results

Following the observational study, a number of ten comparison criteria were formulated, in order to analyze in perspective, the data discovered on site. Through Criterion 1, we observed a general tendency to use the technique of rigid antebrahio-palmar splint type immobilization on the anterior side (volar), for all four medical units, as seen in Tabel 1. Section A.

Tabel 1. Criteria 1-4

	SECTION A	**SECTION B**	**SECTION C**	**SECTION D**
MEDICAL UNIT	Criterion 1: Immobilization technique	Criterion 2: Time required	Criterion 3: Materials used	Criterion 4: Total cost of materials
		5-10		
Hospital 1	•antebrahio-palmar splint type on the anterior side (volar); •brahio-antebrahio-palmar splint type.	5-11 minutes	• plaster bandages 10cm x 3m/ 15cm x 3m; • 5-10 gauze bandages 10cm x 10m; • ½ medical tape; • Cotton wool.	7.89-12.93 €
Hospital 2	•antebrahio-palmar splint type on the anterior side (volar)/ posterior; •brahio-antebrahio-palmar splint type; • circular splint type.	5-10 minutes	• plaster bandages 5cm x 2.7 m/ 10cm x 2.7m/ 15cm x 2.7m/ 20cm x 2.7m/ 30cm x 2.7m; • 5-10 gauze bandages 10cm x 10m; • ½ medical tape; • Cotton wool.	12.36-14.88 €
Hospital 3	•antebrahio-palmar splint type on the anterior side (volar); •brahio-antebrahio-palmar splint type.	5-10 minutes	• plaster bandages 5cm x 3m/ 10cm x 3m/ 15cm x 3m/ 20cm x 3m; • 5-10 gauze bandages 10cm x 10m; ½ medical tape; • Cotton wool.	14.56-20.34 €
Clinic	•antebrahio-palmar splint type on the anterior side (volar)	• 3 min/ scanning; • 30 min/ design; • 4 h printing. • 10 min/ post-production adjustments	• Filament PETG 1kg; • 3 x velcro straps.	5.14-6.13 €

Through Criterion 2, we observed a similar required time interval between the 3 Hospitals, fact that suggests a certain degree of standardization of this procedure, while in the case of 3D printed orthoses applied in the clinic, a longer total time was required, as seen in Table 1. Section B. Considering Criterion 3, insignificant differences were observed between the 3 Hospitals, while the 3D printed orthoses required a distinct set of materials, as seen in Table 1. Section C. Through Criterion 4, regarding the manufacturing costs, we observed for Hospital 1 a mean cost of 10.41€, for Hospital 2 a mean cost of 13.63€, for Hospital 3 a mean cost of 17.46€, while the method used in the clinic recorded the lowest costs, the mean being 5.64€, as seen in Table 1. Section D. Considering Criterion 5, we noticed that the weight of the final device obtained in the 3 Hospitals falls within the same range, namely 500-1000g, while 3D printed orthoses stand out for a much lower weight, falling in the range of 104-237g, as seen in Table 2. Section A.

Tabel 2. Criteria 5-6

	SECTION A	**SECTION B**
Medical Unit	Criterion 5: Device weight	Criterion 6: Staff
Hospital 1	500- 1000g	• 2 medical assistants in the plastering room • intern/ resident / attending physician as the case may be
Hospital 2	500- 1000g	• 2 medical assistants in the plastering room • intern/ resident / attending physician as the case may be
Hospital 3	500- 1000g	intern/ resident / attending physician as the case may be
Clinic	104-237g	• Physical therapist (scanning/equip) • 3D Designer

By Criterion 6, we identified that the staff in the hospitals were similar, while the clinic staff had other specializations than those found in the hospitals, as seen in Table 2. Section B. Criterion 7 illustrates similar characters regarding the compartmentalization, the destination of the space and the facilities, while the clinic utilized several distinct spaces, as seen in Table 3. Section A.

Tabel 3. Criteria 7-10

	SECTION A	SECTION B	SECTION C	SECTION D
Medical unit	Criterion 7: Workspace	Criterion 8: Tehnico-medical devices	Criterion 9: Acces to utilities and consumables	Criterion 10: Work volume /day
Hospital 1	•Separate plastering room, attached to ED; • Facilities: 1x medical bed, 2x chairs, 10x temporary immobilization devices	• PC and Negatoscope • Plaster cast forceps • Scissors • Electric saw • Sink	• Running water •Electrical current • Internet acces	10-40 devices
Hospital 2	•Separate plastering room, attached to ED; • Facilities: 2x medical bed, 1x chairs, 3x temporary immobilization devices	• PC and Negatoscope • Plaster cast forceps • Scissors • Electric saw • Sink	• Running water •Electrical current • Internet acces	10- 60 devices
Hospital 3	• ED room; • Facilities: 2x medical bed, 1x chairs, 0x temporary immobilization devices	• PC and Negatoscope • Plaster cast forceps • Scissors • Electric saw • Plastic basin	• Running water •Electrical current • Internet acces	1-30 devices
Clinic	•Scanning- clinic room (1x medical bed, 1x chairs) • Design- 3D Workshop • Print- 3D Workshop	• 3D Scanner and Tablet • PC • 3D printer	•Electrical current • Internet acces	• Scann: 50- 100 • Design: 10-16 • Print: 2-4

Criterion 8 illustrates that the hospital units are equipped with a similar set of equipment, while the 3D printed orthoses stand out for having a distinct set of equipment and devices, as seen in Table 3. Section B. Through Criterion 9, we observed that all 4 units included in this study require access to electricity and internet, while Hospitals also require access to running water, as seen in Table 3. Section C. Criterion 10 illustrates the workload reported per day, with a mean of 25 devices for Hospital 1, a mean of 35 for Hospital 2, a mean of 15.5 for Hospital 3, and in the case of the clinic a mean of 3, as seen in Table 3. Section D.

Discussions

In 2021, Dessai has conducted a cross-sectional study to assess various aspects related to the customized hand splints administered to the patients in the Occupational Therapy Department of Kasturba Manipal Hospital. The conclusion of this study indicates the need for therapists to pay more attention to device characteristics, such as adjustments, ease of use and comfort, arguing from the interpretation of the data collected through the questionnaires [2]. Furthermore, in 2023, Irani and Ozelie carried out a study in which they selected a batch of subjects from an academic medical center, batch for which both a 3D printed orthosis and a commercial orthosis were prescribed. The conclusion of this article presents the 3D printed orthosis as a better alternative in terms of financial aspect, compared to other commercial alternatives [4]. In 2018, Joseph et al. published a study assessing participant satisfaction with a set of custom hand orthoses from a hand and upper limb specialized rehabilitation clinic in Florida. The conclusion of this article suggests that therapists who make orthotic devices for patients should refer to the comfort, efficiency and ease of use an orthosis as benchmarks for patient satisfaction [5].

Conclusions

Through a cross-sectional study, data for ten comparison criteria was collected in order to analyze in perspective three hospitals from Romania classified I by the Classification of hospitals according to competence, posted by the Ministry of Health, as well as those collected from the clinic. Following this research, we identified similar characteristics for: production time, workload per day, choice of materials, materials costs, weight of the final device, compartmentation of the setting, set of equipment and devices of a technical and/or medical nature, staff that worked on set for the three Hospitals while the 3D printed orthoses registered other characteristics. All four units included in this study have a tendency regarding the immobilization technique and depend upon access to electricity and internet. This study helped us to put in perspective our approach in immobilizing the hand using 3D technology with the methodologies used in practice in an ED environment. We consider that for the long time needed to develop a 3D printed splint, this method is not yet feasible for an ED environment, given the fact that plaster cast needs lesser time, which is essential for emergencies management. On the other hand, for the advantages that it provides, such as low costs, being lightweight etc., we consider that 3D printed hand orthoses are a valid alternative for plaster cast in later stages of hand treatment.

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Functional Mobility, Quality of Life, and Fall Risk in Parkinson's Patients: A Longitudinal Study of the LSVT Big Program through Continuous Monitoring

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Abstract

Introduction: Parkinson's disease poses unique challenges for individuals, including mobility issues and a decreased quality of life. This study investigates the long-term impact of the LSVT Big Program and ongoing support on functional mobility and quality of life in Parkinson's patients, particularly during the COVID-19 pandemic.
Aim: The primary objective was to investigate how ongoing monitoring and support, particularly during the COVID-19 pandemic, influenced functional mobility, fall risk, and quality of life in these patients.
Materials and Methods: The study design incorporated the PDQ-39 questionnaire to measure the quality-of-life perception across various subdomains. Fall risk assessment was performed using the G-Walk inertial sensor, providing objective data on functional mobility and fall risk. Regular phone monitoring was introduced during the pandemic to provide continuous support.
Results: significant improvements in functional mobility and fall risk, with a statistically significant decrease in the total iTUG time ($W = 26.00$, $p = .047$, $r = 0.85$), between the initial ($Mdn = 13.52$, $SD = 5.89$) and final evaluation ($Mdn = 10.64$, $SD = 1.55$), after the 12-month telephone monitoring period. Moreover, participants reported significant enhancements in quality of life across various PDQ-39 subdomains: initial “Mobility"($M = 41.07$, $SD = 18.92$) compared with final assessment ($M = 20.35$, $SD = 6.68$), ($t(6) = 3.65$, $p = .011$, $d = 1.38$), "Activities of Daily Living" at the final evaluation ($M = 26.78$, $SD = 16.81$) in contrast to the initial assessment ($M = 41.07$, $SD = 25.95$), ($t(6) = 3.71$, $p = .010$, $d = 1.40$).
Conclusions: These findings suggest that the LSVT Big program, together with long-term monitoring, may represent an effective approach to improving functional mobility and decreasing the risk of falls in Parkinson's patients. The study highlights the potential benefits of monitoring for maintaining and enhancing program improvements, even in the face of challenges such as the COVID-19 pandemic, emphasizing the importance of personalizing treatment for optimal results.

Keywords: Parkinson's Disease, fall risk, inertial sensor, monitoring.

Introduction

Parkinson's disease (PD) is a progressive neurodegenerative disorder characterized by motor symptoms such as bradykinesia, rigidity, resting tremors, and postural instability, along with a range of non-motor symptoms that can significantly impact an individual's quality of life ([1], [2],[3]).

As PD progresses, individuals often experience difficulties with mobility and activities of daily living, which can lead to an increased risk of falls and a decreased overall quality of life (QoL) ([4], [5]). Given the complex and multifaceted nature of PD, effective interventions are essential to manage its symptoms and enhance the well-being of affected individuals ([6], [7], [8]).

One such intervention that has gained prominence in recent years is the Lee Silverman Voice Treatment Big (LSVT Big) program [9]. Originally developed as a speech therapy program (LSVT Loud), LSVT Big has been adapted to address motor deficits in individuals with PD ([10], [11]). The program focuses on amplitude-based training, emphasizing exaggerated movements to combat the hypokinetic motor symptoms that characterize PD. LSVT Big has shown promise in improving motor function and mobility in PD patients ([9], [12], [13]). However, there is a growing need to assess its long-term impact, particularly in the context of ongoing support and the unique challenges posed by the COVID-19 pandemic.

The LSVT Big program, based on the principles of neuroplasticity, aims to retrain the motor system in individuals with PD [9]. It employs intensive and high-effort exercises designed to counteract the progressive loss of motor function and enhance mobility. The program has demonstrated short-term benefits, including increased step length, improved gait velocity, and enhanced balance control ([9], [13], [14]). However, questions regarding the sustainability of these improvements over the long term, particularly in real-world settings, remain largely unanswered.

Falls represent a critical concern in the management of PD [15]. Postural instability, gait disturbances, and freezing of gait contribute to an increased risk of falls in PD patients ([16], [17], [18]). Falls not only lead to physical injuries but also have psychological consequences, eroding an individual's confidence and further compromising their mobility ([19], [20]). Given the potential for serious repercussions, fall risk assessment and interventions to mitigate this risk are of paramount importance in PD care ([21], [22]).

The provision of ongoing support and monitoring has emerged as a critical component of PD care, especially in the context of the COVID-19 pandemic [23]. The pandemic, marked by social distancing measures and restricted access to healthcare facilities, presented unique challenges for individuals with chronic conditions like PD ([24], [25]). Isolation, reduced physical activity, and disrupted healthcare routines exacerbated the physical and psychological burden on PD patients ([26], [27]). Consequently, the role of telehealth and remote monitoring in maintaining the continuity of care and ensuring the well-being of PD patients has become increasingly significant ([28], [29], [30]).

In this context, our study seeks to investigate the long-term impact of the LSVT Big Program, combined with ongoing monitoring and support, on functional mobility, fall risk, and QoL in individuals with PD. We particularly focus on the challenges posed by the COVID-19 pandemic and the potential of personalized, remote interventions to address the unique needs of PD patients. This research aims to contribute to the growing body of literature on effective interventions for PD management and the role of telehealth in optimizing outcomes for individuals with neurodegenerative disorders.

Materials and Methods

Study Participants

In this prospective longitudinal study, we enrolled seven persons with Parkinson's disease, of which five were women. Their average age was 68.14 ± 5.08 years. The participants' demographic information can be found in Table 1. The inclusion criteria encompassed individuals with confirmed Parkinson's disease, approval for engaging in physical activity, Hoehn & Yahr scale (H&Y) scores of ≤3, the ability to walk independently, willingness to participate with informed consent, and maintaining stable cardiovascular health. Exclusion criteria involved individuals aged over 80 years, significant cognitive impairments, severe communication difficulties, or those who declined to take part in the study

Table 1. General and clinical characteristics of the group

N	Gender	Age	Marital status	Disease stage	Time since diagnose	Weight (Kg)	Height (Cm)	BMI
1	F	72	Unmarried	2	10	49	163	18,44
2	F	65	Married	3	10	78	169	27,31
3	F	70	Married	2	16	63	158	25,24
4	M	63	Married	1	12	103	176	33,25
5	M	76	Married	3	6	58	158	23,23
6	F	69	Married	3	10	92	155	38,29
7	F	62	Married	3	11	78	160	30,47

Measures

Functional mobility and fall risk were objectively assessed using the G-Walk inertial sensor (BTS Bioengineering, Italy). Participants were instructed to complete the Timed Up and Go (TUG) test, and data from the inertial sensor were collected to measure parameters such as total time duration of the test, sit to stand, forward walk, turning, return gait, stand to sit. The iTUG test was conducted at the beginning and end of the 12-month monitoring period.

Quality of Life Assessment: The Parkinson's Disease Questionnaire-39 (PDQ-39) was administered to evaluate the participant's quality of life perception across various subdomains, including mobility, activities of daily living, emotional well-being, and social support [31]. The PDQ-39 was completed at the outset of the study and after the 12-month telephone monitoring period.

Data Analysis

Data were analyzed using IBM SPSS Statistics, version 23.0. Descriptive statistics, including means and standard deviations, were calculated for continuous variables such as the total time duration of the iTUG, subphases of the test, and PDQ-39 subdomain scores. Wilcoxon, and paired t-tests were used to compare pre-intervention and post-12-month intervention values for functional mobility and quality of life outcomes. The significance level was set at $p < .05$. Effect sizes (Cohen's d) were also computed to assess the magnitude of observed changes.

Results

The objective of this study was to assess the long-time effects of the LSVT Big program on functional mobility, risk of falls, and the overall quality of life in individuals diagnosed with Parkinson's disease (PD). Seven PD patients participated in the LSVT Big program and underwent 12 months of remote telephone monitoring to track their progress.

Table 2. Comparison of Initial and Final iTUG Test assessment in the Study Group

Parameters	N	Median	Std. Dev.	Min.	Max.	*p*
iTUG_I (s)	7	13.520	5.898	7.900	25.060	**.047**
iTUG_F (s)	7	10.640	1.551	9.250	13.410	
SI_2_ST_I_(s)	7	1.100	2.443	0.500	7.370	.293
SI_2_ST_F_(s)	7	0.900	0.153	0.700	1.100	
FWRD_I_(s)	7	3.520	5.306	0.340	16.810	.219
FWRD_F_(S)	7	2.400	0.817	1.410	4.010	
Mid_turn_I_ (s)	7	2.410	0.597	1.900	3.350	.469
Mid_turn_F_(s)	7	2.300	1.018	1.470	4.400	
Return_gait_I_(s)	7	2.900	0.545	1.900	3.300	.059
Return_gait_ F_(s)	7	2.130	0.857	0.540	2.900	
End_turn_I_ (s)	7	1.900	0.684	1.500	3.480	1000
End_turn_ F_(s)	7	1.900	0.545	1.100	2.700	
ST_2_SI_I_(s)	7	1.200	1.870	0.800	6.060	1000
ST_2_SI_F_(s)	7	1.600	0.313	0.900	1.700	

TUG – Timed Up and Go; SI_2_ST – Sit to Stand; FWRD – Forward gait, ST_2_SI - Stand to Sit; s – seconds.

The results of the Wilcoxon test demonstrated a significant decrease in the total iTUG time between the initial values (Mdn = 13.52, SD = 5.89) and the final values (Mdn = 10.64, SD = 1.55), (W = 26.00, p = .047, r = 0.85). For the remaining variables (Table 2), despite the decrease in the total iTUG time, there were no statistically significant differences in the times for various stages, such such as "SI_2_ST" (sit-to-stand transition) (Mdn = 0.90, SD = 0.15) compared to the initial time (Mdn = 1.10, SD = 2.44), forward walking "FWRD" (Mdn = 2.40, SD = 0.81) compared to the initial time (Mdn = 3.52, SD = 5.30), the "Mid_turn" (Mdn = 2.30, SD = 1.01), and the time for turning "Return_gait" (Mdn = 2.13, SD = 0.85), compared to the initial time (Mdn = 2.90, SD = 0.54), the Wilcoxon test did not register statistically significant differences between the two initial/final assessment, with p-values exceeding .05.

Table 3. Comparison of Initial and Final PDQ-39 scores in the Study Group

PDQ 39 domains	N	Mean	Std. Dev.	Min.	Max.	*p*
Mobility_I	7	41.071	18.922	15.000	67.500	**.011**
Mobility_F	7	20.357	6.682	10.000	27.500	
ADL_I	7	41.070	25.957	8.330	70.830	**.010**
ADL_F	7	26.786	16.815	8.330	50.000	
Emotional_I	7	28.571	20.474	8.330	66.670	.150
Emotional_F	7	23.214	22.028	4.170	62.500	
Stigma_I	7	25.000	20.729	0.000	50.000	**.022**
Stigma_F	7	12.500	11.968	0.000	25.000	
Social_I	7	28.571	21.973	0.000	58.330	**.016**
Social_F	7	16.666	15.956	0.000	33.330	
Cogni_I	7	41.071	16.870	25.000	75.000	**.035**
Cogni_F	7	23.214	7.835	12.500	37.500	
Communic_I	7	20.239	17.909	0.000	50.000	.156
Communic_F	7	11.904	14.321	0.000	41.670	
Body disconf_I	7	50.001	22.568	25.000	91.670	.062
Body disconf_F	7	33.331	12.728	16.670	58.330	
PDQ39 SI_I	7	34.450	15.465	16.250	56.980	**.009**
PDQ39 SI_F	7	18.714	6.031	10.940	28.380	

ADL- Daily living activities, I – Initial assessment, F- final assessment, PDQ 39 SI – Parkinson's Disease total Score Index

The PDQ39 quality of life showed improvements at the end of the study, as indicated by the total PDQ39 SI index (p = 0.009, d = 1.43). Additionally, improvements were observed in five out of the eight subdomains of the PDQ39 questionnaire after a 12-month phone monitoring (Table 3). There was a significant improvement in "Mobility" after 12 months compared to baseline (p = .011, d = 1.38). Significant improvement was observed in "ADL" at the final evaluation compared to the initial assessment (p = .010, d = 1.40). Significant improvements were also observed for Stigma (p = .022, d = 1.15), Social (p = .016, d = 1.26) and Cognitive subdomains (p = .035, d = 1.02). Although there was a slight decrease in the average perception of 'Emotional well-being, no significant difference was found between the initial and final assessments (p = .150, d = 0.62).

Conclusions

These findings suggest that the LSVT Big program, together with long-term monitoring, may represent an effective approach for enhancing functional mobility, decreasing the risk of falls, and improving the quality of life in individuals with Parkinson's disease. The study highlights the potential benefits of monitoring for maintaining and enhancing program improvements, even in the face of challenges such as the COVID-19 pandemic, emphasizing the importance of personalizing treatment for optimal results. Due to low number of study participants, to

consolidate the results obtained, future research could involve a larger number of participants, thus ensuring greater validity of the findings.

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Functional Recovery After Distal Femur Epiphyses Fracture

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Abstract

Distal femur epiphysis fractures represent a common traumatic condition, with an increasing incidence among the young and active population. In recent decades, advancements in medical technology and treatment methods brought significant changes in the approach of knee fractures, with focus on minimizing the impact on functionality and improving the quality of life for patients.

The study aims to identify the most effective physiotherapy tools and methods required for functional recovery following a distal femur epiphysis fracture.

The present research represents a case study conducted on a patient with osteochondral fracture of the external femoral condyle of the left knee, accompanied by an intra-articular loose body and patellar dislocation. The study was carried out over a period of 4 months, during which various physiotherapy methods were employed, including joint manipulations, neuroproprioceptive facilitation techniques, mechanotherapy, and exercises aimed at restoring joint mobility, muscle strength, joint stability, and gait re-education.

Following the implementation of physiotherapy programs, a flexion mobility of 135 degrees was achieved, and the extension deficit was reduced to 0 degrees. Gait parameters, including step length, cadence, and walking speed, were improved. Furthermore, in terms of muscle strength, values comparable to the unaffected lower limb were attained.

Early physiotherapy intervention, tailored to the morphophysiological characteristics and surgical techniques employed, can restore knee functionality following distal femur epiphyses fracture.

Keywords: rehabilitation, trauma, functionality

Introduction

The femoral epiphysis fractures are a common traumatic pathology treated by orthopedic surgeons, and these traumas are often associated with multiple life-threatening bone damage. These fractures can occur as a result of road accidents, falls from a height, drops from the same level in people with osteoporosis, hitting cluttered objects (Saita Y. 2015).

Globally, the incidence of femoral fractures is between 10 and 21 per 100,000 inhabitants per year, and 2% of these are open fractions. (Saita Y. 2015)

According to the literature, men are more likely to suffer such trauma between the ages of 15 and 35, while in the case of women their rate increases from the age of 60. Men are more prone to femur fractures as a result of road accidents or other high-energy mechanisms, and women are more likely to suffer femur fracture from falls at the same level. (Weiss R.J. 2009).

Direct trauma is known to be the most common mechanism for producing femoral fractures, including the direct hit of the thigh or the transmission of a very large force through the knee. The presence of associated lesions is very important from a clinical point of view because they will require a certain therapeutic behavior (Tornetta P. 2007).

The distal extremity of the femur is represented by muscle groups that can produce deformities around the fracture by the traction forces on the bone (Gangavalli A.K. 2016).

The diagnosis of the patient is carried out through clinical examination and history to identify the mechanisms of production of bone lesion. Paraclinical examination consists of performing X-rays of various incidences and computed tomography that plays an important role in identifying lesions that cannot be identified at X-ray (Norc S.E. 2005).

The prognosis of functional rehabilitation may vary depending on the severity of the fracture, the age of the patient, the type of treatment and the effectiveness of kinetotherapy programmes (Arastu M.H. 2013).

Physiotherapy plays an important role in the recovery process with the aim of re-educating joint mobility, strength and stability, as well as reeducating walking and balanced weight distribution in the lower limbs. (McDonough C.M. 2021). Through motion therapy, complications such as pseudarthrosis, vicious calusation and vascular complications can be prevented. A very important component of the physiotherapy program is the individualization of the recovery treatment according to the characteristics of the fracture and the patient (Neculăeș M. 2020).

Femoral fractures can be atypical, their management aimed at rehabilitating functionality, reducing pain and facilitating the bone healing process. Some of these fractures are associated with delayed healing with risk of need for re-surgical intervention (Tyler W. 2014).

Aim

The study aims to identify the most effective physiotherapy tools and methods required for functional recovery following a distal femur epiphysis fracture.

Materials and Methods

The present research is a case study conducted on a patient with osteochondral fracture of the external femoral condyle of the left knee, with intraarticular loose body and rotulian luxation.

The tests used in the initial and final evaluation were represented by goniometry, manual muscle strength, measurement of joint perimeter and walking parameters.

The initial functional evaluation of the patient highlights significant mobility deficits at the level of the knee especially on the flexion movement, but also a significant deficit of extension. There is also a significant swelling of the operated knee with a difference of 3 cm from the healthy knee and the association of patellar bursitis, clinically and imaging confirmed by soft tissues ultrasound. The walk was initially carried out with partial support on the lower limb operated by forearm crutch.

The functional recovery was initiated at 30 days postoperative, after the suppression of immobilization and the objectives pursued consisting in preventing algodystrophy syndrome, reducing swelling, inflammation and pain, reeducating the mobility of the knee flexion and correcting the deficit of extension.

In the second stage of the recovery, the goal was to re-educate the muscle strength of the leg and thigh, reeducate joint stability and walking.

The physiotherapeutic methods used in the first stage targeted joint manipulations and traction, passive mobilizations, isometric contractions at the level of the quadriceps, neuroproprioceptive facilitation techniques such as hold-relax, rhythmic initiation, slow reversal, slow reversal hold and alternating isometry.

These techniques were mainly performed in open kinematic chain and from positions that facilitated joint decoating. At the end of this stage, cycloergometer exercises were introduced, when the knee mobility reached a minimum of 90° of flexion.

The re-education of the support was achieved by exercises of indirect loading of the affected lower limb from the supine position, from sitting with support on inflatable objects. This phase was preceded by the re-education phase of the direct support that was realized from orthostatism, where progressive loading was carried out from 20% of body weight to 100% at 2 months safter surgery. In dynamics, the support on the affected lower limb was achieved by a 50% lower percentage than the static load, gradually reaching the full load and the abandonment of the crutch at 3 months postoperative.

Results

The presentation and interpretation of the results obtained in the research was carried out through graphical interpretation, which highlighted the evolution of the patient from the initial evaluation to the final evaluation.

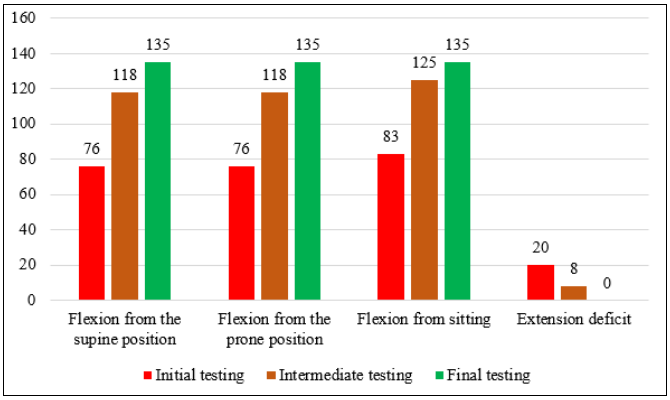

Fig. 1. Left knee goniometry

As shown in figure 1, the development of the mobility of the affected knee is positive with the complete reduction of the knee flexion and the possibility of achieving the maximum angle of 135˚of flexion in the affected joint. In obtaining these results a very important role was played by passive mobilizations, joint manipulations and neuroproprioceptive facilitation techniques, which were performed mainly from the sitting position for joint decoating and for better stretching of periarticular soft tissues. Active exercises also played an important role in regaining the maximum amplitude of movement by stimulating the muscles and knee joint (Moseley A.M. 2008; Diong, J. 2015; Beckmann, M. 2020; Pan, R.J. 2023).

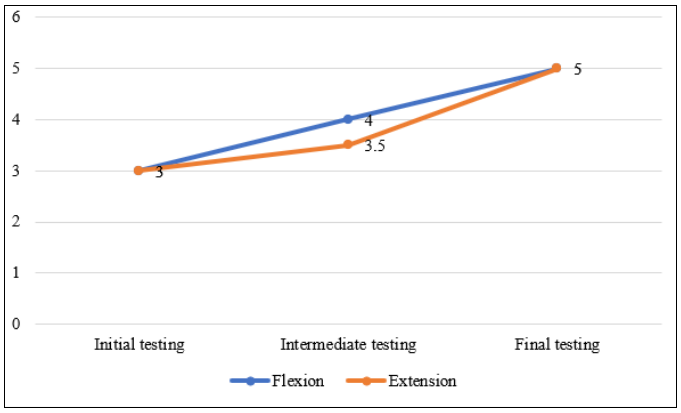

Fig. 2. Left knee muscle strength testing

The muscle strength of the affected knee increased considerably following the application of physiotherapy programs, reaching the end of the recovery period to normal values (fig 2).

The favorable evolution was facilitated by exercises performed mainly in open kinetic chain, from the seating position most often, to stimulate the muscles responsible for performing the flexion and extension movements of the knee. Elastic bands were used for resistance training and similar sand bags applied to the ankle level in order pull the knee for decreasing the degree of friction between the joint surfaces.

For re-education of the muscle tone of the quadriceps isometric contractions were used with stimulation of its proprioception to increase the quality of muscle contraction. Also, active endurance exercises played an important role in regaining normal muscle strength (Lee, S.Y. 2017; Briggs R.A. 2018; Donohoe, E. 2020).

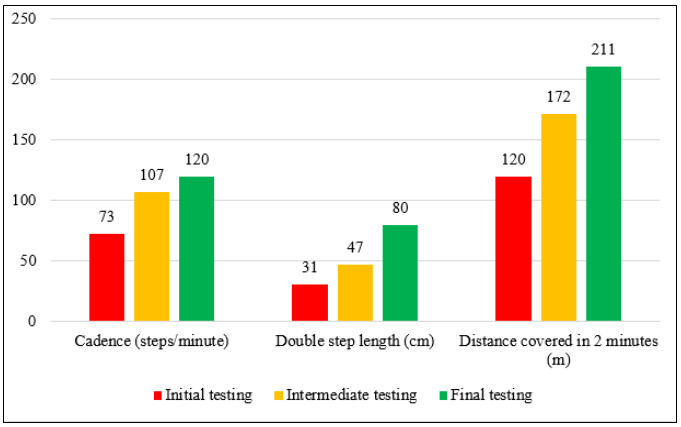

Fig 3. Walking parameters

Figure 3 shows the evolution of the walking parameters, which highlights a favorable evolution from the initial evolution to the final evaluation. After the initial re-education of walking through indirect loading with the help of the exercises from the supine position and those from the sitting with the exercise of pressures on the inflatable pillows, the locomotion was carried out through the hooks. This was done to avoid inflammation in the knee (Seker, A. 2019).

The re-education of walking parameters was achieved with the help of the treadmill, where walking was carried out with the equal distribution of weight at the level of the lower limbs. Also

applied walking paths were made, with pre-defined intervals of step length in order to equalize it and to regain the correct motor engram (Van Ooijen, M.W. 2016).

Conclusions

Early physiotherapy intervention, tailored to the morphophysiological characteristics and surgical techniques employed, can restore knee functionality following distal femur epiphyses fracture.

Physiotherapy programs following distal femur fractures are esentially in promoting a successful recovery, improving functionality, reducing pain, and enhancing the overall quality of life for patients. These programs should be tailored to each patient's unique needs and continually monitored and adjusted as the individual progresses.

Physiotherapy can help patients learn how to walk again after a femur fracture through gait training for re-educating the correct pattern and reducing the risk of compensatory mechanisms.

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The Importance of Goalkeeper's Placement on the Decision-Making to Pass or Throw the Ball at Goal in Shoot Outs in Beach Handball

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Abstract

The goalkeeper, in sports games, must have a good physical condition, and their participation in the offensive part must be an active one. The **purpose** of study**.** We wanted to investigate to what extent the placement of the goalkeeper can influence their decisions when they have to throw or pass the ball in the shoot-out phase.
Methods and Means: The study, was carried out by viewing the beach handball games from the 2022 and 2023 "Beach Handbal Zalau" Cup competitions and recording on observation sheets. The statistical analysis program SPSS Statistics 17 was used to interpret the obtained data. Calculations were performed for independent sample t-test, mean, standard deviation.
Results: An independent-samples t-test was conducted to compare all passes and throws on goal values from Z3 for CJ. There was a significant difference in the scores for CJ (M=2.50, SD=0.58) and BM (M=0.0, SD=0.0) conditions; t= 8.66, p= 0.00; CJ (M=2.50, SD=0.58) and AR (M=2.50, SD=0.58) conditions; t= 8.66, p= 0.00.
Conclusions: In conclusion, we can say that changing the technical-tactical approach to shoot out throws by placing the goalkeepers in zone 3 of their own area, brings a significant increase in their decision-making when they have to pass the ball to their own players or throw directly at the opponent's goal.

Keywords: beach handball, decision-making, shoot out, goalkeeper

Introduction

In handball, the tie-breaking method is achieved by throws from 7m, while in the beach handball game by shoot out, these characteristics giving goalkeepers an important role in achieving the success of their own teams.

The goalkeeper, in sports games, must have a good physical condition, and their participation in the offensive part must be an active one. The construction of attacks or their initiation is starting from them, which denotes the importance of the speed of putting the ball back into game, the way in which they do it, all these qualities highlighting the decisions that must be made in the shortest possible time (Le Menn et al., 2019; Mancha-Triguero et al., 2020).

If in taking penalties (football) or 7m throws (handball/beach handball) goalkeepers study the players in the most detailed way possible to increase their chance to defend the shot/thrown balls,

in beach handball, it is more different. They have the option to go out from their area and intercept the balls before they reach the attacking player (defensive phase).

To our knowledge, an aspect that has not been analyzed in beach handball is related to the throws from the shoot out and how they can influence the outcome of a match, thus influencing the outcome for the winning or losing team.

Scientific analyses, such as technical skills and cognitive aspects (attention, perception, decision making), regarding the activity of goalkeepers do not exist in our literature. Certain authors, such as Saavedra et al. (2019), Zapardiel (2020), Dol et al. (2020), analyzed international beach handball games, finding that the teams are close in value and that difference between the winning and losing teams was the number of points scored, the number of throws saved by the goalkeepers and the number of throws on goal blocked be the defending players.

Goalkeepers play an essential role in beach handball and require a special training. Therefore, the requirements for technical-tactical skills, or the specifics of the offensive phase of the game, are significantly different compared to that of field players (Fasold et al., 2019; Piechota & Majorczyk, 2023).

If in the defensive phase of the game the goalkeepers position themselves in a certain way to block balls, the same must be done in the attacking phase. They decide whether to pass the ball or throw it at the goal, but beside the throwing technique, their placement is also very important.

The Purpose of Study

The purpose of this study was to investigate to what extent the placement of the goalkeeper can influence their decisions when they have to throw or pass the ball in the shoot-out phase.

Materials and Methods

The study was carried out by viewing the beach handball games from the 2022 and 2023 “Beach Handbal Zalau” Cup competitions and recording on observation sheets. The participating teams were CSS Viitorul Cluj (CJ), CS Baia Mare (BM), CSS Zalău (SJ), CS Arad (AR), LPS Bistrița (BN). The observation sheets contained the quantitative values of all the shoot outs triggered by the goalkeepers regarding the zone from which they passed (Pass) or throw (Throw) the ball: Z1 (zone 1), Z2 (zone 2), Z3 (Zone 3).

The statistical analysis program SPSS Statistics 17 was used to interpret the obtained data. Calculations were performed for independent sample t-test, mean, standard deviation.

Results

The analysis of data from the observation sheets was done taking into account the areas from which the goalkeepers passed the ball or threw it directly towards the opposing goal.

Table 1. All data obtained from the observation sheets

Year	Zone	CJ		BM		SJ		AR		BN	
		Pass	**Throw**	**Pass**	**Throw**	**Pass**	**Throw**	**Pass**	**Throw**	**Pass**	**Throw**
	Z1	0	0	5	0	4	0	1	0	4	0
2022	Z2	17	3	13	2	13	3	17	2	14	2
	Z3	0	0	0	0	0	0	0	0	0	0
	Z1	0	0	0	0	2	0	0	0	2	0
2023	Z2	0	0	12	6	16	2	16	4	13	5
	Z3	10	10	0	0	0	0	0	0	0	0

Table 2. Results of the independent sample test for all data obtained

	Variables	**t**	**df**	**p**	**Mean Difference**		**Variables**	**t**	**df**	**p**	**Mean Difference**
CJ - BM	Pass_Z1_T1	-1.67	3.00	0.19	-1.25	CJ - AR	Pass_Z1_T1	-1.00	3.00	0.39	-0.25
	Pass_Z2_T1	1.85	6.00	0.11	1.00		Pass_Z2_T1	0.00	6.00	1.00	0.00
	Throw_Z2_T1	0.65	6.00	0.54	0.25		Throw_Z2_T1	0.65	6.00	0.54	0.25
	Pass_Z2_T2	-12.12	3.00	0.00	-3.50		Pass_Z2_T2	-9.80	6.00	0.00	-4.00
	Pass_Z3_T2	8.66	3.00	0.00	2.50		Pass_Z3_T2	8.66	6.00	0.00	2.50
	Throw_Z2_T2	-5.20	3.00	0.01	-1.50		Throw_Z2_T2	-2.45	6.00	0.05	-1.00
	Throw_Z3_T2	8.66	3.00	0.00	2.50		Throw_Z3_T2	8.66	6.00	0.00	2.50
CJ - SJ	Pass_Z1_T1	-1.41	6.00	0.21	-1.00	CJ - BN	Pass_Z1_T1	-1.00	3.00	0.39	-0.50
	Pass_Z2_T1	1.85	6.00	0.11	1.00		Pass_Z2_T1	0.76	3.41	0.50	0.75
	Throw_Z2_T1	0.00	6.00	1.00	0.00		Throw_Z2_T1	0.45	6.00	0.67	0.25
	Pass_Z1_T2	-1.00	3.00	0.39	-0.50		Pass_Z1_T2	-1.00	3.00	0.39	-0.50
	Pass_Z2_T2	-9.80	6.00	0.00	-4.00		Pass_Z2_T2	-15.00	3.00	0.00	-3.75
	Pass_Z3_T2	1.08	6.00	0.32	0.75		Pass_Z3_T2	8.66	6.00	0.00	2.50
	Throw_Z2_T2	-1.73	3.00	0.18	-0.50		Throw_Z2_T2	-2.45	6.00	0.05	-1.00
	Throw_Z3_T2	0.65	6.00	0.54	0.50		Throw_Z3_T2	8.66	6.00	0.00	2.50

An independent-samples t-test was conducted to compare all passes values from Z3 for CJ. There was a significant difference in the scores for CJ (M=2.50, SD=0.58) and BM (M=0.0, SD=0.0) conditions; t=8.66, p= 0.00; CJ (M=2.50, SD=0.58) and AR (M=2.50, SD=0.58) conditions; t= 8.66, p= 0.00; These results suggest that passes from zone 3 really does have an effect for CJ team. Specifically, our results suggest that when goalkeepers from CJ team can't throw the ball directly on the opponent's goal, they choose to pass the ball. No significant difference in the scores for passes values from Z2 and Z1 between CJ-BM, CJ-AR, CJ-BN.

Table 3. Descriptive statistics for all five teams

Variables	T	Mean	Std. Deviation	Variables	T	Mean	Std. Deviation
Pass_Z1_T1	CJ	0.00	0.00	Pass_Z1_T1	CJ	0.00	0.00
	BM	1.25	1.50		AR	0.25	0.50
Pass_Z2_T1	CJ	4.25	0.50	Pass_Z2_T1	CJ	4.25	0.50
	BM	3.25	0.96		AR	4.25	0.50
Throw_Z2_T1	CJ	0.75	0.50	Throw_Z2_T1	CJ	0.75	0.50
	BM	0.50	0.58		AR	0.50	0.58
Pass_Z2_T2	CJ	0.00	0.00	Pass_Z2_T2	CJ	0.00	0.00
	BM	3.50	0.58		AR	4.00	0.82
Pass_Z3_T2	CJ	2.50	0.58	Pass_Z3_T2	CJ	2.50	0.58
	BM	0.00	0.00		AR	0.00	0.00
Throw_Z2_T2	CJ	0.00	0.00	Throw_Z2_T2	CJ	0.00	0.00
	BM	1.50	0.58		AR	1.00	0.82
Throw_Z3_T2	CJ	2.50	0.58	Throw_Z3_T2	CJ	2.50	0.58
	BM	0.00	0.00		AR	0.00	0.00
Pass_Z1_T1	CJ	0.00	0.00	Pass_Z1_T1	CJ	0.00	0.00
	SJ	1.00	1.41		BN	0.50	1.00
Pass_Z2_T1	CJ	4.25	0.50	Pass_Z2_T1	CJ	4.25	0.50
	SJ	3.25	0.96		BN	3.50	1.91
Throw_Z2_T1	CJ	0.75	0.50	Throw_Z2_T1	CJ	0.75	0.50
	SJ	0.75	0.96		BN	0.50	1.00
Pass_Z1_T2	CJ	0.00	0.00	Pass_Z1_T2	CJ	0.00	0.00
	SJ	0.50	1.00		BN	0.50	1.00
Pass_Z2_T2	CJ	0.00	0.00	Pass_Z2_T2	CJ	0.00	0.00
	SJ	4.00	0.82		BN	3.75	0.50
Pass_Z3_T2	CJ	2.50	0.58	Pass_Z3_T2	CJ	2.50	0.58
	SJ	1.75	1.26		BN	0.00	0.00
Throw_Z2_T2	CJ	0.00	0.00	Throw_Z2_T2	CJ	0.00	0.00
	SJ	0.50	0.58		BN	1.00	0.82
Throw_Z3_T2	CJ	2.50	0.58	Throw_Z3_T2	CJ	2.50	0.58
	SJ	2.00	1.41		BN	0.00	0.00

An independent-samples t-test was conducted to compare all throws values from Z3 for CJ. There was a significant difference in the scores for CJ (M=2.50, SD=0.58) and BM (M=0.0, SD=0.0) conditions; t=8.66, p= 0.00; CJ (M=2.50, SD=0.58) and AR (M=2.50, SD=0.58) conditions; t= 8.66, p= 0.00; These results suggest that throws from zone 3 really does have an effect for CJ team. This aspect is due to the fact that opposing goalkeeper came out to intercept the ball but the goalkeeper who starts the shoot-out action notices this aspect and throws the ball directly towards the opponent's goal. No significant difference in the scores for throws values from Z2 and Z1 between CJ-BM, CJ-AR, CJ-BN.

Discussion

The throws from the shoot-out phase in beach handball game also have a strong emotional impact on the players. Out of the desire to win, but also based on the fatigue accumulated during the match, they choose the easier option to compete the action. Goalkeepers wait for the attacking player to get as close to the opponent's goal area as possible, in order to pass the ball to them, they move 3 steps forward and wait for the player to turn to receive the ball. This aspect helps opposing goalkeepers to position themselves so that they can make an interception or defend in case they are caught with a directly shot on goal (Figure 1).

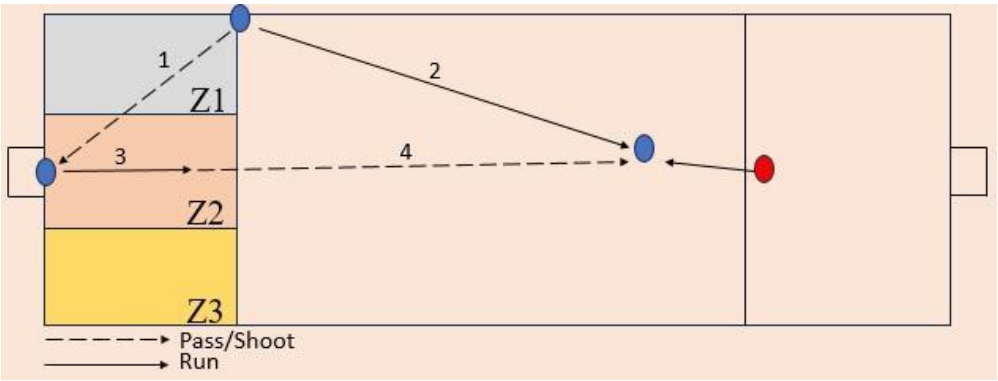

Fig. 1. Running in front

Goalkeepers in beach handball have a very important role, including the fact that they can score goals valued at 2 points by throwing the balls from goal to goal. Authors such as Pascual (2008) and Sa et al. (2015) concluded that the performance of the handball goalkeeper is essential during the matches in terms of achieving positive results and placing the team in the final rankings of the competitions.

The process of training goalkeepers in beach handball is very important. In addition to their physical training, the planning must ensure a tactical training in terms of both the defensive phase (ball blocking) and the offensive phase (passing/throwing the ball), especially from shoot out throws (Piechota & Majorczyk, 2023).

What we changed in the second tournament with the beach handball team of CSS Viitorul Cluj, was the different approach to the throws from the shoot out from the 2022 edition and other teams. The data helped us to see that the number of decisions was equal in terms of shots or passes executed by the goalkeepers. Vizcay (2020) and Quinones et al. (2020) believe that the actions of goalkeepers and their decisions in the moments of a game can balance or unbalance the results in key moments.

This technical-tactical aspect helps the goalkeepers, they choose to move to the 3rd zone of their own space, they open their angle more towards the goal and give the attacking player more time to observe the position of the opposing goalkeeper at the moment catching the ball, because there are not with their head turned completely towards their own goalkeeper, but they have the position of the opposing goalkeeper as well in their field of vision (Figure 2).

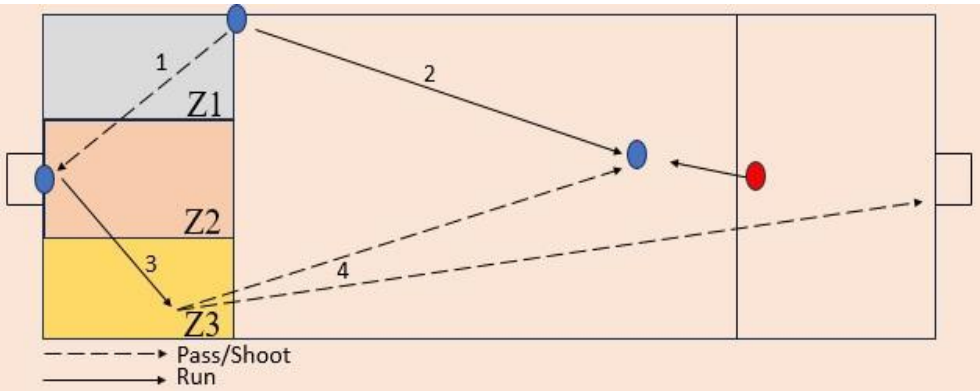

Fig. 2. Running in the opposite corner

Conclusions

The purpose of this study was to analyze to what extent the placement of the goalkeeper can influence their decisions in the shoot-out phase from a beach handball game.

In the two editions of the "Zalău Beach Handball" Cup, the share of passes and shots towards the goal in the shoot-out was higher from zone 2 of the goalkeeper's area, and the number of decisions made from zone 1 decreased in 2023 compared to 2022, following the analysis of the obtained data.

Through the different tactical approach of the CSS Viitorul Cluj team from one edition to another, we could observe a change in the number of decisions taken when the goalkeeper was in zone 3, they equally distributed both actions (passes and throws) throughout the whole competitions from 2023.

In conclusion, we can say that changing the technical-tactical approach to shoot out throws by placing the goalkeepers in zone 3 of their own area, brings a significant increase in their decision-making when they have to pass the ball to their own players or throw directly at the opponent's goal.

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Assessment of Agility Among Rugby Players

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Abstract

Introduction: Agility and changes of direction are considered decisive elements in the game of rugby, due to the fact that the rapid change of the direction of travel can lead to a positive finality, which will influence the outcome of the match.
Aim: The aim of this paper is to assess agility among rugby players according to the position in which they are specialized and to make a correlation between the results obtained in the agility test 505 and the test of change of direction at one stimulus.
Materials and Methods: The subjects of this research are 26 male rugby players (16 forwards and 10 backs) competing in the National Championship, age 26.4 ± 0.84 years, height of 181.53 ± 4.46 cm, weight of 101.01 ± 13.32 kg, muscle mass of 70.93 ± 9.26 kg and fat mass 23.95 ± 8.49 kg. Agility was assessed by the 505 agility-test (505), the change of direction test at one (COD-1S) and two stimulus (COD-2S), measured with the Witty Sem-Microgate automatic timing system and the and the body analysis was determined with Tanita MC-580. The physical evaluations were carried out the second week of the pre-season.
Results: The results obtained after the statistical analysis highlighted the fact that between forwards and backs there are statistically significant differences in terms of agility ($p<0.05$). Also, the Pearson correlation pointed out a good association ($r=0.458$) between the results obtained in the 505 and COD-1S.
Conclusions: The level of agility development is different among rugby players, depending on the position in which they play, backs obtaining better results than forwards. The good association between 505 and COD-1S can lead us to the conclusion that, in the game of rugby, to evaluate agility and also the speed of reacting to a certain stimulus, the COD-1S can be used, being a specific test that can reproduce a real situation during the game.

Keywords: rugby, change of direction, agility.

Introduction

Agility and changes of direction are considered decisive elements in the game of rugby, due to the fact that the rapid change of the direction of travel can lead to a positive finality, which will influence the outcome of the match [1].

The effort in the game of rugby is a mixed one, being present moments of maximum intensity, represented by the attack phases carried out with a high speed of movement and execution, by movement actions combined with repeated physical confrontations and by changes of direction used to avoid the opponent, but also moments of moderate intensity, due to the players'

involvement in the phases of the game, depending on their positions, backs or forwards [2], [3]. This sport is characterized by frequent dynamic collisions and defensive actions aimed at preventing the opponent from advancing, resulting in disputes over possession of the ball [4].

In order to be able to reach the maximum level of physical performance in the game of rugby, field specialists have identified that the most important skills that athletes need in carrying out the tasks during the match are represented by movement speed, reaction speed and agility [5], [6], [7], [8], [9], [10], [11].

Because of the different positional requirements of rugby players, there are significant differences between the physical profiles of forwards and backs, the studies demonstrating that the backs obtained better results than the forwards in the evaluation of the movement speed [12], [13], [14], [15].

Numerous specialists who have studied the biological potential of performance athletes in several team sports have demonstrated that most of the handball, soccer and rugby players who achieved the best results in the movement speed evaluation tests achieved results lower in direction change assessment trials [16], [17], [18], [19], [20].

The same results were found in other studies, where both female and male rugby players were less efficient at changing direction relative to maximum speed of travel [21].

Among rugby players, the correlation was made between the results obtained in the evaluation of movement speed, changes of direction and the strength of the lower limbs, demonstrating that faster athletes and with a greater height, were less efficient in achieving speed changes [22], [23].

In another study conducted on female rugby players a high level of agility was highlighted, the10m movement speed was correlated with short-distance agility, and also, agility was correlated with the athletes' anaerobic capabilities [24].

The results of another study demonstrated that faster rugby players are less efficient at changing direction, regardless of the angle of change. Sprint impulse is strongly associated with greater deficits in direction change in the steeper angle and multiple direction changes assessed by the L-drill and pro-agility tests, while the results obtained in the speed tests are closely related to the results obtained in the evaluation of the change of direction evaluated by the CUT test [21].

A determined factor in performing the change of direction is represented by the static and dynamic balance of the subjects evaluated with the help of stabilometry [25]. Stabilometric assessment can be an important factor in choosing appropriate exercises to improve weight distribution in the lower limbs [26].

Agility, an essential quality in the game of rugby, is the athlete's ability to quickly and efficiently adapt or change direction of movement in response to a given stimulus. As rugby is a game of strategy and avoidance, agility is a very important factor that must be included in all training programs. Avoiding opponents with direction changes has been shown to reduce disruptions during a rugby match by up to 72% [27].

According to the literature there are numerous studies with different tests for measuring agility, such as the 505-test [28], [29], the modified 505 test [30], the speed change test of direction, the Y shaped agility test [31], Zigzag [22], Illinois Agility test [5], [32]. Each of these tests varies in length, number and angle of direction changes, and movement patterns.

Aim

The aim of this paper is to assess agility among rugby players according to the position in which they are specialized and to make a correlation between the results obtained in the agility test 505 and the test of change of direction at one stimulus. Based on the results obtained in the specialized literature, we assume that, in terms of agility, there are statistically significant differences between rugby players depending on their position. We also assume that there will be a good correlation between the results obtained in the two agility tests.

Materials and Methods

The subjects of this research are 26 male rugby players (16 forwards and 10 backs) competing in the National Championship, age 26.4 ± 0.84 years, height of 181.53 ± 4.46 cm, weight of 101.01 ± 13.32 kg, muscle mass of 70.93 ± 9.26 kg and fat mass 23.95 ± 8.49 kg. Agility was assessed by the 505-agility test (505), the change of direction test at one (COD-1S) and two stimulus (COD-2S), measured with the Witty Sem-Microgate automatic timing system and the and the body analysis was determined with Tanita MC-580. The physical evaluations were carried out the second week of the pre-season.

As we see in Fig. 1, 505 consists of a run over a distance of 15 m, a turn and a run over a distance of 5 m, the sensors that record the time being located at a distance of 10 m from the start line.

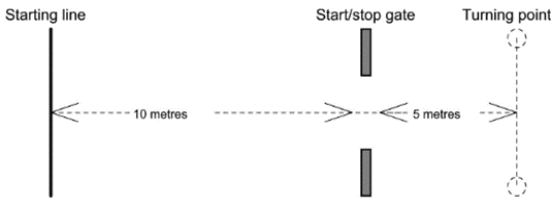

Fig. 1. Schematic illustration of the 505 [30]

The COD-1S consists of running for a distance of 5 m, a change of direction on the right leg or on the left leg, depending on the arrow indicated by the visual signal, and a run for a distance of 5 m at an angle of 45 degrees, up to the sensor gate (Fig. 2).

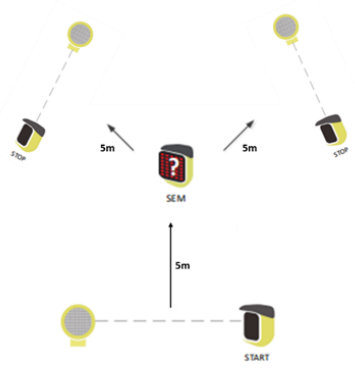

Fig. 2. Schematic illustration of the COD-1S

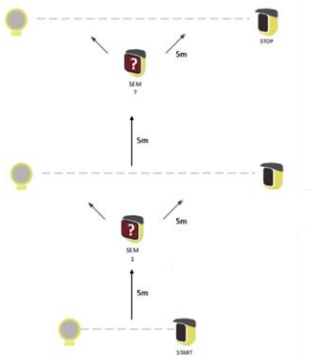

Fig. 3. Schematic illustration of the COD-2S

Regarding the COD-2S, the subjects run to the first signal where they change direction according to the indicated arrow, resuming running until the second stimulus, where they make the second change of direction and run to gate. The distances between gates and the two stimulus are 5 m (Fig. 3).

Results

The results obtained after the statistical analysis highlighted the fact that between forwards and backs there are statistically significant differences in terms of agility ($p<0.05$). We notice that the backs obtained better results compared to the forwards in all three agility evaluation tests, according to Table 1.

Table 1. Results of the subjects

	Forwards (N=16)			Backs (N=10)			p
	Mean		Std. Dev.	Mean		Std. Dev.	
505 (s)	2,79	±	0,14	2,56	±	0,06	**0,000**
COD-1S (s)	2,87	±	0,07	2,74	±	0,10	**0,001**
COD-2S (s)	4,76	±	0,56	4,30	±	0,28	**0,023**

*p<0,05

Also, the Pearson correlation pointed out a good association (r=0.458) between the results obtained in the 505 and COD-1S (Table 2). This association can indicate the fact that to evaluate agility among rugby players we can use one of the two tests, the results obtained by the players being similar. Thus, we consider that COD-1S reproduces a situation closer to reality during the game, due to the existence of the visual signal that provides the direction of movement, left or right. During the match, the player carrying the ball changes direction when the opponent appears, trying to avoid him and find the running lane.

Table 2. The correlation between the agility tests 505 and COD-1S

	Mean		Std. Dev.	r/p
505 (s)	2,70	±	0,16	**0,458 /**
COD-1S (s)	2,82	±	0,10	**0,019**

In the specialized literature, there are many studies that highlight the importance of speed, agility and reaction speed among rugby players, due the fact that current game is based on the moments of maximum intensity and fast transitions from attack to defense. Being a confirmatory study, it was necessary to report the obtained data to the specialized literature of the entire group, so the results obtained by the athletes in the 505 have a higher average value (2.70 ± 0.16 s) compared to the international averages 2.39 ± 0.17 s [30], 2.51 ± 0 .19 s [33], 2.48 ± 0.11 s [34], 2.60 ± 0.16 s [35], 2.52 ± 0.23 s [36].

Conclusions

The level of agility development is different among rugby players, depending on the position in which they play, backs obtaining better results than forwards. The good association between 505 and COD-1S can lead us to the conclusion that, in the game of rugby, to evaluate agility and also the speed of reacting to a certain stimulus, the COD-1S can be used, being a specific test that can reproduce a real situation during the game. Also, during the match, the player carrying the ball will be followed by several opponents who will try to stop him from passing the try line, thus justifying the use of COD-2S. Well-executed changes of direction to avoid opponents are often the key elements in marking the essay.

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No Short-Term Effects of Carrying a Shoulder Bag on Dynamic Plantar Pressure in Young Adults

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Abstract

Introduction: An asymmetrical load distribution due to carrying a shoulder bag may affect posture and balance, as well as plantar pressure distribution.
Aim: The aim of the study was to assess the short-term effects of carrying a shoulder bag on dynamic plantar pressure in healthy young adults.
Materials and Methods: Dynamic plantar pressure measurement was performed with the P-walk platform (BTS Bioengineering, Italy). Maximum plantar pressure, peak plantar pressure, as well as forefoot, middle foot and rearfoot pressure distribution were calculated for each leg while walking with and without a shoulder bag (10% of the body weight for each subject).
Results: Ten healthy young adults (mean age 22.7 ± 1.63 years; 5 males; weight 67.27 ± 12.06 kg; height 174.1 ± 9.24 cm) were included in the study. No significant differences were found on plantar pressure parameters when walking carrying a shoulder bag compared to walking without a bag.
Conclusions: Carrying a shoulder-bag with a load of 10% of subject's weight had no significant short-term effects on dynamic plantar pressure in healthy young adults. Further studies are needed to investigate the long-term effects, as well as the effects of different bag loads.

Keywords: plantar pressure, gait, shoulder bag

Introduction

The plantar pressure analysis is increasingly used in modern rehabilitation medicine. It is a tool that assesses the static or dynamic parameters both in patients suffering from a wide range of diseases and in healthy subjects in different conditions. In addition, the dynamic plantar pressure is an important criterion that provides data about the human gait [1]. Studies have shown that the distribution of plantar pressure is influenced by body weight [2–4].

Carrying different types of bags (back-bags, cross-bags, shoulder bags) and loads is common during daily activities. The weight of bags that subjects carry during the everyday activities (for example, walking towards work/ school and from work/ school to home) is added to their body weight. The summed weight will probably change the distribution of plantar pressures while subjects are standing or walking [5]. Adding loads have an impact on posture and balance control, especially in dynamic situations like walking. The style of carrying the bag influence the

weight distribution [6] and changes the position and oscillations of body center of mass. Carrying an asymmetric load proved to increase the flexion of the trunk to the contralateral side, with an increase in the homolateral hip torque [7]. As reported by different studies, an asymmetrical loading alters the position of the body center of mass with regard to the gravity line, inducing postural adaptations that can lead to muscular and joints overuse, leading to back pain, spine deformities, balance perturbation [8–11].

Our hypothesis is that adding an asymmetrical load (shoulder bag), a change in plantar pressure distribution would be recorded during gait compared with the non-load condition. Thus, the aim of the study was to assess the short-term effects of carrying a shoulder bag on dynamic plantar pressure in healthy young adults.

Material and Method

Ten healthy young volunteer adult subjects agreed to participate in this study. The inclusion criteria were: age between 20 and 25 years, no vestibular, neurological or musculoskeletal disorders, no history of recent injury or surgery. Written informed consent was obtain from all subjects. The study was carried out in accordance with the Declaration of Helsinki.

Dynamic plantar pressure was assessed using a single P-walk pressure platform (BTS Bioengineering S.P.A. Italy). Data acquisition frequency is 250 Hz and is processed by the G-Studio software. The parameters recorded were average and maximum plantar pressure, plantar surface for each foot, as well as the load on the front, middle and rear part of each foot, normalized by body weight (%). The software also characterizes the type of the foot, based on arch index. An arch index (AI) between 0.21 and 0.26 characterize a normal foot, while an AI lower than 0.21 suggests a high arch foot, and an AI greater than 0.26 a flat foot [12]. All parameters were recorded during walking. Subjects were asked to walk barefoot at a self-selected speed, with an average of 2 - 3 steps before stepping on the platform, for step normalization. Three normal steps on each foot were recorded. The dynamic plantar pressure analysis was performed in two conditions – with and without carrying a shoulder bag on the right shoulder. The weight of the shoulder bag was 10% of each subject body weight.

The statistical analysis was performed with MedCalc® Statistical Software version 22.013 (MedCalc Software Ltd, Ostend, Belgium). Normal distributed data are presented as mean and standard deviation. To compare the data between the two conditions, the paired Student t was performed. Statistical significance was set at $p < 0.05$.

Results

Ten young adults aged between 20 and 25 years old (mean age 22.7 ± 1.63 years; 50% females; body mass index 22.03 ± 2.21 kg/m^2) participated in the study. The mean weight of the shoulder bag was 6.72 ± 1.2 kg, ranging from 5 to 8.6 kg.

The plantar surface area, average and maximum plantar pressure of each foot, in both testing conditions, are presented in Table 1. A significant greater plantar surface was observed only for the right foot while carrying the shoulder bag on the right shoulder compared with no-load condition ($p = 0.01$).

A significant greater average pressure was observed on the left foot compared with the right foot while carrying the shoulder bag on the right shoulder ($p = 0.003$).

Table 1. Dynamic plantar pressures analysis in both testing conditions – with and without a right shoulder bag

	Without bag		Carrying a right shoulder bag		p	
	Left foot	**Right foot**	**Left foot**	**Right foot**	**left**	**right**
Plantar surface (cm^2)	167.5±19.55	162.7±16.76	171±21.12	173.8±14.71	>0.05	0.01
Average pressure (kPa)	81.03±11.62	79.28±10.43	78.37±12.56	71.97±12.76	>0.05	>0.05
Maximum pressure (kPa)	173.35±18.69	173.51±21.00	158.71±32.73	160.82±33.07	>0.05	>0.05

Data are presented as mean ± SD

The load distribution on the front, middle and the rear part of each foot is presented in Table 2. No significant differences were observed between conditions. A significant greater rearfoot load was observed on the right foot compared to the left while walking and carrying the shoulder on the right shoulder.

Table 2. Dynamic foot load distribution in both testing conditions – with and without a right shoulder bag

	Without bag		Carrying a right shoulder bag		p	
	Left foot	**Right foot**	**Left foot**	**Right foot**	**left**	**right**
Forefoot (%)	45.38±2.9	47.07±4.28	48.78±5.2	46.76±3.18	>0.05	>0.05
Middle foot (%)	23.34±5.71	22.02±6.07	19.41±7.65	23.6±4.23	>0.05	>0.05
Rearfoot (%)	31.29±3.84	30.92±2.86	32.02±2.66	29.64±2.62	>0.05	>0.05

Data are presented as mean ± SD

The dynamic arch index calculated by the software is presented in Table 3 for each foot. No significantly differences were noted between conditions or feet.

Table 3. Foot arch index in both testing conditions – with and without a right shoulder bag

	Without bag		Carrying a right shoulder bag		p	
	Left foot	**Right foot**	**Left foot**	**Right foot**	**left**	**right**
Arch index	0.23±0.05	0.22±0.06	0.19±0.07	0.23±0.04	>0.05	>0.05

Data are presented as mean ± SD

Discussion

The study aimed to assess the short-term effects of carrying a shoulder bag on dynamic plantar pressure in healthy young adults. Our hypothesis that carrying an asymmetric load during gait would have a significant effect on plantar pressure compared to the no-load condition was not completely sustained by the results of the present study.

Carrying a shoulder bag with a weight of 10% of body weight does not significantly influence the plantar pressure during gait. Similar results were observed also by Park et al. [13], who did not found large effects on changes in plantar pressure while walking with an asymmetric bag.

Our results revealed a significant greater average plantar pressure on the left foot compared to the right one while walking carrying the shoulder bag on the right site. This could be explained by the contralateral lateral flexion of the trunk as a compensation to asymmetrical loading. Moreover, a significant greater rearfoot load was observed on the right foot compared to the left while walking and carrying the shoulder on the right shoulder. Our results are not in accordance with those of Gong et al. [14] who also analyzed the plantar pressures both in standing and during gait with young subjects carrying a shoulder pack, with five different weights (0, 2, 5, 10 and 15 kg). They did not find any difference in plantar pressure between the left and right sides

during gait. Zawadka et al. [15] investigated the effects of carrying asymmetric light loads in young subjects and found that although the trunk was shifted away from the external load, greater plantar pressures were recorded on the loaded limb, with significant differences between feet [15]. Their results were obtained in static condition and not in dynamic condition. The practice of daily physical activity influences the ability of carrying different loads without overloading the musculoskeletal system. As in different health conditions [16], the level of physical activity can impact the results of the current study.

The relative small sample size, using only bags with the recommended weight (10% of bodyweight) are limitations of our study.

Conclusion

Carrying a shoulder-bag with a load of 10% of subject's weight had no significant short-term effects on dynamic plantar pressure in healthy young adults. Further studies are needed to investigate the long-term effects, as well as the effects of different bag loads.

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The Study of the Relationship Between Inflammatory Process Markers and Physical Exercise in Colorectal Cancer

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Abstract

Interleukin IL-6 is an inflammatory cytokine that plays a key role in the immune system and inflammation. Elevated levels of IL-6 have been associated with colorectal cancer, as this cytokine can support the growth and spread of cancer cells through various mechanisms. Additionally, IL-6 may be involved in angiogenesis (the formation of new blood vessels to nourish tumors) and promoting cellular invasion into nearby healthy tissues. Regarding physical exercise, it can play an important role in the prevention and management of colorectal cancer. The regular physical activity can reduce the risk of developing colorectal cancer.

Keywords: Colorectal cancer, inflammation, physical exercise, interleukin-6 (IL-6).

Introduction

Colorectal cancer is the most common malignant neoplasm within the gastrointestinal system and ranks third globally in terms of incidence and second in terms of mortality. The latest data regarding the impact of this condition on the general population show that in 2020, colorectal cancer was responsible for over 1,900,000 newly diagnosed cases and over 900,000 deaths.

Colorectal cancer is a solid tumor that originates in the inner layers of the intestinal wall but can grow, penetrating the entire wall. Initially, the disease presents as a small, benign polyp on the inner wall of the colon, which, if not removed in a timely manner, can transform into a malignant neoplasm, associated with chronic inflammatory processes.

The aim of this paper is to discuss several aspects related to the connection between chronic inflammation, physical activity, and the inflammatory marker represented by interleukin IL-6, aspects found in the literature, studied by us, and which may serve as a starting point for fundamental research. The paper is a review based on study a of 22 studies regarding the IL-6 and physical activity in cancer pathology.

Methods of the Literature Review

In order to create a narrative review, we browsed the PubMed database with the keywords: “chronic inflammatory process”, “IL-6”, “cancer pathology”, “physical activity”, “colorectal cancer”. Our research includes original articles, review articles and case reports. All original articles and clinical trials, regarding physical training, cancer, chronic inflammatory process, demonstrated the link between development of inflammatory process and level of IL-6 and relationship with physical activity, and how the physical activity could improve the life quality and reduce the inflammatory process. Finally, only the most relevant studies, written in English,

were selected from the reference list. Our review proposes to present information about the following important topics: the inflammatory process and physical activity, physical exercise and Interleukin IL-6.

The Inflammatory Process and Physical Activity

Colorectal cancer, affecting the colon and rectum, remains one of the most prevalent and menacing forms of cancer worldwide. Understanding the factors contributing to the onset and progression of this disease is essential for the development of more effective therapeutic and preventative approaches [1]. In this context, chronic inflammation has been identified as a significant factor that can contribute to the initiation and progression of colorectal cancer. At the core of this chronic inflammation is interleukin-6 (IL-6), a proinflammatory cytokine [2] with complex roles in regulating immune and inflammatory responses in the body.

In this context, physical exercise has become increasingly studied and recognized for its potential to influence the inflammatory process, especially concerning interleukin-6 (IL-6) levels. As demonstrated by recent research, the issue of physical inactivity is considered to be responsible for a significant number of all colon cancer cases, whereas physical activity has been associated with a reduced risk of developing such a condition [3]. In fact, it has been estimated that high levels of physical activity can reduce the risk of colon cancer by up to 50%.

In the study by the same recent author, it was suggested that the reduction of inflammation induced by physical activity can play a significant role, as inflammation has been associated with every event involved in the development and progression of cancer, and physical activity has been reported to have the ability to reduce inflammatory processes.

Starting from the components of energy balance, recent study concludes that physical activity and body mass index (BMI) are well-established risk factors as well as predictors of colorectal cancer, with the underlying mechanisms of the link between energy balance and colorectal cancer being extremely complex [2].

The study on the relationship between physical activity and the potential development of an inflammatory process characteristic of colorectal cancer was conducted by Christine M. Friendennreich et.al. [4], the study on the relationship between physical activity and the potential development of an inflammatory process characteristic of colorectal cancer begins with the definition of physical activity. Physical activity, defined as any movement of the body produced by skeletal muscles that requires energy expenditure, has been characterized and investigated in epidemiological studies based on the domain in which the activity takes place (such as occupational, recreational, household, and transportation activity), the volume of activity (measured by frequency, duration, and intensity), and the periods of time during which the activity occurs (from current activity to activity over the course of a lifetime).

To date, over 500 observational epidemiological studies have investigated the link between physical activity and cancer incidence. The results obtained are taken into consideration in guidelines such as the 2018 Physical Activity Guidelines for Americans (PAGA) and the World Cancer Research Fund/American Institute for Cancer Research (WCRF/AICR), which provide recommendations on physical activity for reducing the risk of cancer.

The collective results from these reviews and meta-analyses indicate the existence of evidence supporting a reduced risk for 11 different types of cancer when comparing individuals with the highest levels of physical activity to those with the lowest. Specifically, there is strong evidence that physical activity reduces the risk of bladder, breast, colon, endometrial, esophageal

adenocarcinoma, and gastric cancer. The link between physical exercise and the potential development of cancer is analyzed and explored in study of Murphy et.al [1], based on a series of clinical-epidemiological evidence, the benefits of exercise in reducing the risk of cancer, particularly in the case of colon cancer, which is strongly influenced by lifestyle factors, are supported. In this context, the work of Kerr, mentions that physical activity is associated with a reduction in the risk of approximately 15% for colonic adenomas, the precursor to colon cancer [5]. This association applies to both men and women and is notably more significant in the case of advanced adenomas, with a risk reduction of 35% (see also the subsequent section on sedentary behavior).

Physical Exercise and Interleukin IL-6

Physical exercise can indeed contribute to maintaining a healthy body weight, which is important because obesity and overweight are risk factors for colorectal cancer. By maintaining a healthy body weight, chronic inflammation can be reduced, and interleukin-6 (IL-6) levels can be kept under control.

In recent years, interest in the potential of physical exercise to influence the inflammatory process, especially concerning IL-6 levels, has significantly grown [6]. Studies have suggested that physical exercise can be an effective tool in managing colorectal cancer, not only by improving the quality of life for patients but also by directly addressing the underlying inflammatory process.

Physical exercise has been associated with a reduction in chronic inflammation; therefore, it can help lower levels of IL-6 and other proinflammatory cytokines, which can be beneficial in colorectal cancer. Regular exercise, in combination with a healthy diet and lifestyle, can play a crucial role in reducing the risk of cancer and improving overall health [6]. However, it's important to consult with healthcare professionals when incorporating exercise into cancer prevention or treatment plans, as individual circumstances may vary.

Another mechanism through which physical exercise can influence IL-6 levels is by improving the functioning of the immune system. Regular physical activity can support a more efficient immune response, and this can contribute to reducing the production of IL-6. Furthermore, physical exercise can enhance the functioning of the immune system, which can help combat cancer cells and prevent recurrences. Through regular physical activity, the body can develop a better capacity to respond to pathogens and keep abnormal cells under control [7].

In the activation of proinflammatory cytokine secretion, in his work [2], discusses systemic inflammation, considered a potential key player. In this context, adipose tissue in obese individuals leads to low-grade systemic inflammation through the secretion of proinflammatory cytokines by hypertrophied adipocytes. Therefore, the introduction of a physical exercise program combined with a weight-reducing diet leads to greater reductions in systemic inflammation. However, physical exercise, even without weight loss, also improves levels of proinflammatory biomarkers, such as C-reactive protein (CRP), reducing their plasma levels.

Interleukin-6 (IL-6) is a proinflammatory cytokine with complex roles in colorectal cancer. According to Murphy et.al [3], Interleukin-6 (IL-6) is a cytokine that has been associated with a poor prognosis in various types of cancer, including colon and breast cancer. IL-6 is normally produced by immune cells and endothelial cells, but elevated levels of IL-6 can contribute to chronic inflammation and may play a role in the development and progression of colorectal cancer. IL-6 belongs to the cytokine family and is responsible for transmitting signals in

response to inflammation and infections. It plays a crucial role in regulating the immune and inflammatory response in the body.

Studies have suggested that IL-6 may be involved in colorectal cancer through several mechanisms. For example, IL-6 can promote the growth of cancer cells and angiogenesis (the formation of new blood vessels that nourish tumors). Additionally, it can influence the immune system in a way that favors tumor growth [8].

In the context of physical exercise, research has begun to explore how physical activity can influence IL-6 levels and inflammation in colorectal cancer. Regular physical exercise can have anti-inflammatory effects by reducing IL-6 levels and improving insulin sensitivity, thereby reducing the risk factors for the development of colorectal cancer and other associated conditions. Overall, IL-6 is a cytokine with a multifunctional role in the body, influencing inflammation, immune response, and metabolic regulation. Its relationship with physical exercise highlights the potential benefits of regular physical activity in mitigating inflammation and reducing the risk of colorectal cancer and other related diseases was demonstrated by Zeynep et.al. [9].

Although IL-6 is an essential cytokine in regulating the immune response and inflammatory processes in the body, elevated and persistent levels of this cytokine can contribute to chronic inflammation and, consequently, promote colorectal cancer.

Therefore, a thorough exploration of the relationship between physical exercise and the inflammatory process, especially concerning IL-6, can open new perspectives in the fight against this dreaded condition. Regular physical exercise is recognized for its ability to reduce chronic inflammation, improve immune system function, and counteract the negative effects of obesity, which is a significant risk factor for colorectal cancer. Physical exercise can influence the expression and production of IL-6, and how this influence can contribute to the holistic management of patients with colorectal cancer. The interplay between exercise, IL-6, and colorectal cancer underscores the potential of physical activity as a valuable component of comprehensive strategies for both cancer prevention and management. Further research in this area can provide valuable insights into optimizing exercise interventions for individuals at risk of or affected by colorectal cancer [9].

Recent studies and discoveries in the field of medical research suggest that physical exercise can be a vital component of the therapeutic approach for patients with colorectal cancer. In the following, we present in detail how physical exercise can influence IL-6 levels and contribute to the management of colorectal cancer, aiming to provide a comprehensive understanding of the importance of this factor in the therapeutic process. Possible mechanisms of the anti-inflammatory effect of physical exercise are represented by the release of IL-6 from muscles and the subsequent increase in circulating levels of IL-10 and IL-1, which are antagonists. Physical exercise plays a significant role in reducing the inflammatory process in colorectal cancer, contributing to the reduction of interleukin-6 (IL-6) levels. Here's how:

- Reducing Chronic Inflammation: Regular physical exercise is known for its ability to reduce chronic inflammation in the body. IL-6 is a proinflammatory cytokine associated with this chronic inflammation. Through exercise, the body can release anti-inflammatory cytokines that counteract the effects of IL-6 and reduce inflammation.
- Modulating Adipocytes: Physical exercise helps reduce adipose tissue and regulate the function of adipose cells. Adipocytes are significant sources of IL-6 in obesity, and thus, physical exercise can contribute to reducing the excessive secretion of IL-6 from this tissue.

- Improving Metabolism: Physical exercise can enhance insulin sensitivity and regulate glucose metabolism. This can contribute to reducing IL-6 levels because insulin can influence the secretion of IL-6.
- Improving Intestinal Function: Certain exercises can contribute to improving intestinal function after colorectal cancer surgeries, helping manage digestive issues.
- Increasing Anti-Inflammatory Cytokines: Physical exercise can stimulate the production of anti-inflammatory cytokines, such as interleukin-10 (IL-10), which can counterbalance the effects of IL-6.
- Reducing Oxidative Stress: Physical exercise can reduce oxidative stress in the body. This can decrease the inflammation induced by IL-6, as oxidative stress can increase the secretion of this cytokine.
- Effects on the Immune System: Physical exercise can stimulate the immune system and increase the activity of immune cells that fight against inflammation. This can have a positive impact on controlling inflammation in colorectal cancer.
- Immune Response to Exercise: Physical exercise can stimulate the immune system, increase the production of immune cells, and release anti-inflammatory cytokines. This can create a less favorable environment for the development and progression of colorectal cancer, with direct effects on IL-6 levels.
- Beneficial Effects of Postoperative Exercises: For patients who have undergone surgical procedures for colorectal cancer, physical exercises can be extremely beneficial in the recovery process, aiding in the restoration of intestinal functionality and accelerating healing.
- Minimizing Treatment Side Effects: Physical exercises can reduce the side effects of treatment, such as fatigue, anxiety, and depression. They can contribute to improving the quality of life for patients.
- Treatment Resistance: Some studies suggest that physical exercises can enhance the response of colorectal cancer patients to standard treatments such as chemotherapy or radiation therapy, making cancer cells more sensitive to the action of these therapies.

When it comes to dosing directed physical effort with the aim of reducing the risk of developing colorectal cancer, there are many discussions, but most studies recommend 4 hours of aerobic exercise per week. Aerobic exercise can help reduce the levels of prostaglandins and may involve markers such as IGF-1/IGFBP.

Conclusion

Moderate physical exercise plays an anti-inflammatory role by reducing IL-6 and cytokines that modulate angiogenesis, thereby impeding tumor development. Physical exercise reduces the risk of cancer development and progression by activating anti-inflammatory myokines at the muscular level, increasing insulin sensitivity, reducing leptin levels, boosting immunity, lowering estrogen levels, and reducing circulating androgen hormones.

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Physiotherapy in the Recovery After Fractures of the Upper Limb Phalanges

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Abstract

Introduction: Injuries to the phalanges of the upper limb are a common issue encountered in traumatology, often having a significant impact on the disruption of hand and finger functionality. They can be found across various age groups and are caused by domestic, occupational, and sports-related accidents. Even though the dimensions of the involved bones are small, appropriate surgical intervention and the implementation of an early physiotherapy program are essential to ensure complete recovery and prevent potential long-term complications, such as hand and finger dysfunction.
Aim: The purpose of this study is to identify and select the tools and techniques necessary for regaining hand functionality by preventing the onset of musculotendinous sequelae following immobilization.
Materials and Methods: The present research represents a case study conducted on a 10-year-old patient who suffered a polytrauma, including a closed comminuted fracture of the second and third phalanges of the third finger and the third phalanx of the fourth finger on the right hand due to crushing injury. Among the physiotherapeutic methods used, neuroproprioceptive facilitation techniques for recovering musculotendinous retractions, joint manipulations, and the utilization of a mobilizing orthosis for the fourth finger were particularly prominent.
Results: Following the applied physiotherapy programs, an improvement in the strength of the affected hand and fingers was observed, along with complete recovery of the mobility deficit at the interphalangeal joints.
Conclusions: The present study highlights the importance of physiotherapy treatment in cases of fractures of the phalanges of the upper limb, which represent a significant clinical and functional issue, with a notable impact on hand and finger functionality.

Keywords: bone injuries, functional rehabilitation, tendon.

Introduction

Arm fractures are a common phenomenon in traumatic pathology and have disability potential. Most bone lesions of the hand can be treated orthopedically without the need for surgery, but in some cases the last one may be the best option [1].

Hand injuries are among the most common in the bone system and can occur at any age, with children and young adults often suffering such injuries during sports activities. In middle-aged adults, arm fractures can occur during professional activities, and in the elderly, they can suffer from fracture of the distal extremity of the upper limb by falling [2].

The literature in Europe contains relatively few works on hand injuries, their incidence, methods of treatment and recovery of fractures and dislocations at the level of phalanges and metacarpal bones. It is all the less spoken about extraarticular and intraarticular fractures with displacement, at different ages [3]. The most common fractures of the metacarpal bone are in sports such as basketball, football, hockey or baseball [4]. The therapeutic protocol is similar in the case of athletes, predominantly non-surgical, with temporary immobilization of the affected segment, even though over time numerous procedures of surgical fixation have been developed [5].

Functional recovery after arm fractures is a crucial aspect in the process of recovery of lost functions and for the purpose of preventing musculoskeletal retractions [6]. The physiotherapy protocol varies depending on the type of fracture, its location and severity, but there are a few general objectives pursued such as: pain management, initiation of mobility of the hand and fingers as quickly as possible, re-education of muscle strength and overall functionality of the upper limb [7,8].

A very important aspect is related to the management of the pain present in the hand and fingers, which is due both to the trauma itself and tendinous retractions or scars, which can maintain the local inflammatory syndrome, a longer period of time [9]. Manual techniques used in physiotherapy, along with active exercises can lead to reduction of pain and tendency to musculoskeletal retraction, as well as to flexibility of the scar.

The management of phalanges fractures can often be complicated due to the fact that the fingers have relatively little soft tissue to protect and support the bones and, for this reason, phalanges fractures may often be opened with many degrees of damage to soft tissues. Inadequate paraclinical examination can lead to a wrong diagnosis, studies highlighting the fact that there is a relatively high percentage of fractures not identified on the initial X-rays [10].

The functionality of the hand and especially the use of the fingers is vital for carrying out daily activities, the correct selection and efficiency of the treatment is extremely necessary, in order to adequate anatomical reduction and the stability of the fracture, with early but controlled mobilization. 2-3 weeks of immobilization is generally accepted for most phalanges' fractures, a longer immobilization proving to be ineffective increasing long-term rigidity [11].

Physiotherapy is the key of functional re-education of the post-traumatic hand regardless of whether the fracture has been treated orthopedically or surgically. Calusation occurs after about 6 weeks, but the mobilization of the hand and fingers must begin earlier to avoid musculoskeletal retractions and to avoid joint stiffness [12].

Aim

The purpose of this study is to identify and select the tools and techniques necessary for regaining hand functionality by preventing the onset of musculotendinous sequelae following immobilization.

Materials and Methods

The present study was carried out on a 10-year-old patient, who suffered a polytrauma by crushing with a closed comminuted fracture of 2nd, and 3rd phalanges of the 3rd finger and the 3rd phalanges of the 4th finger in the right hand. The surgical protocol consisted of suturing the traumatized soft tissues and immobilizing 3rd and 4th fingers in the orthosis for 4 weeks. After

suppression of immobilization and removal of threads, physiotherapy for functional re-education of the affected hand and joints was recommended.

The initial evaluation shows the presence of a cheloid scar in the metacarpophalangeal joint of the 4th finger with its fixation in flexion and extension deficiency in the interphalangeal joints of the 3rd finger.

Assessment of the amplitude of movement suggests a 70° extension deficit of the proximal interphalangeal joint of the 4th finger and a 50° extension deficit for the proximal interphalangeal join of the 3rd finger.

Hypotonia of the flexor's muscles of the fingers as well as a decrease in the muscle strength of the extensors of the affected fingers and hand were also observed.

Among the physiotherapeutic means used, were found in particular neuroproprioceptive facilitation techniques for the recovery of musculoskeletal retractions of which we recall rhythmic initiation, hold-relax, alternating isometry, slow reversal and sequentiality for reinforcement.

Joint manipulations were performed with the axle traction and decoatments of the interphalangeal joints associated with the stretching of the flexors muscle and the stretch of the scar present at the level of the 4th finger.

Active exercises were carried out from week 6 postoperative and counted on active and active exercises with manual resistance especially for the extensor muscles of the fingers and fist. In order to maintain the results of the physiotherapy session a dynamic orthosis was used for the 4th finger with the help of which the gained extension was maintained, but which allowed the finger to be flexed in order to perform the prehension during daily activities.

Results

To highlight the results obtained, the graphical interpretation of the values from the tests performed was carried out.

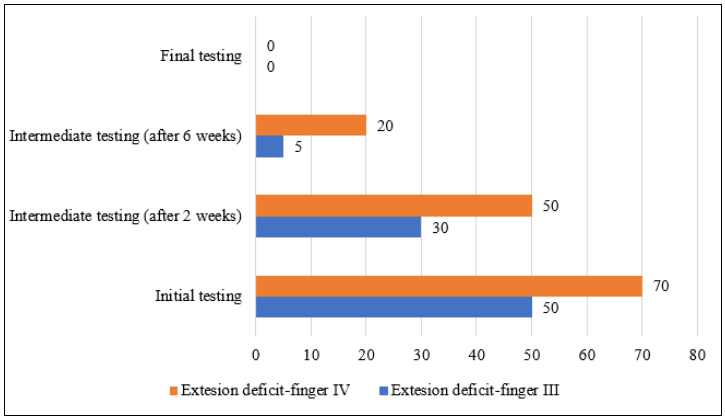

Fig 1. Extension deficit of the affected fingers (degrees)

As shown in Figure 1, the mobility of the fingers was improved, the extension deficit reduced to normal physiological values, with a faster evolution of the 3rd finger due to the absence of soft tissue lesions and cheloid scar.

This evolution (Figure 2 and Figure 3) was due to manual techniques used in physiotherapy programs and the use of dynamic orthosis in the 4th finger. An important role was played by free

active exercises, which focused on re-educating interphalangeal mobility and the elasticity of the scar on the palm face of the 4th finger.

Studies in literature highlight that early mobilization of the affected segments after different types of fractures of the upper limb, can speed up the recovery process with faster resumption of daily activities [13].

Fig 2. Initial and first intermediate evaluation

Fig 3. Second intermediate evaluation and final evaluation

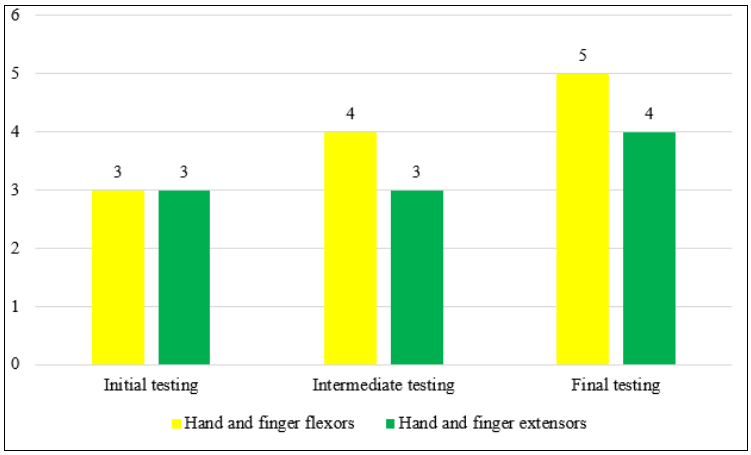

Fig 4. Muscle force testing for right hand

As shown in figure 4, the muscle strength of the affected hand and fingers improved considerably after the application of the physiotherapy program, but still showing a minor strength deficit due to inhibition of muscle contraction caused by the tendency of scar retraction.

Although the specific exercises and techniques performed to recover the muscle strength of the hands and fingers play an important role in regaining the possibilities of performing the current activities as well as professional ones, it is not very clearly established which is the most effective level of strength and difficulty of the exercise [14].

Conclusions

The present study highlights the importance of physiotherapy treatment in cases of fractures of the phalanges of the upper limb, which represent a significant clinical and functional issue, with a notable impact on hand and finger functionality.

Rehabilitation after hand fractures is a comprehensive and individualized process aimed at restoring function and minimizing disabilities.

Patience, dedication and constant effort are key elements for achieving efficient functional recovery with the resumption of daily and socio-professional activities.

Active exercises for re-educating mobility are imperative and should be continued after the completion of the recovery period to avoid the installation of rigidity of the interphalangeal joints and to maintain the flexibility of the scar.

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The Effect of CranioSacral Therapy in Pain and Stress Reduction and Quality of Life Improvement in Patients with Cervical Pain – A comparative study

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Abstract

Introduction: CranioSacral Therapy is a method of manual, non-invasive, very gentle therapy, used to evaluate and treat the CranioSacral system, a system that consists of membranes and cerebrospinal fluid that surrounds and protects the brain and spinal cord. The therapist uses a light touch generally of five grams, with which he releases the restrictions in the CranioSacral system to improve the functioning of the central nervous system, causing relaxation at both the somatic and mental levels.
Aim: The purpose for which this study was conducted lies in the desire to establish whether the effects obtained by the therapeutic program consisting of CranioSacral Therapy is more effective in reducing pain and stress level and in increasing the quality of life than that consisting by kinesiotherapy applied to the subjects taken in this study.
Materials and Methods: From a group of 30 patients with neck pain, 15 patients were randomly chosen to receive a CranioSacral therapy intervention (experimental group) and 15 patients a physiotherapy (control group) intervention for a period of 2 weeks. We have used evaluation methods based on which we can determine the effectiveness of our programs for pain the VAS scale and the survey method by applying the stress level and Quality of Life Assessment questionnaire.
Results: Statistical analyzes have shown that there are significant differences between pre- and post-test evaluation between the experimental and control groups.
Conclusions: In our study, CranioSacral therapy had better results than physiotherapy in reducing the pain and stress level and in increasing the quality of life in patients with neck pain. These results need to be considered by therapists to better understand and involve this concept for beneficial effects in treating patients with cervical pain arising from various causes.

Keywords: craniosacral therapy, pain, stress, quality of life, cervical pain

Introduction

Cervical pain is a common condition that causes substantial disability and is increasing worldwide. Of all 291 conditions studied in the Global Burden of Disease 2010 study, neck pain ranked 4th in terms of disability as measured by YLD (Years Lived with Disability) and 4th 21 in terms of deficiencies in general. Additionally, the study reported that the incidence of neck pain increased by 21% between 2005 and 2015. [1]

The high prevalence of neck pain and the associated costs in terms of health care expenditures and lost productivity cause an increasing economic burden on contemporary society. Physiotherapy can have a massive impact on the global burden of neck pain. By applying good examination skills, effective clinical judgment and appropriate selection of interventions, the impact of neck pain for any individual can be significantly reduced. In addition, the high tendency of neck pain to become chronic can be reduced with effective management. [2]

The main symptoms of patients with cervicalgia, irrespective of cause, are cervical pains which determine, in most cases, migraines, as well as the decrease of cervical spine mobility. The association of trigger points therapy with massage and physical therapy exercises, determine a decrease in active trigger points for the muscles which were acted upon and the consequence is a decrease in muscle tension, an increase in joint mobility, a decrease in cervical pains and migraines, as well as an increase in the quality of life of patients with cervical pains of various causes. [3]

Restoring functional balance in the cervical-dorsal region through physical therapy contributes significantly to the reduction or disappearance of pain symptoms. [4]

Manipulation and mobilization techniques, including traction movements, have been shown to reduce symptoms in the patient with neck pain and headache. Exercises that improve coordination, strength and endurance of the cervical muscles have also been shown to improve in these patients. Although each of these techniques is beneficial, patients who receive a combination of the two treatments show the greatest reduction in symptoms. [5]

Another study presents how the use of traction and physical exercise together with other means of rehabilitation in cervical spine dysfunctions, contributes to pain reduction. [6]

CranioSacral Therapy is a non-invasive, very gentle manual therapy method used to evaluate and treat the CranioSacral system, which is made up of membranes and cerebrospinal fluid that surround and protect the brain and spinal cord. The therapist uses a light touch, with which he releases the restrictions in the CranioSacral system to improve the functioning of the central nervous system, causing relaxation on both a somatic and mental level. [7]

The CranioSacral system is closely related to the whole body: a disorder or an imbalance can affect bones, muscles and organs, but it can also influence the central nervous system, the endocrine system or the circulatory system. Through the influence of CranioSacral therapy these imbalances can be felt and through very gentle techniques and manipulations on the bones of the skull or on the sacrum they can be normalized. CranioSacral Therapy produces a decrease in stress or tension, a strengthening of the body's vital functions as well as an improvement in the patient's general condition. [8]

According to Jakel et al. (2012) CranioSacral therapy can be an alternative treatment approach aimed at releasing restrictions around the spinal cord and brain and subsequently restoring body function. [9]

Also, a study conducted by Haller et all, demonstrate that CranioSacral Therapy has been shown to be effective and safe in reducing the intensity of cervical pain and can improve quality of life for up to 3-6 months after the intervention. [10]

Purpose and Objectives of the Study

The purpose for which this study was conducted lies in the desire to establish whether the effects obtained by the therapeutic program consisting of CranioSacral Therapy is more effective than that consisting by physiotherapy applied to the subjects taken in this study and to highlight

the role of CranioSacral therapy in reducing pain more quickly, thereby influencing the level of stress and implicitly increasing the quality of life of people with cervical pain.

We would like to demonstrate the effectiveness of CranioSacral therapy in reducing pain intensity, stress level and increasing quality of life through intragroup analysis of subjects in the experimental group, the effectiveness of physical therapy in improving the symptoms present in cervical pain through the intragroup analysis of the subjects in the control group and to establish the most effective therapeutic approach by comparing the results obtained in the subjects taken in the research, following the application of the two therapeutic strategies

The data recording is to be presented through tables corresponding to the evolution of the tests to highlight the indices and parameters obtained as a result of the tests done on the subjects included in this study.

Material and Methods

The study was carried out between November 2020 and August 2021, within our own office in Oradea, on a group of 30 subjects who presented with cervical pain from various causes. The subjects were randomly divided into two equal groups as follows: experimental group G1 – followed a program of 6 sessions of Craniosacral therapy, the treatment period lasted 2 weeks; control group G2 followed a program of 6 sessions of physical therapy, the treatment lasted also 2 weeks. The subjects were tested at the beginning of the treatment and at the completion of the treatment, thus aiming the results obtained following the treatment applied for the monitored parameter. All subjects provided written consent and agreed to participate in this study by signing the Informed Subject Agreement.

The Wong Baker Faces Scale was used for pain assessment, which is a tool used by many specialists for pain assessment. It comprises several levels of pain assessment scored from 0 to 10 as follows: 0 – no pain; 1 – mild pain; 2 – nagging pain; 3 – tolerable pain; 4 – demanding pain; 5 – very demanding pain; 6 – very annoying pain; 7 – very intense pain; 8 – almost unbearable pain; 9 – unbearable pain; 10 – lacerating pain.

The subject evaluated with this type of scale must choose a face, corresponding to the level of pain felt at the time of testing, so the specialist can appreciate the intensity of the pain felt by the subject and can assign it to a certain grade.

The level of stress was evaluated using the Questionnaire (Cohen-Williamson). It aims to explore the subjective feeling of stress felt by each subject, as well as how they evaluate stress.

When administering the questionnaire, the subjects are asked to answer questions as spontaneously as possible, based on what happened to them during the past month. The questionnaire includes 14 questions each with 4 answers. The rating of the answers is as follows: for items 1.2.3.8.11.12.14 – A) 1 point, B) 2 points, C) 3 points, D) 4 points, E) 5 points; for items 4.5.6.7.9.10.13 A) 5 points, B) 4 points, C) 3 points, D) 2 points, E) 1 point.

Thus, the minimum value of the test is 14 points, and the maximum value is 75 points. If the score is less than 25, it is considered a low stress level. Conversely, a score greater than 50 is evidence of a high level of stress.

For the assessment of the quality of life, was used the Questionnaire for the assessment of the level of quality of life (questionnaire adapted from Moret, Chwalow & Badudoin-Balleur, 1993). This is a self-administered questionnaire, which includes 12 questions targeting different aspects of daily activities, participation in social life and mental state. The 12 questions each have 4 answers. The score is made as follows: not at all – 0 points; little - 1 point; how much – 2 points;

a lot – 3 points. To achieve the final score, the number of points assigned to each question is added, depending on the answer given by the examined subject. The minimum value is 0, representing the lowest level of quality of life, and the maximum value is 36 points, representing the highest level of quality of life felt by the subject at the time of testing.

Research Samples

The subjects of the study were 30. The age of the subjects was between 35 and 55 years. (Table 1). Experimental group G1 consisted of 15 subjects, with an average age of 43.93 ± 7.26 years (val. min. 35, val. max. 55 years) who presented with cervical pain caused in 40% of cases of cervical discopathy (no6), 26.7% of cases of disc herniation (no4), 33.3% of cases of cervical spondylosis (no5), with an average duration of the condition of ~3 years (val. min. 1 year/val max 7 years). The control group G2 consisted of 15 subjects, with a mean age of 43.07 ± 6.30 years (val. min. 35, val. max. 55 years) who presented with cervical pain caused in 26.7 % of cases of cervical discopathy (no4), 40% of cases of disc herniation (no6), 33.3% of cases of cervical spondylosis (no5), with an average duration of the condition of ~3 years (val. min. 1 year/max 8 years).

Table 1. Characteristics of the subjects

No. crt.	**Char. of the subjects**	**Group**	**No**	**mean±std.dev**	**min value**	**max value**	
1.	Age of subjects	G1	15	49,93±7,26	35	55	
2.	Duration of illness			3,00±1,92	1	7	
3.	Age of subjects	G2	15	43,07±6,302,9	35	55	
4.	Duration of illness			3±1,94	1	8	

Statistical Analysis

Quantitative and qualitative analysis, as well as data interpretation, was carried out using the SPSS 15.0.0 statistical program. For the inferential analysis, the following were used:

- Independent samples t-test to be able to compare the means of the initial and final results between the experimental and the control group
- The simple correlation coefficient R - the Bravis-Pearson index for evaluating the strength and direction of association between pain intensity and stress level, as well as the association between pain intensity and quality of life,

Results

When comparing the averages of the initial and final results obtained in the subjects of experimental group **G1**, the following values were obtained:

pain assessment:

- it is observed that initially, the average of the pain was **7,13±0,64** points, (min. value 0, max. value 10).
- at the final assessment, the average of value of the pain decreased at **3,73±0,79** points, (min. value 0, max. value 10).

stress level assessment:

- it is observed that initially, the average of the stress value was **64,73±7,50** points, (max. value 75).
- at the final assessment, the average of the stress value dropped to **48,40±4,43** points, (max. value 75).

quality of life assessment:

- it is observed that initially, the average of the quality-of-life value was **11,00±1,55** points, (max. value 36).
- at the final assessment, the average of the quality-of-life value increased to **21,07±4,68** points, (max. value 36).

When comparing the averages of the initial and final results obtained in the subjects of control group **G2**, the following values were obtained:

pain assessment:

- it is observed that initially, the average of the pain was **7,40±0,73** points, (min. value 0, max. value 10).
- at the final assessment, the average of value of the pain decreased at **6,20±0,86** points, (min. value 0, max. value 10).

stress level assessment:

- it is observed that initially, the average of the stress value was **65,67±7,72** points, (max. value 75).
- at the final assessment, the average of the stress value dropped to **61,80±5,85** points, (max. value 75).

quality of life assessment:

- it is observed that initially, the average of the quality-of-life value was **12,20±2,14** points, (max. value 36).
- at the final assessment, the average of the quality-of-life value increased to **14,93±2,12** points, (max. value 36).

Table 2 shows a comparison of the averages of the initial results obtained in the evaluation of the pain intensity, stress level and quality of life in the subjects of experimental group G1 and control group G2.

Table 2. The values obtained at the initial assessment for pain intensity, stress level and quality of life

No	The evaluated parameter	Group N=15	mean±std.dev.	min.val.	max.val.	$p \leq 0,05$
1	Pain intensity	G1	7,13±0,64	6	8	**p = 0,299**
	Pain intensity	G2	7,40±0,73	6	8	
2	Stress level	G1	64,73±7,50	53	75	**p = 0,723**
	Stress level	G2	65,67±7,72	55	75	
3	Quality of life	G1	11,00±1,55	9	14	**p = 0,091**
	Quality of life	G2	12,20±2,14	9	17	

Table 3 shows a comparison of the averages of the final results obtained in the evaluation of the pain intensity, stress level and quality of life and pain reduction duration in the subjects of experimental group G1 and control group G2

Table 3. Intergroup comparison of final values for pain intensity, stress level, quality of life, and duration of pain reduction

No	The evaluated parameter	Group N=15	mean±std.dev.	min.val.	max.val.	p ≤ 0,05
1	Pain intensity	G1	3,73±0,79	2	5	**p = 0,000**
	Pain intensity	G2	6,20±0,86	5	8	
2	Stress level	G1	48,40±4,43	38	58	**p = 0,000**
	Stress level	G2	61,80±5,85	52	70	
3	Quality of life	G1	21,07±4,68	15	30	**p = 0,000**
	Quality of life	G2	14,93±2,12	11	18	
4	Pain reduction duration	G1	2,00±0,92	1	4	
	Pain reduction duration	G2	6,47±1,12	5	8	**p = 0,000**

Table IV shows the degree of association between pain intensity and quality of life, as well as between stress level and quality of life for subjects in the experimental group and control group. It is observed that at the subjects of the experimental group there is a significant correlation both between pain intensity and quality of life [r= -339, p≤0.005], and between stress level and quality of life [r= -008, p≤0.005]. In control group subjects, it is observed that there is no significant correlation between pain intensity and quality of life [r= -393, p≤0.005], but there is a significant correlation between stress level and quality of life [r= -513, p≤0.005].

Table 4. Degree of association between pain intensity and quality of life, stress level and quality of life, for the experimental and control group

No.	**Related parameters**	**Experimental Group N = 15**		**Control Group N = 15**	
		mean±std.dev.	**p≤ 0,005**	**mean±std.dev.**	**p≤ 0,005**
1	Pain intensity	3,73±0,79	0,004	6,20±0,86	0,217
	Quality of life	21,07±4,68		14,93±2,12	
2	Stress level	48,40±4,43	0,002	61,80±5,85	0,005
	Quality of life	21,07±4,68		14,93±2,12	

Discussions

Comparing the results obtained by us with the results of other specialized scientific studies, we believe that it has been demonstrated the effectiveness of using CranioSacral therapy in reducing the intensity of pain and stress level and increasing the quality of life of patients with cervical pain.

CranioSacral Therapy has been shown to be effective and safe in reducing the intensity of cervical pain and can improve functional disability and quality of life up to 3-6 months after the intervention. CranioSacral therapy can be a useful treatment option adding to standard medical care especially in chronic neck pain and recurrent pain. [10]

In 2016 a study was published in the specialized magazine "Clinical Journal of Pain" from the United States of America in which 54 patients with cervical pain of various causes participated and other problems associated with these pains (headaches, migraines, paresthesias in the arms, pain in the shoulders). Patients treated with CranioSacral therapy have reported an improvement in the quality of life, a considerable reduction in pain during movement, a reduction in anxiety, an improvement in the quality of sleep, as well as an overall improvement in mental state. [11]

Conclusions

Considering the results obtained in the first study in subjects who benefited from 6 sessions of CranioSacral therapy **(G1)** or 6 sessions of physical therapy **(G2)**, it is obvious to us that both therapeutic approaches, both CranioSacral therapy and physical therapy, managed to change the parameters in a positive way.

If initially the two groups started on average with similar values for all the parameters considered, at the end of the treatment the subjects of the experimental group who benefited from CranioSacral therapy had a lower pain level and a lower stress level and a higher satisfaction level of quality of life than control group subjects. In addition, pain decreased in a much shorter period of time (an average of 2 days) in subjects who benefited from CranioSacral therapy **(G1)** compared to subjects who benefited from physical therapy **(G2)** (an average of 6.47 days).

When interpreting the Bravis-Pearson test (r coefficient) in the experimental group **(G1**), it is observed that there is a significant correlation both between pain intensity and quality of life [r= -339, p≤0.005] in the sense that the decrease in pain intensity will cause a perception of an increase in the level of quality of life, and between stress level and quality of life [r = -008, p≤0.005], that means as the level of stress decreases the perception of quality of life will increase, comparing to the subjects in the control group (**G2**), it is observed that there is no significant correlation between pain intensity and quality of life [r= -393, p≤0.005]. Regarding the correlation between the level of stress and the quality of life [r= -513, p≤0.005] it is observed that there is a significant association between the two parameters as a result of these subjects doing physical exercise and noticing that they were able to cope better with daily demands and even bear pain better, even though it did not decrease as quickly and as intensely, as a result they had a decrease in their stress level which they perceived as an improvement in the quality of life.

CranioSacral therapy has an important role in reducing pain in a much shorter time, which positively influences both the stress level and the quality of life of subjects with cervical pain.

We can state that the the application of CranioSacral therapy has superior results regarding the evolution of pain and stress level compared to the results obtained through physical therapy, with a positive impact on the quality of life of people with cervical pain.

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The Relationship Between Printed Media and the Promotion of Dual Career Among Young People

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Abstract

Introduction: The press contributes in a perfect way to the dissemination of information about sports and the sports field, through its main action: transmission from a transmitter to several receivers. The expansion of information presentation is a certainty, and in modern society, users can create, listen, learn and share certain experiences.
Aim: In the present research, we aim to analyze the relationship between the printed media and the promotion of the notion of "dual career" among young people.
Materials and Methods: The survey method (questionnaire) was used, and the statistical analysis was carried out using the Chi-square Test of Independence.
Results: The results of the study are clear: the subjects do not consider the printed media an effective channel for promoting dual career among young athletes.
Conclusion: The conclusion of the study can provide a future direction of action for decision-makers regarding the education of young people about dual career, using mass media for this purpose.

Keywords: mass media, printed media, dual career, young people.

Introduction

The transition from high school to university, for young people, can be associated with additional stress determined by the change of several variables: the environment, the transition to another level of performance, etc. [1]. Due to the popularization of sports, interest in athletes, beyond competitions and sports events, has grown constantly. However, the phrase "dual career" is not frequently found in sports life and thus cancels the educational side of the individual who constantly participates in specific competitions.

Vidal et al. [2] remind us that dual career is defined as "the combination of elite sport and education"[3]. With all the progress registered in the development of a discourse aimed at the dual career, at the micro (individual), macro (social) or global (political) level, a deep approach to the relationship between dual career and the media is still missing. In recent years, scientific research analyzes the interaction of dual career with the life of young people [4, 5], and specialists present the new aspects of the phrase in the collective conception. Florescu [6] is of the opinion that young people analyze the behaviors and values presented in the mass media, and if the promoted opinions converge towards an accepted conduct, they can become role models.

According to Capranica and Guidotti [7], the media implies shaping the national culture in all aspects, thus including dual career [8]. Athletes are often present in the mass media through the prism of the results obtained. While great performance is constantly portrayed in the communication channels, it also benefits from the help of excessive marketing and advertising. Mass media can influence the public if they use modeling theory. A person from the public sees (or reads) through the media about another person (who is a model) and wants to identify with him, because he considers the model as successful, attractive and worthy of imitation [9]. The author is of the opinion that the media influences thinking in the sense of reevaluating one's own beliefs or conceptions.

The press has an important role in daily life, and the constant exposure of information related to sports and physical exercises is, according to Grosu et al. [10], interesting and fun. Since many of the actions can be exposed in real time, the exchange and presentation of information is an inherent behavior of today's society [11].

The way of communication has undergone, throughout history, a series of radical transformations and each of them is determined by revolutions in communication techniques. In recent years, the media and its influence on society has grown exponentially, along with the development of technology, and some countries even implement formal and non-formal media education programs [12]. If in the beginning there was only the telegraph and the post office, in a short period of time radio, newspapers, television followed and with the advent of the Internet, the possibilities of expression of the mass media increased. Despite the fact that the development of society leads to digital evolution, Pop [13], is of the opinion that the classic media will resist and succeed in adapting to the new by preserving its identity, and the information age will not capture the niche of the traditional media.

Although there are a multitude of information options (television, radio, internet), the printed press has always been considered the key way of presenting information about sports [14], information that can be transferred to the online environment today. That is why the writers or authors of the materials play an essential role in forming the readers' perception of the athletes. How the athletes are promoted, the type of epithets used in their presentation or the actions on the playing field, is decisive in the formation of the opinion on the individual [15]. Clavio [16] is of the opinion that, in the last decades, the amount of news related to sports has increased both in the traditional media and in the new approaches of the media, but newspapers have, however, kept an important role in the sports discourse and in society's culture.

Aim and Hypothesis

The purpose of the research is to determine if there is an interaction between a media dissemination channel (printed media) and the dual career of the athletes.

The hypothesis of the study: The printed press is not an opinion maker in informing about "dual career".

Material and Method

To carry out the main study, a questionnaire composed of 11 items was used, grouped into two categories: mass media and "dual career". The questionnaire used has been pre-tested so that there is no doubt about the understanding of the terms it proposes.

The subjects of the research were 477 12th grade students of High Schools with Sports Program from Moldovian Area (Iasi, Onești, Suceava, Roman, Focșani, Botoșani, Bacău, Piatra Neamț, Vaslui).

In the research carried out, groupings of items were made, in order to analyze and interpret the answers obtained to the questions. The association of the resulting responses was evaluated using multivariate statistical analysis of the data [17]. The interpretation of the answers involved the use of the Chi-square Test of Independence. It determines whether there is an association between categorical variables (it is analyzed whether the variables are independent or associated) and is a non-parametric test [18].

For hypothesis testing, the main item association is represented by the following questions:

I.1 Do you know what the term "dual career" refers to in a sporting context?
I.4 Would a printed material, in which the notion of "dual career" is explained, help you?
together with
I.2 The notion of "dual career" has recently been introduced into the public discourse to indicate: athletes' attempt to combine sporting activity with training, athletes' attempt to combine performance with success, athletes' attempt to combine sporting activity with education, athletes' attempt to combine performance with competition.
I.4 Would a printed material, in which the notion of "dual career" is explained, help you?

We are interested in the existence of a statistical relationship between those who have knowledge about the term "dual career" and their interest in printed material that develops the notion of "dual career". Through this association, we want to know if the use of printed media channels would be suitable for disseminating and popularizing information about "dual career" among our target population - students studying in High Schools with a Sports Program.

To investigate this connection, we used the Chi-square test of Independence, applied to two sets of questions. In the first phase, we tested the association between the way subjects answer if they know what the term "dual career" refers to in a sports context (answers with "yes" or "no") and their opinion regarding the usefulness/help that a printed material on this term provides ("yes" or "no" answers).

Results

The results obtained are presented in figure 1 and table 1. Among those who declare that they do not know what the term dual career refers to, 75.2% believe that a printed material explaining the notion of dual career would help them; if we refer to the subjects who assume knowledge of the term, 82.4% of them consider such material helpful. From a descriptive point of view, we notice that there are differences in perception on the usefulness of such a material (Figure 1, Table 1).

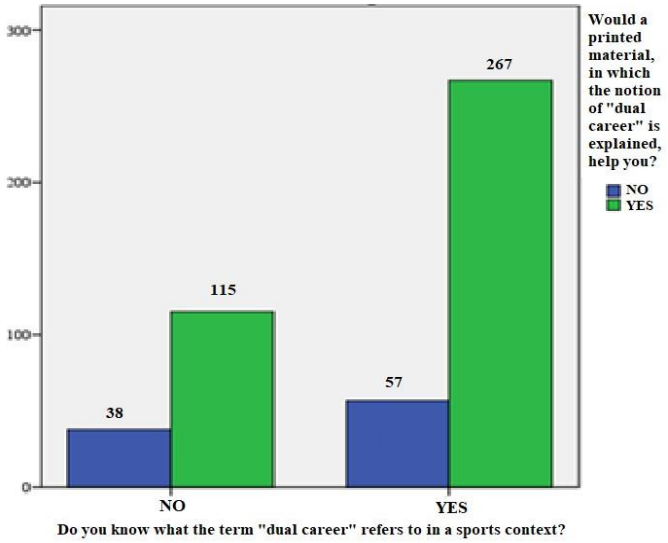

Fig 1. The results obtained for the association of the answers to items 1 and 4

Table 1. Contingency table for the two variables
Do you know what the term "dual career" refers to in a sports context? * Would a printed material, in which the notion of "dual career" is explained, help you?
Crosstab

			Would a printed material, in which the notion of "dual career" is explained, help you?		*Total*
			no	yes	
Do you know what the term "dual career" refers to in a sports context?	no	Counting	38	115	153
		% of Do you know what the term "dual career" refers to in a sports context?	24.8%	75.2%	100%
		% from Total	8.0%	24.1%	32.1%
	yes	Counting	57	267	324
		% of Do you know what the term "dual career" refers to in a sports context?	17.6%	82.4%	100%
		% from Total	11.9%	56.0%	67.9%
Total		Counting	95	382	477
		% of Do you know what the term "dual career" refers to in a sports context?	19.9%	80.1%	100%
		% from Total	19.9%	80.1%	100%

To test whether there is a connection between the way subjects answer the 2 items, we test the independence of the two variables corresponding to the answers to the questions.

The two test hypotheses are:

H0: How subjects respond if they know what the term dual career refers to in a sports context is independent of their opinion of the usefulness/help that a printed material about this term provides.

H1: How subjects respond if they know what the term dual career refers to in a sports context is not independent of their opinion of the usefulness/help that a printed material about this term provides.

The answers that the students gave to the respective items were interpreted statistically in table 2.

Table 2. Results of applying the Chi-square Test of Independence

	Value	*df*	*Asymp. Sig. (2-sided)*
Pearson Chi-Square	3.419[a]	1	.064
Continuity Correction[b]	2.980	1	.084
Likelihood Ratio	3.327	1	.068
Linear-by-Linear Association	3.412	1	.065
N of Valid Cases	477		

a. 0 cells (0,0%) have expected count less than 5. The minimum expected count is 30.47
b. Computed only for 2x2 table

For this association analysis (the case of a 2x2 matrix), we consider the probability associated with the null hypothesis to be 6.4% and if we consider a risk of 5%, we do not reject the null hypothesis, so the variables are independent (Table 2).

Under these conditions, we can say that the way subjects respond if they know what the term "dual career" refers to in a sports context, is independent of their opinion regarding the usefulness/help that a printed material about this term provides it.

Therefore, the statement that the printed material is not suitable for those who declare that they know or do not know what the term "dual career" represents, is supported by the results obtained.

Next, we tested the usefulness of a printed material depending on how each respondent associates the term "dual career" with one of the 4 answer options offered.

How subjects answered the two questions is shown in Table 3.

Table 3. The answers given for items 2 and 4
*Would a printed material, in which the notion of "dual career" is explained, help you? *The notion of "dual career" has recently been introduced into public discourse to indicate: Crosstab*

			The notion of "dual career" has recently been introduced into public discourse to indicate:				
			Athletes' attempt to combine sports activity with training	Athletes' attempt to combine performance with success	The attempt of athletes to combine sports activity with education	Athletes' attempt to combine performance with competition	*Total*
Would a printed material, in which the notion of "dual career" is explained, help you?	no	Counting	12	19	62	2	95
		% of Would a printed material, in which the notion of "dual career" is explained, help you?	12.6%	20.0%	65.3%	2.1%	100%
		% from Total	2.5%	4.0%	13.0%	0.4%	19.9%
	yes	Counting	38	103	234	7	382
		% of Would a printed material, in which the notion of "dual career" is explained, help you?	9.9%	27.0%	61.3%	1.8%	100%
		% from Total	8.0%	21.6%	49.1%	1.5%	80.1%
Total		Counting	50	122	296	9	477
		% of Would a printed material, in which the notion of "dual career" is explained, help you?	10.5%	25.6%	62.1%	1.9%	100%
		% from Total	10.5%	25.6%	62.1%	1.9%	100%

We notice that among those who consider a printed material useful, only 61.3% know what "dual career" represents. Among those who do not consider the printed material useful, a proportion of 65.3% are able to choose the correct answer (Table 3).

Next, we tested whether there is a statistical connection between how students answer the two questions (Table 4).

Table 4. Chi-square Test of Independence analysis for responses to items 2 and 4

	Value	*df*	*Asymp. Sig. (2-sided)*
Pearson Chi-Square	2.192[a]	3	.534
Likelihood Ratio	2.254	3	.521
Linear-by-Linear Association	.054	1	.817
N of Valid Cases	477		

a. 1 cells (12,5%) have expected count less than 5. The minimum expected count is 1.79

Based on the results of applying the Chi-square Test of Independence, we can state that the probability that the two variables (how they answered the two questions) are independent is 53.4% higher than the assumed risk of 5%. For this reason, we can state that there is no connection between the assessment of the usefulness of a printed material and the way in which each respondent associates the term "dual career" (Table 4).

Conclusions

In order for the notion of "dual career" to reach the consciousness of the subjects, the opinion of the students was investigated regarding the ways they prefer to interact with this concept. The results obtained are obvious, namely: the students do not consider the printed media a solution for promoting dual career among them and would not consider it useful to create written materials for disseminating information. In conclusion, we can say that the written way of popularizing the term "dual career" is not the right one, in other words the hypothesis of the study is confirmed.

Acknowledgement

This work was co-funded by the European Social Fund, through Operational Programme Human Capital 2014-2020, project number POCU/993/6/13/153322, project title “Educational and training support for PhD students and young researchers in preparation for insertion in the labor market”.

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Review Regarding Methods Used in the Recovery of Idiopathic Scoliosis

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Abstract

Idiopathic scoliosis is defined as a three-dimensional deformation of the spine, of unknown cause. The diagnosis is made when an angle greater than 10° is observed on the radiograph, associated with rotation of the vertebral body. To assess scoliosis, specialists use tests, X-rays, measurements or questionnaires. Treatment includes a wide range of therapies, with effects that are continually being studied.To analyse the results presented in different articles, which take into account methods and techniques used in the recovery of patients diagnosed with idiopathic scoliosis.A number of 1273 articles published between 2015 and 2023 were found in 3 databases: Google Scholar, PubMed and SpringerLink.
Twenty studies that met the inclusion criteria were selected for analysis and discussion. These articles discuss Schroth exercises (n=16), Pilates exercises (n=4), core stabilization exercises (n=2), specific recovery exercises for scoliosis (n=2), Kinesio Tape (n=1), Proprioceptive Neuromuscular Facilitation Techniques (n=1) as well as other kinetic methods in the treatment of idiopathic scoliosis.Following the study, it can be stated that Schroth therapy is effective in the case of scoliosis both when it is performed independently, but also when it is combined with wearing a brace or breathing exercises. However, we consider this conclusion to be influenced by the research method. We believe that analysis on a much larger number of articles is still needed.

Keywords: Idiopathic scoliosis, Therapy, Exercise, Schroth, Effects, Quality of life

Introduction

Scoliosis is a complex deformation of the spine in all 3 planes, showing lateral curvature and rotation of the vertebrae. Idiopathic scoliosis is considered the most common in patients. In this case, treatment depends on the patient's age, the magnitude of the curvature and the risk of progression, and consists of exercises, orthotics or surgical correction [1,2].

Clinical examination is essential in the diagnosis and treatment of idiopathic scoliosis to rule out other possible causes of the condition. Asymmetries can be highlighted in the shoulders, shoulder blades, pelvis or trunk, or costal gibbosity in the case of forward flexion of the trunk [3, 4].

The Cobb method, described by J.R. Cobb in 1948 and mentioned by Kotwicki, is globally accepted as the simplest method that analyzes the inclination of the bordering vertebrae, but without providing information on the length of the curvature, vertebral rotation or lateral transposition of the scoliosis apex. It is considered that differences below ± 5° between measurements are not clinically significant, and in the case of curvature progression, differences ≥ 6° are required [5].

The SRS-22 questionnaire has become one of the most widely used tools in the clinical evaluation of a patient with idiopathic scoliosis. The test is a way of analyzing the quality of life that includes 22 questions covering 5 domains: function/activity, pain, self-image, mental health and satisfaction with treatment. Each question is scored from 1, the worst, to 5, the best. The domains thus have a total score between 5 and 25, except for satisfaction with treatment, which has a score between 2 and 10 [6].

There are a variety of procedures proposed for treatment, depending on the severity of the curvature, the size of the gibbosity, the age of diagnosis, the skeletal maturity and the patient's opinion of self-image. Simple observation and Xray is enough for mild curves, but severe ones may even require surgical intervention [1], [7].

Aim

The aim of this paper was to analyze the results presented in the research studies regarding different methods and techniques used in the rehabilitation of patients with idiopathic scoliosis.

Materials and Methods

In this study, a number of 16 articles published between 2015 and 2023 in 3 databases (Google Scholar, PubMed and SpringerLink) were analyzed and processed, using as keywords: *idiopathic scoliosis, Schroth, exercise, effects, trial*. Selected articles met the following inclusion criteria: articles published after 2013, full-text in English articles comparing different recovery methods, articles describing the use of Schroth method or other recovery methods.

The exclusion criteria from this study were: review or meta-analysis articles, articles whose title does not contain or refer to at least one keyword, articles that do not use the method of comparison between groups of subjects or the results of the same group, articles that included electrotherapy procedures or spinal manipulations.

Initially, 1273 studies were identified (1090 in Google Scholar, 158 in SpringerLink and 25 in PubMed), from which, following the exclusion of 950 studies (by applying the exclusion criteria), a number of 113 possible articles useful for research remained to be retrieved. Following the elimination of duplicate articles, those whose title or abstract did not correspond to our research, in the current study, we chose the 16 most relevant articles to analyze and discuss.

Results

In this review, a number of 16 studies using Schroth exercises (n = 16), Pilates exercises (n = 4), core stabilization exercises (n = 2), specific recovery exercises for scoliosis (n = 2), Kinesio Tape (n = 1), Proprioceptive Neuromuscular Facilitation Techniques (n = 1) or others (n = 7), as well as kinetic methods in the treatment of idiopathic scoliosis. In total, a number of 747 patients were included in the studies, but the studies carried out by Schreiber et al. (2015, 2016, 2019) used the same group of subjects, so the actual total number of patients studied was 647. Among the parameters identified and quantified, the Cobb angle was the most frequently measured parameter, being present in 16 of the studies, followed by trunk rotation angle (n = 10) and quality of life, using questionnaires (n = 8).

After analyzing the articles included in this paper, it was decided to combine the studies according to the treatment method applied and the group with which it was compared. Thus, we divided the studies into six categories, in which the Schroth method was compared with other types of therapy such as basic gymnastics, Pilates, Kinesio Tapes, breathing exercises, proprioceptive neuromuscular facilitation techniques or core stabilization exercises.

Schroth Method Without Control Group

Two articles were found and analyzed that used Schroth method, as a treatment, in a number of 43 and 12 patients respectively (n = 55). The studies did not use a control group, only comparing the results of patients before and after starting the exercise program. Both studies apply a similar approach, but there are differences in their design and methodology. The study by Gao et al. [8] is focused on adolescent idiopathic scoliosis (n = 17), having a sample of 43 patients (36F + 7M), larger than the 12 patients described by Ng et al. [9] (11F + 1M), where the focus is on idiopathic scoliosis in adults. Schroth exercises were applied similarly in both studies, starting with a period of learning and understanding during classes or meetings, followed by continuation of the exercises at home. Ng et al. describes a 9-month period in which exercises were continued at home, unlike Gao et al. where the period is noticeably longer and varies depending on the patient, between 25 and 52 months [8, 9].

Regarding Cobb angle, in the study by Ng et al. significant differences of $p = 0.0032$ were observed, compared to the study by Gao et al, where p was 0.084, thus having different results between the two. Ng et al. obtain improvements ($\geq 6°$) at 33.3%, being described as statistically significant ($p = 0.0032$), unlike Gao et al., who also obtained a reduction in curvature, but which is not significant ($p = 0.084$), as well as curvature progression of $1.2 \pm 1.1°$ per year in 6 patients. Ng et al. also obtained a significant difference ($p = 0.0115$) in the case of trunk rotation angle, in 10 of the patients [8, 9].

For the SRS-22 questionnaire, significant differences were observed, mentioned by both authors, in terms of self-image, with the mention that the study by Gao et al. does not measure the initial value. Regarding pain, assessed with the SRS-22 scale, significant changes were observed as mentioned by Gao et al. in which the duration of the study was longer than in the case of the other study, which did not achieve significant results [8, 9].

Schroth Method vs Standard Treatment or No Treatment

A number of 6 studies used an experimental group, where Schroth method was applied, this being compared with a control group that used basic treatment, brace or that did not receive treatment [10,11,12,13, 14, 15]. Of these studies, 3 of them were carried out on the same group of 50 people, in which all patients received basic treatment, which includes observation, brace and, if necessary, surgical treatment [10, 11, 12]. Five of the studies dealt with adolescent idiopathic scoliosis [10, 11, 12, 13, 15] and one of the studies only provided details on the mean age [14]. Kwan compares 2 groups to find out whether the use of Schroth exercises influences the results of brace treatment, noting a greater improvement in Cobb angle if compliance with the exercises is greater [15]. Instead, Lee & Lee highlighted the results of Schroth therapy using patients who could not receive treatment, for various reasons, and Kuru et al. compared 3 groups to see both whether the therapy is effective and whether it is important to do it under supervision. [13, 14]. Comparing the methodology of exercise application, similarities and differences between the procedures can be observed. Thus, the study by Scheiber et al. consisted of 5 learning sessions during the first 2 weeks, followed by weekly sessions accompanied by a home exercise program [10]. Lee & Lee did not use Schroth exercises at home, opting instead to treat patients in 2-hour sessions, 2 times a week, for 12 weeks [14]. Similar to Scheiber et al., Kwan et al. used a 2-weekly learning session for 8 weeks, followed by a home program, but no follow-up sessions under supervision [10, 15]. Kuru et al. used the exercises under supervision and those at home, but with the use of different groups [13].

In terms of results, Scheiber et al. (2016) showed a significant reduction in the maximum curvature angle ($p = 0.006$), but also in the sums of the curvatures ($p = 0.046$), in favor of Schroth exercise therapy [11]. Scheiber et al. (2015) strengthen the case for more effective exercise by improving Biering-Sorensen test scores and SRS-22r scores [10]. Significant improvements in radiological parameters were also noted by Lee & Lee, but without significant changes in appearance [14]. Kuru et al. did not obtain significant changes in the SRS-23 test in either group, but obtained significant differences in Cobb angle and trunk rotation angle [13]. Lee & Lee, Scheiber et al. (2019) and Kwan et al. also note the achievement of significant changes in the rate of correction in patients with idiopathic scoliosis in favor of Schroth exercises. Regarding exercise effectiveness, Kuru et al. showed that Schroth exercises performed under supervision are superior to those performed at home [12, 14, 15].

Schroth Method vs Pilates Method

Comparison of the Schroth and Pilates methods was found in four studies [16, 17, 18, 19]. Of these, 2 compared Schroth exercises with Pilates exercises [16, 17]: one compared Pilates exercises with Schroth breathing and Pilates exercises with lateral breathing [18] and one compared braced and unbraced patients who performed Schroth exercises and Pilates exercises. [19] Regarding patients, studies by Kim & HwangBo, HwangBo (2016) and HwangBo (2018) had only female subjects; the study conducted by Rrecaj-Malaj et al. although it had male subjects, their percentage was only 36.2% [16, 17, 18, 19].

Kim & HwangBo, HwangBo (2016) and HwangBo (2018) they used the same procedure for conducting meetings, 3 times a week for 12 weeks [16, 17, 18]. Rrecaj-Malaj et al., conducted the study for 24 weeks, divided into 2 equal periods: the first 2 weeks subjects learned the exercises under supervision, followed by 10 weeks of home exercises that remained the same

throughout the period; patients were also assessed at 12 weeks, as in the other 3 studies. Regarding the results, a higher quality of Schroth exercises is observed, but also the Pilates exercises had significant results in the correction of idiopathic scoliosis [19]. Kim & HwangBo and Hwang Bo (2016) identified significant improvements in the Cobb angle, both between pre- and post-study measurements, and between the two groups, in favor of the Schroth groups [16, 17]. HwangBo (2016) also analyzed patients' psychological factors, with the same intra-group and between-group results similar to those found by HwangBo (2018) in favor of Pilates exercises with Schroth breathing [17, 18]. Rrecaj-Malaj et al. showed that if these 2 methods are used together, they can reduce the Cobb angle and the trunk rotation angle, with benefits also on the amplitude of trunk flexion on the pelvis and quality of life, regardless of whether or not the patient wears a brace [19].

Schroth Method Along With Kinesio Tape or Breathing Exercises

A number of 2 articles reviewed used Schroth exercise therapy, but in combination with the application of kinesiology tapes or breathing exercises. To find out and show the effects of the methods, both studies used the comparison of the combined therapy with a control group that was only given Schroth exercises [20, 21]. In the case of the study conducted by Kim & Park, the application of the therapy for 8 weeks is described, with a preparatory exercise done at the beginning of the session (5 min.), followed by the breathing exercises done in the experimental group or on the stationary bike in the control group (10 min.) and Schroth exercises (40 min.), ended with the same preparatory exercise (5 min.) [21]. Duangkeaw et al. reported that the sessions were conducted for 6 weeks, with 2-hour per session, for 2 times a week, only with female patients in the group. Instead, in the study of Kim & Park, there were 33.3% male patients [20, 21]. Taking into account the measurements made, both studies analyzed the Cobb angle and pulmonary function parameters, obtaining significant results ($p < 0.05$) both in the experimental group and in the control group. Duangkeaw et al. also provide statistical data on trunk rotation angle and Biering-Sorensen test results, obtaining significant results. Thus, in addition to the benefits brought about in the case of the Cobb angle and the angle of trunk rotation, Schroth exercises in combination with Kinesio Taping improve the endurance of the back muscles and respiratory function [20]. Kim & Park observed that a combination of Schroth and respiratory exercises is superior to the use of Schroth therapy alone in improving Cobb angle and respiratory parameters [21].

Schroth Method vs Proprioceptive Neuromuscular Facilitation Techniques (PNF) and Schroth Method vs Core Exercises

The efficiency of Schroth exercises is also highlighted by 2 other studies that compare 2 different procedures, as follows: in the study by Mohamed & Yousef, Schroth exercises are compared with PNF techniques, and in the study by Kocaman et al., Schroth exercises are also compared, but with core stabilization exercises [22, 23]. In total, Mohamed & Yousef use a group of 34 female patients, larger than the 28 used by Kocaman et al., but the last one also includes 7 male patients. Both studies applied the sessions 3 times a week, but with varying durations between them. Kocaman et al. described a session duration of 90 minutes, applied over a period of 10 weeks, while Mohamed & Yousuf used 60 minutes per session, done over 6 months [22, 23]. Significant results were obtained between Cobb angle and rotation angle

measurements in Schroth exercise group, as well as between group values. Mohamed & Yousef did not achieve significant results in the use of PNF techniques, not being recommended as a way of correction [23]. In contrast, core stabilization exercises have been shown to have significant effects on radiological parameters and quality of life, but less than Schroth exercises [22].

Conclusions

After analyzing the 16 articles, a higher percentage of studies including only female subjects is observed, the possible reason being the difference between the sexes in terms of the incidence of the pathology. Studies show that Schroth exercises influence the evolution of scoliosis in a positive way. Also, the association of Schroth therapy with Pilates, with the application of Kinesio Tape or with specific corrective and core stabilization exercises can bring more effectiveness in the correction of idiopathic scoliosis. In contrast, facilitation techniques do not provide significant effects in correction.

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Differences in the Manifestation of Psychomotricity, Determined by Age, in Children who Practice Swimming

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Abstract

Introduction: The psychomotor area is vast, if we start from the idea that every movement requires motivation, mental support and feelings. Psychomotricity follows motor acquisitions coordinated through mental activity and the progress of the human being in the first years of life and childhood, acquisitions that must lead to the creative, affective and social development of the individual depending on himself and the social environment in which he lives.
Aim: The aim of the study was to highlight the differences in the manifestation of psychomotor behaviors - according to age - in children who practice sports swimming.
Materials and method. The research subjects (N=82 distributed in two subgroups: 42 aged between 6.0-7.11 years; respectively, 40 aged between 8.0-9.11 years) are male (n=41) and female (n=41) children who practices sports swimming in one of the swimming pools of a city in Romania. They were tested, using specific instruments, to evaluate six components from the psychomotricity sphere: 1. manual dexterity; 2. body diagram; 3. body balance; 4. body balance on water/buoyancy; 5. spatial orientation; 6. general coordination. The study was conducted over a period of 10 months (September 2022 - July 2023). Children participated in two swimming sessions per week.
Results: For five of the research variables (manual dexterity, body schema, body balance, spatial orientation and general coordination) statistically significant differences were found, while for only one variable (body balance on water) no statistically significant differences were recorded. The results indicate differences between the two age groups, the subgroup of older children (8.0-9.11 years) who practice swimming having more developed psychomotor skills compared to the younger ones (6.0-7.11 years).
Conclusions: Psychomotor skills are interrelated with the age factor for children who practice swimming. Increasing age determines better psychomotor manifestations.

Keywords: swimming, children, psychomotor behaviors, age.

Introduction

For a very long time, the specialized literature did not make a clear differentiation between the terms motricity and psychomotricity. Most of the time the term motricity included movement in all its complexity, with both the motor and the mental side [1].
In most dictionaries the two terms (motricity and psychomotricity) have partially or totally overlapping definitions. However, the term psychomotricity would not have appeared if there

was no real need, especially in practical activity, to differentiate it from that of motricity. The differentiation of these terms is therefore carried out for practical purposes, when in one of the two fields there are difficulties that must be removed through psychomotor education, physical therapy or medical physical culture.

The field of psychomotricity is in a permanent evolution, continuously researched, and gradually approached in academic physical education. Psychomotor education is really important because from a biological and mental point of view it contributes to the integral development of the child. From a motor perspective, psychomotricity accelerates the main functions and improves the social-affective component [2, 3].

Psychomotricity has been explained and debated, theoretically and practically, as a technique aimed at forming and strengthening temperament and personality with effects in proper social integration [4].

In this study, we started from certain questions that were generated by the practical activity at the swimming pools:

- what are the age differences in the manifestation of psychomotor behaviors among children who practice swimming?
- do older children have a better level of manifestation of psychomotricity compared to younger children?

Through this research we measured the level of psychomotor behaviors (manual dexterity, body schema, body balance, body balance on water/buoyancy, spatial orientation and general coordination) on a sample of 82 subjects (42 younger children, aged between 6.0-7.11 years and 40 older children, aged between 8.0-9.11 years), practicing sport swimming at a swimming pool in the Municipality of Iasi, Romania. We noticed the differences between older children and younger children.

Materials and Methods

The Variables of the Research and Mode How They Were Measured and Evaluated

The independent variable in the study was age, older children (8.0-9.11 years) and younger children (6.0-7.11 years). We have used the following variables from the area of psychomotricity, as dependent variables: 1. manual dexterity, 2. body scheme, 3. body balance, 4. body balance on water/buoyancy, 5. spatial orientation, 6. general coordination.

a. *Manual Dexterity*

In specialized literature, manual dexterity is divided into: finger and hand dexterity. Finger dexterity is the ability to perform precisely coordinated movements with the fingers of the hands (with or without manipulation of objects); Hand dexterity is the ability to perform precisely coordinated movements of one hand or one hand together with the forearm and arm - entire upper limb [5, 6].

To determine the level of manual dexterity of the children who are part of the research sample, we used the "Punctuation" Test. This is a test that measures manual dexterity and speed manual [7, 8, 9, 10].

b. *Body Scheme*

Body scheme is the image that each person has of his own body in the context of the relationship between his body segments and the environment. Body positions become known through contact with various objects in the environment [11].

Body scheme plays an important role in the motor learning process. Through it, the

movements of the body from the inside to the environment are organized, and it also influences motor development [12].

To measure the body scheme, we used the Goodenough Test [13, 14].

c. *Body Balance*

Body balance is an individual's ability to regulate the relationship between the center of gravity (the line of gravity) and the base of support during activities of daily living. It can also be defined as the act of maintaining, achieving or restoring a state of balance during daily activity [15].

This variable was measured by means of the Flamingo Test [16, 17], which is also called the static position test on one leg - single leg stance [18, 19, 20].

d. *Body Balance on Water/Buoyancy*

In research articles, the phrase hydrostatic profile is found, which refers to the ability to float - buoyancy [21, 22]. The hydrostatic profile of swimmers can be measured with several valid and accurate instruments and techniques [21, 23].

The specialized literature presents the Vertical Buoyancy Test as a simple and easy procedure for estimating the hydrostatic profile [24]. This test consists of maintaining the balance of the body vertically in deep water, in apnea after a deep breath has been taken beforehand through the mouth.

e. *Spatial Orientation*

Spatial orientation is the ability of the individual to locate and orient himself in relation to objects, people and his own body in a given space. It is knowing how to locate what is to the right or left, before or behind, above or below oneself [25]. Studies show that subjects who practice sports have better spatial orientation than non-athletes [25].

The Spatial Orientation variable was measured by Spatial Perception and Dynamic Balance Test. This test was applied to investigate proprioception and spatial orientation but also to determine coordination skills and dynamic balance [26].

f. *General Coordination*

There are two basic modes of coordination that have been identified and investigated in depth in the study of cyclic movements (such as swimming). These are [27]:

- in-phase coordination refers to simultaneous contraction of homologous/paired muscles (e.g., flexion or extension of arms simultaneously);
- anti-phase coordination refers to the simultaneous activation of non-homologous/paired muscles (e.g., flexion of one arm and extension of the other).

Several recent studies have emphasized the close relationships between arm coordination, speed and execution technique in sports swimming [28, 29, 30].

This variable, general coordination was measured by means of the Matorin test [31].

Research Objectives

The main objective of this research study is to highlight the differences in the manifestation of psychomotor behaviors in children who practice sports swimming, depending on the age variable (younger children of the age 6.0-7.11 years comparative with older children of the age 8.0-9.11 years).

Research Hypotheses

In this research we proposed the following main study hypothesis: we believe that there is a differentiation in the manifestation of psychomotor behaviors in children who practice

swimming according to the age variable. Specifically, older children (8.0-9.11 years) have better psychomotor skills than younger children (6.0-7.11 years).

The secondary hypotheses derived from the main hypothesis:

H1 – manual dexterity is significantly better among older children compared to younger children;

H2 – body scheme is significantly better among older children compared to younger children;

H3 – body balance is significantly better among older children compared to younger children;

H4 – body balance on water/buoyancy is significantly better among older children compared to younger children;

H5 – spatial orientation is significantly better among older children compared to younger children;

H6 – general coordination is significantly better among older children compared to younger children.

Research Population and Sample

To carry out this research, we used the observation method (participatory observation).

The research was carried out in compliance with the ethical principles imposed by the Oviedo Convention of 1997. The subjects were informed about the research in which they would participate and a written consent was obtained from a parent regarding the fact that the young swimmers would be part of a study of research aimed at the area of psychomotricity.

The study population consists of children aged 6.0-9.11 years (M = 7.90; SD = ±0.45) who practice sports swimming in the Municipality of Iasi, Romania, and the study sample consists of 82 subjects who practice swimming twice a week (two hour per session), at the Zenity Pool Iasi, Romania (Table 1). Subjects are in the consolidation stage a of front crawl, backstroke and breaststroke styles.

Table 1. Research subjects - age distribution

Sample research	The research subjects	Percent	Valid Percentage	Cumulative percentage
Younger children (6.0-7.11 years)	42	51.22	51.22	51.22
Older children (8.0-9.11 years)	40	48.78	48.78	100.0
Total	82	100.0	100.0	

Results

Collected data were systematized and entered into a database using IBM SPSS 20 (IBM Corp, Armonk, NY, USA). In the statistical processing of the data, descriptive analyzes were performed in order to check the distribution of the data (Kolmogorov-Smirnov Coefficient). The t-test for independent samples was used to check statistical differences between variables. The confidence interval taken into account was 95% (sig. 0.05).

Testing the main hypothesis and those derived from it.

To test the main hypothesis and those derived from it, we used the t-test with two independent samples, the results of which are included in Table 2 and Table 3.

Table 2. Descriptive statistical analysis - research variables

Research variables	Gender	N	Mean	Std. Deviation	Std. Error Mean
1. Manual dexterity *Tapping Test*	Younger children	42	70.26	9.17	1.51
	Older children	40	73.85	9.03	1.56
2. Body scheme *Goodenough Test*	Younger children	42	16.54	4.53	.59
	Older children	40	19.63	4.46	.54
3. Body balance *Flamingo Test*	Younger children	42	10.11	2.05	.41
	Older children	40	12.83	1.91	.38
4. Body balance on water/buoyancy *Vertical Buoyancy Test*	Younger children	42	17.58	2.63	.47
	Older children	40	18.03	2.15	.36
5. Spatial orientation *Spatial Perception Test*	Younger children	42	8.34	1.30	.25
	Older children	40	6.27	1.24	.18
6. General coordination *Matorin Test*	Younger children	42	10.56	2.26	.58
	Older children	40	13.71	1.87	.47

In interpreting this t-test for independent samples we start from the significance value (sig) of Levene's test (F). For the research variables, the sig of the Levene's test has the following values: manual dexterity = 0.68; body scheme = 0.58; body balance = 0.12; body balance on water/buoyancy = 0.14; spatial orientation = 0.20 and general coordination = 0.02.

Of all the variables, only overall coordination has the significance threshold of the Levene's Test for Equality of Variance within the margin accepted by the academic community (sig. 0.05 or less). For this variable - general coordination - we will interpret the data from the second row of T-Test for Equality of Means. For the other variables we will interpret the data from the first row.

Table 3. Testing Research Hypotheses - Independent Samples t-Test

RESEARCH VARIABLES		Levene's Test for Equality of Variances		t-test for Equality of Means				
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference
1. Manual dexterity	EVA*	.055	.688	3.53	82	.025	3.59	1.016
	EVnA*			3.53	81.4	.025	3.59	1.015
2. Body scheme	EVA*	.142	.586	4.38	82	.032	3.09	.704
	EVnA*			4.39	81.5	.032	3.09	.703
3. Body balance	EVA*	1.34	.122	7.86	82	.015	2.72	.346
	EVnA*			7.93	81.8	.014	2.72	.343
4. Body balance on water /buoyancy	EVA*	3.68	.144	.98	82	.202	.45	.456
	EVnA*			.99	79.9	.201	.45	.452
5. Spatial orientation	EVA*	1.59	.201	-3.23	82	.027	-2.07	.064
	EVnA*			-3.13	79.7	.025	-2.07	.066
6. General coordination	EVA*	3.08	.027	6.81	82	.024	3.15	.462
	EVnA*			6.73	79.0	.021	3.15	.468

*EVA = Equal variances assumed; *EVnA = Equal variances not assumed

Interpretation of Results for Each Variable

a. *Manual Dexteterity*

The manifestation of the variable manual dexterity according to the age of the subjects shows 3.59 percentiles in favor of older children compared to younger children. The arithmetic' mean of the values obtained for this variable by older children (M = 73.85; SD = ±9.03) is statistically significantly higher (t = 3.53; df = 82; p = 0.02) compared to the mean for younger children (M = 70.26; SD = ±9.17). Therefore, we can state that the hypothesis H1 - manual dexterity is significantly better among older children compared to younger children is confirmed.

b. *Body Scheme*

From the measurements made (Goodenough Test), we find that older children have a better body scheme than younger children with 3.09 points. The arithmetic' mean of the values obtained for this variable by older children (M = 19.63; SD = ±4.46) is statistically significantly higher (t = 4.38; df = 82; p = 0.03) compared to the average for younger children (M = 16.54; SD = ±4.53). From the data presented above, it follows that the hypothesis H2 - body scheme is significantly better among older children compared to younger children is confirmed.

c. *Body Balance*

The manifestation of the variable body balance according to the age of the subjects shows 2.72 seconds in favor of older children compared to younger children. The arithmetic' mean of the values obtained for this variable by older children (M = 12.83; SD = ±1.91) is statistically significantly higher (t = 7.86; df = 82; p = 0.01) compared to the mean for younger children (M = 10.11; SD = ±2.05). Therefore, we can state that the hypothesis H3 - body balance is

significantly better among older children compared to younger children is confirmed.

d. *Body Balance on Water/Buoyancy*

From the measurements made (Vertical Buoyancy Test), we find that older children have a better body balance on water than younger children with 0.45 seconds. The arithmetic' mean of the values obtained for this variable by older children (M = 18.03; SD = ±2.15) is not statistically significantly higher (t = 0.98; df = 82; p = 0.20) compared to the average for younger children (M = 17.58; SD = ±2.63). From the data presented above, it follows that the hypothesis H4 - body balance on water/buoyancy is significantly better among older children compared to younger children is disproved.

e. *Spatial Orientation*

The manifestation of the variable spatial orientation according to the age of the subjects shows -2.07 centimeters in favor of older children compared to younger children. The arithmetic' mean of the values obtained for this variable by older children (M = 6.27; SD = ±1.24) is statistically significantly lower (t = -3.23; df = 82; p = 0.02) compared to the mean for younger children (M = 8.34; SD = ±1.30). Therefore, we can state that the hypothesis H5 - spatial orientation is significantly better among older children compared to younger children is confirmed.

f. *General Coordination*

From the measurements made (Matorin Test), we find that older children have a better general coordination than younger children with 3.15 points. The arithmetic' mean of the values obtained for this variable by older children (M = 13.71; SD = ±1.87) is statistically significantly higher (t = 6.73; df = 79; p = 0.02) compared to the average for younger children (M = 10.56; SD = ±2.26). From the data presented above, it follows that the hypothesis H6 - general coordination is significantly better among older children compared to younger children is confirmed.

From the data presented above, it follows that the main hypothesis of the study - we believe that there is a differentiation in the manifestation of psychomotor behaviors in children who practice sports swimming according to the age variable - is confirmed. More precisely, there are five secondary hypotheses confirmed and one disproved (H4).

Discussion

In this study, we aimed to highlight age differences in the manifestation of psychomotor behaviors in 6,0–9.11-year-old children who practice sports swimming. From the quantitative data analyzed in this study, it appears that older children who practice swimming have more developed psychomotor behaviors compared to younger children.

For five of the research variables in the field of psychomotricity (manual dexterity, body scheme, body balance, spatial orientation and general coordination), the age factor is an important predictor in their manifestation. The older the age, the better the manifestation of these components of psychomotricity.

In the specialized literature there are studies that studied the connection between grip strength, age and hand dexterity. In adults, the age variable does not have a significant influence in the manifestation of hand dexterity, compared to variables such as grip strength or muscle control, but in children (between 2-14 years) the age variable is important in the manifestation of manual dexterity [32]. And in our study the age variable is an important factor in the manifestation of manual dexterity.

Children's judgments about the sizes of body segments and the body as a whole - the body

scheme - improve with age, and the period 6 to 9 is when the image of one's own body takes shape in space and time. At preschool ages, the body image is unstable, and children's cognitive limitations could explain the lack of a good representation of the body schema [33]. And in our research the body scheme variable is interdependent with the age factor.

There are studies that show that adolescents have better body balance (postural control) than children and contradict certain theories that claim that body balance is defined around the age of ten [34, 35]. Human balance maturity is not completed in childhood and may last until adolescence or young adulthood [36]. And in the case of the subjects in our research (children who practice swimming) body balance has better manifestations in the older ones (8.0-9.11 years) compared to the younger ones (6.0-7.11 years).

In the specialized literature, there are no studies showing that the age variable would be a predictor for body balance on water - buoyancy. In our research, the difference in the manifestation of body balance on water according to age is not statistically significant.

All children use spatial concepts in various areas of their lives, as they are useful for everyday activities, but especially for motor/sports activities [37]. In our research there are statistically significant differences between older and younger subjects (older children have better spatial orientation).

From the analysis of the quantitative data, it appears that the general coordination variable has a significantly better statistical level among older children compared to younger children. Children aged 8.0-9.11 years who practice swimming have 3.15 points better overall coordination compared to younger children (6.0-7.11 years). The literature found increasingly higher scores on this psychomotor skill as children got older, both among girls and boys [38].

Certain researchers state that psychomotor skills, including those presented by us in this research, are interdependent with the age variable in children between 4 and 15 years old [39].

Conclusions

The psychomotor behaviors useful in practicing swimming are manifested differently depending on the age variable, among children who practice this sport. In all psychomotor skills measured and evaluated in this research (manual dexterity, body schema, body balance, body balance on water, spatial orientation and general coordination), the subgroup of older children obtained better results compared to the subgroup of younger children.

We specify the fact that for five variables invoked from the area of psychomotricity (manual dexterity, body scheme, body balance, spatial orientation and general coordination), the differences between the arithmetic means of the two subgroups were significant from a statistical point of view (they had the significance threshold -p-, accepted by the academic community, of less than 0.05). In the one variable (body balance on water/) the differences between the arithmetic means of the two research subgroups (older children and younger children) are not statistically significant, they have a significance threshold of greater than 0.05.

From the above we can draw the conclusion that the age variable is a predictor in the manifestation of psychomotor behaviors among children who practice swimming. This aspect is reinforced by the fact that the main hypothesis of this study we believe that there is a differentiation in the manifestation of psychomotor behaviors in children who practice swimming according to the age variable - specifically, older children (8.0-9.11 years) have better psychomotor skills than younger children (6.0-7.11 years) is confirmed.

Limits of Research

In this study we do not have other groups of children who practice other sports and we did not make a comparison with children who do not practice sports - sedentary.

A more extensive statistical analysis using other instruments, on more psychomotor components and on a larger number of subjects may constitute future directions of analysis.

Conflict of Interests

The author declares that there is no conflict of interests.

Acknowledgments

This work was co-funded by the European Social Fund, through Operational Programme Human Capital 2014-2020, project number POCU/993/6/13/153322, project title "Educational and training support for PhD students and young researchers in preparation for insertion in the labor market".

Author Contributions

All authors have equal contributions. All authors have read and agreed to the published version of the manuscript.

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Swimming Speed Dynamics in Athletes Participating in the 24h "AquaChallenge" Marathon

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Abstract

Introduction: Knowing the oscillations in the speed of the athletes that swim different distances during training or competition is one of the most important directions for predicting performing times over different distances.
Aim: The aim of the present study was to analyze the speed fluctuations in swimming, from round one to the next. We also aimed to determine the rounds with the best and the worst performance, precisely in order to optimize the athletes' physical training.
Material and Methods: During the 9th edition of the 24h AquaChallenge swimming marathon, the speed fluctuation was analyzed on 34 swimmers, 10 of them were females and 24 males, aged between 16 and 74. Each swam 6 laps of 30 minutes. The Timisoara Masters Swimming Club, in collaboration with the Timis County Directorate for Sport and Youth and the Faculty of Physical Education and Sport, processed the demographic data of the participants and timed them during each round.
Results: The results showed that the best performance was recorded in the first round (34.2%), with swimming speed decreasing during each round. In round 5 (61.8%) the lowest performance was determined. As time went by in the competition, the fatigue increased and the athletes could no longer maintain the same speed they started with.
Conclusions: In conclusion, the functional capacity and the maintaining of the same level of speed can be negatively influenced by an increased level of fatigue.

Keywords: speed, fatigue, swimming, athletes

Introduction

Swimming is a challenging locomotion, involving the coordination of upper and lower limbs to propel the body forward in a highly resistive aquatic environment [1]. Swimming is a sport discipline in which muscle strength and body size have an important role in competition performance. Moving through the aquatic environment requires greater energy expenditure [2] given that water is approximately 800 times denser than air, and therefore, the swimmer will have to overcome the resistance it offers in order to move forward [3]. Swimming ranks amongst the most popular leisure activities worldwide [4]. Competitive swimming is a cyclic locomotors activity that occurs in highly constraining environment (as water density is approximately 800 denser than air), causing higher active drag than other cyclic aquatic activities [5].

Swimming performance can be described as the result of the transformation of the swimmer's metabolic power into mechanical power with a given energetic efficiency. Most of the energy produced by the swimmer is utilized to overcome water resistance or drag, and the rate of energy expenditure theoretically increases with the cube of the velocity [6]. Nevertheless, swimming performance is determined by physiological, psychological and anatomical factors [7].

In swimming science, economy of movement is an interesting field of research. In high performance swimming, the common goal at the individual or group level is to answer the question: how to become faster? One variable that would clear this question is to analyze the athlete's technique [8]. Also, several investigations have been conducted to understand the role of bioenergetics and its repercussions in performance. Most of those studies focused exclusively on the contribution of aerobic system to produce energy for movement even though all competitive swimming events also require significant contribution from anaerobic energetic system to cover total energy expenditure [9]. As in other time-based sports, the goal in competitive swimming is to complete a given distance in the shortest possible time [10]. Swimming speed is characterised by a periodically accelerated motion. Intra-cyclic variations of horizontal speed are commonly known as 'speed fluctuation'. Thus, speed fluctuation quantifies the variation in instantaneous speed around its mean value over a full stroke cycle. Regarding the speed fluctuation, it is generally used as an overall indicator of the swimming speed variation over the stroke cycle [11].

Swimming performance can be described as the result of the transformation of the swimmer's metabolic power into mechanical power with a given energetic efficiency. Most of the energy produced by the swimmer is utilized to overcome water resistance or drag, and the rate of energy expenditure theoretically increases with the cube of the velocity [6]. One of the most popular masters' sports is swimming, which is well-suited for lifelong participation [12].

Masters' swimmers are adults who typically train together under the guidance of a coach two or more times per week; they may swim recreationally, for fitness, or competitively and all acknowledge at least a fairly regular pattern of participation in a formal program [13]. While the minimum age requirement for international competition is 25, in many countries, swimmers can register as masters' athletes beginning at age 18. According to research conducted on a European level (Euro barometer) in 2010, 69% of Romanian adults do not regularly conduct sportive activities, the European average in this case being situated at 25%. Basically, in this hierarchy, Romania is on one of the last places in Europe [14].

The present study aims to analyze the speed fluctuations and their dynamics during the "24h AquaChallenge swimming marathon" competition, for amateur participants from Romania. Participants swim for 30 minutes once every 3:30 hours (in total 24 hours of competition). Thus, monitoring of the participants showed that there is a dynamic of speed, but also a fluctuation from one event to another. So, the swimmer does not manage to maintain the same speed from start to finish. Why is this? Physical or mental fatigue, or other factors? We did not set out in this study to identify the factors influencing the fluctuations, but to measure the higher-performing laps and the lower-performing laps to see what the speed dynamics are in this competition.

Fatigue, which has been defined as a "reduced capacity for maximal performance" is recognized as a significant determinant of exercise capacity and sporting performance. Fatigue is a multifaceted phenomenon; performance in a range of tasks is known to be influenced by fatigue that does not necessarily originate within the neuromuscular system [15]. Given that the athletes swam including the night program, we would like to highlight the speed differences between all the races for both women and men.

Aim

The aim of the present study was to analyse the speed fluctuations in swimming, from round one to the next. We also aimed to determine the rounds with the best and the worst performance, precisely in order to optimize the athletes' physical training.

Materials and Methods

In conducting this study, only athletes who completed all six rounds of the competition within 30 minutes were included. In order to determine the distance covered, the referees filled out a course sheet, recording the time for each 50 meters they have swum. Data analysis was performed using Excel software to calculate the average per 100 meters and to create the graphs presented in this paper. The swimming rounds occurred at the following times: Round 1: 1:00 PM - 5:00 PM; Round 2: 5:00 PM - 9:00 PM Round 3: 9:00 PM - 1:00 AM; Round 4: 1:00 AM - 5:00 AM; Round 5: 5:00 AM - 9:00 AM: Round 6: 9:00 AM - 1:00 PM

Results

The descriptive statistics reveal that at the 2023 edition of the 24AquaChallenge competition, there were 6 teams with a total of 58 participants. Among them, 60.3% (35) were male, while 39.7% (23) were female. The age categories for this competition were as follows: Cat.1. participants aged up to 18 years; Cat.2. 19-24 years; Cat.3. 25-29 years; Cat.4. 30-34 years; Cat.5. 35-39 years; Cat.6. 40-44 years; Cat.7. 45-49 years; Cat.8. 50-54 years; Cat.9. 55-59 years; Cat.10. 60-64 years; Cat.11. 65-69 years; Cat.12. 70-74 years. The majority of participants fell into the age categories of 35-39 years (14 participants) and 40-44 years (15 participants). On the other hand, age categories 55-59 years (0 participants), 70-74 years (1 participant), and those under 18 years (2 participants) were at the opposite end of the spectrum. This indicates that, regarding the age of participants, the middle age categories are better represented compared to the two extremes (under 18 years and 70-74 years). 34 participants (58.62%) swam in all 6 rounds of 30 minutes each. Among them, 10 were female and 24 were male. It's worth noting that there was a 3-hour and 30-minute break between rounds. Concerning the age of those who swam in all 6 rounds, we can observe that the middle-age categories (35-39 years, 40-44 years, and 45-49 years) were better represented, with a total of 24 participants (9 female and 15 male).

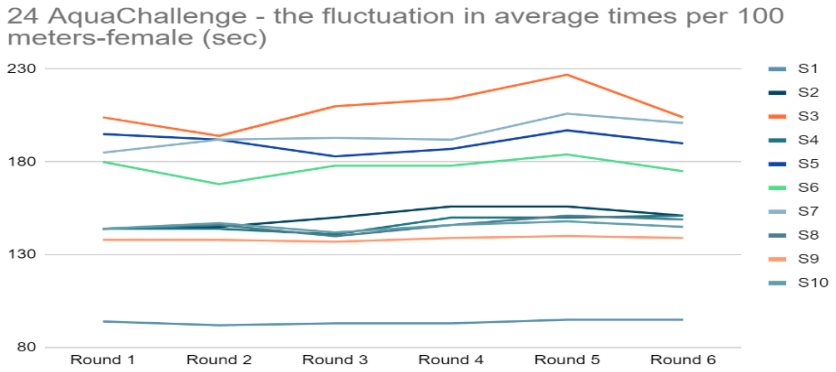

Figure 1. The fluctuation in average times per 100 meters for the female participants

In Fig.1, we can analyze the fluctuation in average times per 100 meters for the female participants. A consistency is noticeable in the first three rounds, followed by a decline in the athletic performance during the night rounds (Round 4 and 5). Additionally, it can be observed that all 10 subjects recorded similar values in Round 6 compared to the first 3 rounds.

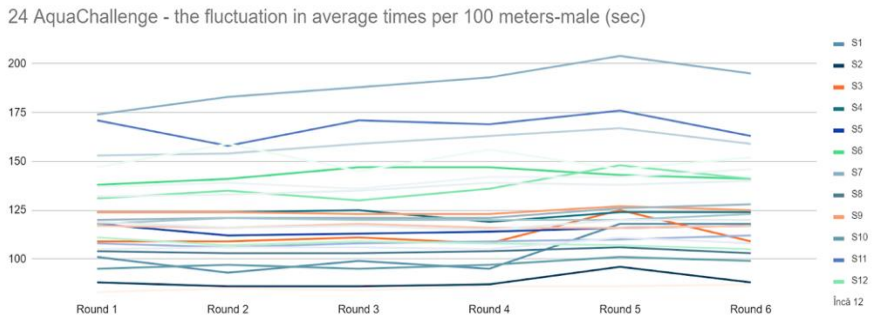

Figure 2. The fluctuation in average times per 100 meters for the male participants.

Regarding the fluctuations in average times per 100 meters for male participants (Fig. 2), a consistency can be observed in the first three swimming rounds, followed by a decline in the athletic performance starting from Round 4. In Round 5, the weakest performance in terms of average times per 100 meters is recorded, which can be attributed to the fact that this round takes place at night. It is also worth noting that, even though Round 6 is the last round, the athletic performance was similar to the initial swimming rounds for most athletes who competed in all six of them.

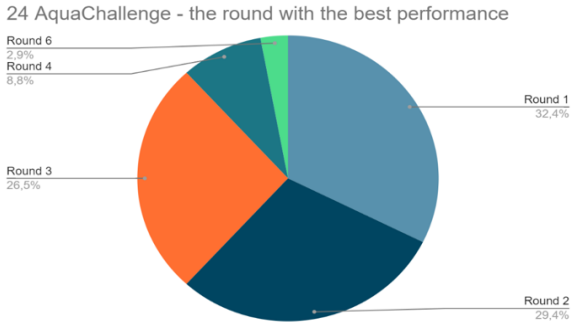

Figure 3. The round with the best performance

Among the 6 rounds of 30 minutes of swimming each, the best results were achieved in Rounds 1 (32.4%), 2 (29.4%), and 3 (26.5%) (Fig. 3). Therefore, in these rounds, athletes swam the longest distance in terms of individual performance. Only 8.8% of participants achieved their best performance in Round 4, and 2.9% managed to swim the longest distance in Round 6. After interpreting the results, we can conclude that the most notable performances in the competition were recorded in the rounds held between 1:00 PM and 1:00 AM, followed by a decrease in performance in the night-time rounds (1:00 AM - 9:00 AM). This can be explained by circadian rhythms and the fatigue accumulated until the night-time rounds.

Additionally, it should be mentioned again that 2.9% of participants achieved their best performance in Round 6. This can be attributed to the careful pacing of effort by these athletes, as well as the fact that, being the final round of the competition, they had extra motivation,

especially those from teams competing for a spot on the podium. In Figure number 7, it can be observed that the weakest performances in the competition were achieved in Round 5 by all athletes who participated in all 6 swimming rounds (Fig. 4).

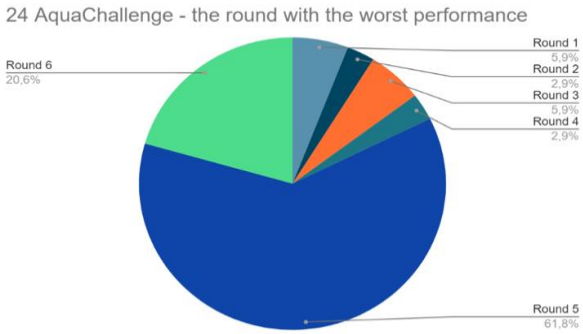

Figure 4. The round with the worst performance

Discussions

The results of our study showed that the best performance was recorded in the first round (34.2%), with swimming speed decreasing during each round. In round 5 (61.8%) the lowest performance was determined. As time went by in the competition, the fatigue increased and the athletes could no longer maintain the same speed they started with. The results obtained by the present study are consistent with those of Răsădean [15], where most subjects had a higher swimming speed at the beginning of the competition, in the first 2 laps, and the speed decreased towards the end of the competition, in the last 2 laps.

In competitive sports, fatigue is an important limiting factor for performance. Inspiratory muscle fatigue may occur in as little as 6 min during high-intensity spontaneously breathing exercise [17]. During fatigue, because of the accumulation of catabolites such as inorganic phosphate and phosphocreatine, the acidity of the interstitial fluid increases causes a change in the shape of the action potential and a decrease of the muscle-fiber conduction velocity [18].

Swimming speed equals the product of stroke length (SL; the distance covered during one stroke cycle) and stroke rate (SR; the number of cycles per second (Hz))[19]. In swimming, speed is directly related to the effective mechanical power output generated by the athlete, and fatigue can be defined as a decrease in effective mechanical power output. Thus, race analyses of swimming competitions, yielding information regarding lap-averaged clean swimming speed (the speed of a race excluding effects of the start, turns, and finish), could provide valuable information regarding how fatigue affects performance outcome [20].

Short-term variations in swimming speed, SL, and SR for a given swimmer (i.e., changes during a race) have been studied as well. Chollet et al. [21], studied variations in stroking characteristics during 100-m races in male swimmers of different skill levels. They concluded that skilled swimmers are able to maintain a more constant SL throughout the race than less skilled swimmers. This would imply that the ability to maintain speed depends more on the ability to maintain SL over the course of the race than SR.

These reductions in speed are within the range of values reported in the literature. Chollet et al. (1997) reported a 5.7% decrease in swimming speed during the last 50 m of a long-course 100-m race. Pai et al. [22] reported a difference in velocity of 6.3% between the first and second 50 m, whereas Letzelter and Freitag [23], found a difference of 7%. It should be noted that in

most of these studies, data were collected during competitive events in which true clean swimming speed for the first 25 m was difficult to measure because of the dive start.

There are few studies that investigate the causes of oscillations in swimmers' speed, both at amateur and professional level. We don't know why some laps show a higher speed and others a lower speed. We assume in this study that fatigue might be the key factor, as athletes get very little sleep in between rounds and the sleep cycle is affected. This is in addition to the muscular fatigue accumulated over the rounds, as well as mental fatigue to cope with the lack of sleep.

Conclusions

In conclusion, following a meticulous examination and comprehensive analysis of the provided evidentiary data and logical arguments, a discernible pattern emerges regarding swimmer performance in relation to fatigue. The observed trends unequivocally indicate a decline in swimmer performance as fatigue progressively sets in. Remarkably, this phenomenon is consistently evidenced across both male and female swimmers.

Notably, the initial round emerges as the phase characterized by the most optimal swim times, substantiating the notion that the participants exhibit their peak performance at the onset of the competition. Conversely, the fifth round consistently stands out as the phase where a substantial majority of participants demonstrate the slowest swim times. This observation is intriguing, considering it precedes the final round.

A plausible explanation for this observed phenomenon may lie in the temporal context of the fourth and fifth rounds, both occurring during nocturnal hours. The amalgamation of advancing fatigue from prior rounds and the added element of potential sleep deprivation during these later rounds could contribute to the discernible decline in swim performance. Such a confluence of physical and environmental factors appears to exert a notable influence on the swimmers' capabilities, manifesting in a decline in performance during the latter stages of the competition.

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Analysis of the Modeling of Physical Condition Through Dynamic Games at the Level of Primary School Students

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Abstract

Introduction: Physical education and school sports are carried out through the lesson, each of them adopting specific organizational methods and contents. For these reasons, the lesson is considered the basic form of physical education and school sports [J.L. Bank et al. 2008]. In the activity of physical education and sports, performance can be seen on the one hand as a result, record success, etc., and on the other hand, aspects such as cognitive performance, motor performance, sports performance, etc. can be encountered [Ene-Voiculescu, 2023].
Aim: Regarding the contribution of physical education to the development of skills, two directions can be distinguished: one refers to the consolidation of general skills, such as: speed of thought, the power of concentration, the spirit of observation, etc., and the other consists in the training of said of some psychomotor attributes, such as: physical strength, speed of movements, static balance, dynamic balance, coordination of movements, mobility, skill, all of which are closely related to the attributes and components of human personality.
Materials and Methods: In the context in which, in order to achieve the objectives established in the activity of physical education and sports regarding the modeling of the physical condition of primary school students, new game programs, current training methods regarding the development of motor skills must be developed, all of which have an important role in the development of creativity children and paying special attention to games.
Conclusions: In conclusion, the sports competitions within physical education classes contribute to the formation of the spirit of equity, respect towards the partner, the feeling of friendship, the spirit of cooperation and last but not least the development of the spirit of fair play.

Keywords: Motor skills, physical condition, movement games, primary education students.

Introduction

Compared to the didactic generalizations regarding typology, content structure, organization, the physical education lesson also has numerous specific features that differentiate it from the other objects provided in the respective education plan:

✓ usually objectives and contents from two different learning units are approached, but having complementary valences, either as a motor structure or as a psychophysical request;

✓ the influence of physical development was constituted as a constant of the lesson structure, which can be realized as a learning unit, as a training situation provided in each lesson, located after the preparation of the body for effort;

✓ the development of motor skills, independent or combined, achieved either through the design of specific learning units, or as a constantly or periodically programmed training situation in the structure of the lesson or as a result of practicing in specific conditions of effort the contents of the learning units addressed in the lesson, it is also a stable preoccupation of the teacher;

✓ preparing the students' bodies for effort, as well as returning after submitting it both during the lesson and at the end of it, are specific and constant training situations [J.L. Bank et al., 2008].

The harmonious physical development of children through sports reduces the risk of obesity, takes care of the health of the heart, helps the optimal development of muscles, ligaments, tendons and the bone system, improves coordination, balance and posture of the body and, last but not least, educates the body to relax after effort thus helping to avoid complications related to muscle tension, developing team spirit, leadership skills and fair play. (https://www.bestkids.ro/blog/sporturi-pentru-copii-cum-alegem-unul-in-functie-de-varsta-si-temperamentul-celui-mic/)

Sport, as an agonistic activity, imposed the term in other fields as well, in technique or social activities, passing from the sphere of motor skills to that of the intellect or art.

In this context, sports performance is the evaluated product of a motor activity. Another aspect that characterizes the competition consists in the fact that it is sometimes at the opposite pole of cooperation, and the rewards are limited and attributed to the athletes who achieve the best performances and who are considered the winners; in the case of cooperation between participants, all are equal vis-à-vis the rewards [Ene-Voiculescu, 2023]

The Motivation for Choosing the Theme

✓ This topic was approached after observing the reactions and reluctance of students towards classic physical education and sports classes and it was found:

✓ Maintaining the old traditional hours in which children are no longer attracted and move away from movement;

✓ Lack of attractive programs to motivate them to exercise;

✓ Students' disinterest in the activities carried out;

✓ Failure to capitalize on the potential of each student;

✓ Spending time in front of the television and the computer;

✓ Defective power supply.

✓ The possibility of carrying out an opportune experiment during physical education classes at the level of primary school students.

✓ The absence from the specialized literature of a methodical volume specific to the training process of primary school students in the context where the current, modern teacher wants to instill in his students the pleasure of working, of making physical effort in a pleasant way, everything organized in the manner playful, of course in an organized way, to develop creativity and to create habits and motivations to be healthy is a main reason in the elaboration of this work.

The Objectives of the Proposed Research

1. Establishing age-specific exercise and game models.
2. Study on the level of physical development and motor structure of primary school students and the development of experimental content focused on intellectual and motor components.
3. Elaboration of models of exercises and games regarding the assessment of students.
4. Experiencing programs regarding the establishment of educated specific motor skills.
5. Opinion survey among students by completing some questionnaires

Research Tasks

1. The study of specialized literature and scientific research works regarding the formative process in physical education and sports in order to model the physical condition of primary school students/
2. Identifying the favorable skills of the students and the evaluation criteria.
3. Investigating the degree of manifestation of favorable skills in fourth grade students.
4. The results obtained expressed by editing some final works.
5. Elaboration of the thesis in its final form.

Working Assumptions

Considering the purpose of the work, that of using games and physical exercise programs implemented in the physical education lesson, we start from the following assumptions:

1. Physical exercises carried out in the form of playful activity contribute to the development and improvement of sensations, perceptions, imagination and representations. Through physical exercise, students get to know their motor possibilities, which enriches and makes their conscious activity clearer, facilitating the development of intellectual skills.
2. If we use specialized programs specially designed according to the level of physical development of children, then the specific motor capacity of primary school students will improve.

We believe that the application in the physical education lesson at the primary level of specially designed and adapted games and exercise programs will lead to the development of ambition, team spirit, to the determination and shaping of the students' physical condition.

Research Methods

Studying specialized literature and authentic scientific research;

- ✓ The preliminary study on the current state of the classes included in the experiment;
- ✓ Anthropometric measurements;
- ✓ Diagnostic method – SWOT analysis;
- ✓ Creating the target-experimental group and developing training projects;

Statistical-mathematical method:

- ✓ arithmetic mean;
- ✓ coefficient of variability;
- ✓ dispersion;
- ✓ Student "T" test;
- ✓ Analysis of the results obtained and evaluation of efficiency;
- ✓ Conclusions.

1. Applied tests

Initial and final tests - somatic parameters

Tanita Tests

Description of functions:

✓ Muscle mass proportion – this function shows the weight of striated and smooth muscles, including the water contained in them;

✓ Bone weight – measures the amount of calcium and other minerals;

✓ Visceral fat – fat from the abdomen that surrounds the internal organs;

✓ Basal metabolic consumption – BMR: this function shows the amount of calories needed for basic metabolism;

✓ Metabolic age – this feature calculates the BMR and shows the average age to which the metabolism belongs;

✓ Total Fitness – this feature compares body composition by comparing body fat and muscle mass

These measurements will be performed at the beginning of the test to see the body composition, where we will observe the segmental distribution of fat mass and muscle mass, and at the final test to observe the evolution of the presented parameters.

2. Applied tests

2.1. Initial and final tests - motor parameters

2.1.1. Application paths:

There will be a time trial. The time achieved will be recorded for the statistical interpretation, in which we will track:

✓ Development of coordination capacities;

✓ Development of reaction and execution speed to visual and auditory stimuli;

✓ Development of eye-motor coordination through activities specific to the physical education lesson. In these tests, we will follow the fundamental movements of the limbs and different body segments, physical capacities and motor activity, so that the students correctly perform complex motor tasks.

Organization and Conduct of Research

The research follows the evolution of two variables, the dependent variable and the independent variable, as well as the positive or negative influence of these variables exerted by certain factors throughout the research.

The evolution of the dependent variable, more precisely the evolution of the results obtained following the application courses, depends on the way in which the independent variable is applied within the lessons, as well as on the actual test conditions.

We will follow the behavior of the dependent variable (applicative paths) within the two groups (experiment group and control group), the application of the independent variable will be applied within the experiment group (the introduction of relays and applicative paths in the physical education lesson).

Results

The research results will be disseminated in international conferences, as well as in articles that will be published in magazines:

- ✓ indexed BDI;
- ✓ ERICH+;
- ✓ ISI articles with impact factor.

Interpretation of Results

Tables and graphs will be made to be able to perform the statistical interpretation following the results of the initial and final tests within the research.

Data and graphical representations will help us define much more precisely the needs and requirements that students will need for fitness modeling.

Conclusions

Physical education is always "an own creation" that must reflect the knowledge, skills, professional abilities of the teacher and the assimilation possibilities of the student.

Decisive in the manifestation of the effectiveness of the physical education lesson is the special ability of the teacher to adapt to the concrete material conditions, to the individual and collective particularities and to the inherent situations that arise during the course of the activity.

Through movement games, in addition to developing certain motor skills, but without realizing it, children communicate feelings, ideas, emotions, relax, releasing accumulated physical and mental tensions.

In conclusion, the sports competitions within physical education classes contribute to the formation of the spirit of equity, respect towards the partner, the feeling of friendship, the spirit of cooperation and last but not least the development of the spirit of fair play.

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Cohesion in Professional Sports Teams. A Sociological Analysis

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Abstract

Introduction: The team in non-individual professional sport represents a self-same social microsystem for achieving specific performances. Beyond the individual physical training and tactical skills of the coach, a sports team that does not function as a fully formed group cannot exploit the resources involved to the full.
Aim: This paper is a sociological analysis of social distance in sports teams, correlated with sense of belonging and individual performance.
Materials and Methods: An online questionnaire was administered to an availability sample of 130 professional athletes from basketball, volleyball, handball and rugby teams. In this questionnaire, we also included an adapted form of the social distance scale (Bogardus).
Results: In general, there is a high degree of acceptance for people of other ethnicity, religion, from another part of the country or from another country, but significantly lower for other sexual orientations. Although all these factors do not directly condition individual performance within the team, the activation of stereotypes (prejudices) can lead to a degradation of the working climate and therefore the commitment and involvement of each individual player.
Conclusions: Although sports performance is primarily conditioned by the physical and tactical preparation of each team member, the climate of the small group is also a factor that can contribute more or less to its achievement. Involving coaches in strengthening group cohesion and facilitating communication between players (not just during matches) can increase cohesion, which is an important resource for professional sports teams.

Keywords: team cohesion, social distance, the performance of sport team

Introduction

The team in non-individual professional sport represents a self-same social microsystem for achieving specific performances. Beyond individual physical training and the tactical skills of the coach, a sports team that does not function as a fully formed group cannot exploit the available resources to the full.

The importance of social relationships has been highlighted in several sociological concepts, which differ in their understanding of the nature of these relationships. Based on the role of different types of social relations in social life and in the cohesion of groups, several theories have been formulated in contemporary sociology, with the emphasis on a particular type of relations. The best known are: sociometric theory, group dynamics theory, symbolic

interactionism [1]. There are also theories that highlight the fact that social relationships are primarily physical relationships. The best-known theory of this type is that of E.T. Hall (1966). The four distances or zones established by E.T. Hall are as follows: a) intimate zone (15-46 cm), b) personal (46-122 cm), c) social (1.22-3.60 m) and d) public (over 3.60 m). The cultural origin of the interlocutor modifies these distances and requires us to know and respect the specifics, keeping each time the distance that the other considers appropriate. The cultural origin of the interlocutor modifies these distances and requires us to know and respect the specifics, keeping each time the distance that the other considers as due. In a face-to-face meeting, it is expected that we do not get closer than the concrete situation requires, otherwise the interlocutor either rejects us explicitly or withdraws to defend his imaginary territory in which he feels comfortable. A related theme to social relations theory is that of social networks which also inspires the similarity/attraction hypothesis between group members [2]. According to this theory "members with similar attributes (same age or gender) will tend to interact more frequently and more positively with each other than dissimilar group members. This general tendency of similar actors to develop stronger bonds has been labeled in the social networking literature as homophily"[3]. According to this theory, if group members share more common characteristics, they will be more strongly attracted to each other than if their characteristics were marked by difference. Social interactions with similar members are more desirable also because in the mechanism of comparison the individual has his own values and attitudes confirmed [4]. In antithesis the term homophobia has been given a meaning referring to a specific type of xenophobia, namely: homophobia is critical and hostile behaviour, which leads to discrimination and violence on the basis of sexual orientation, towards non-heterosexual people [5].

Aim

This paper is a sociological analysis of social distance in sports teams, correlated with sense of belonging and individual performance.

Materials and Methods

This paper is a sociological analysis of social distance in professional sports teams, related to the socio-demographic profile of the respondents. For this purpose, an online questionnaire was administered in March 2023 on a sample of 130 professional athletes from basketball, volleyball, handball and rugby teams. In this questionnaire we also included an adapted form of the social distance scale (Bogardus), focused on 5 dimensions: the degree of acceptance of a teammate of a different religion, ethnicity, from a different part of the country, from a different country and with a different sexual orientation. Although the recorded data come from a sample of availability and do not allow statistical generalizations, they do represent a relevant trend that coaches could take into account in the integration process of new players

Results

The structure of the investigated sample is as follows:

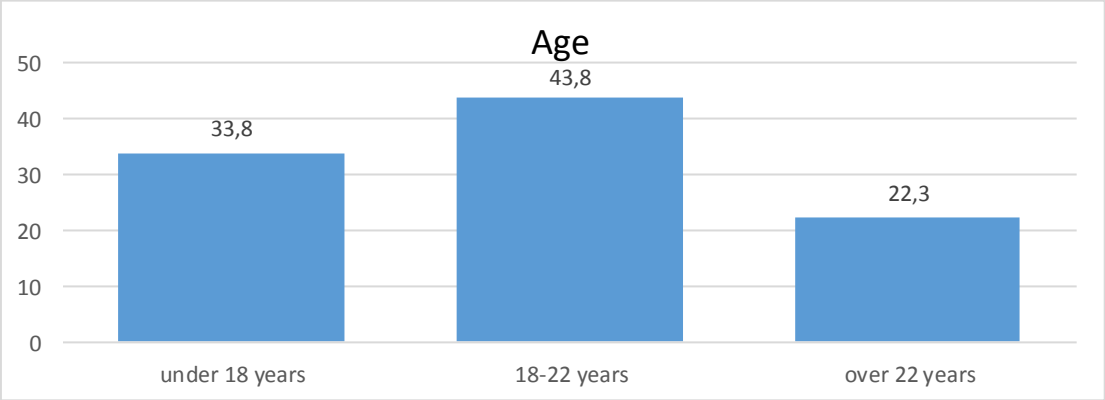

Fig. 1. The investigated sample

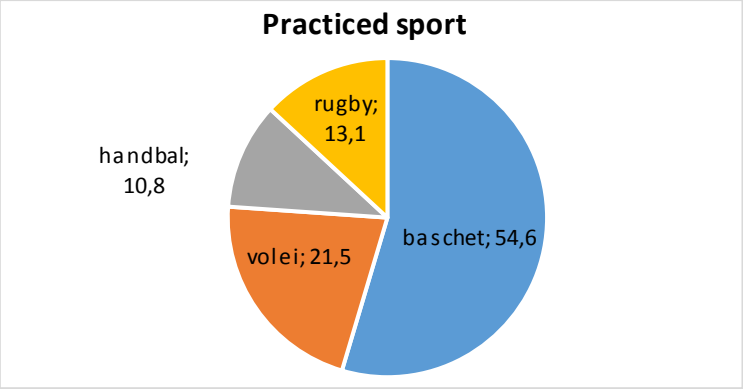

Fig. 2. Sport practiced by respondents

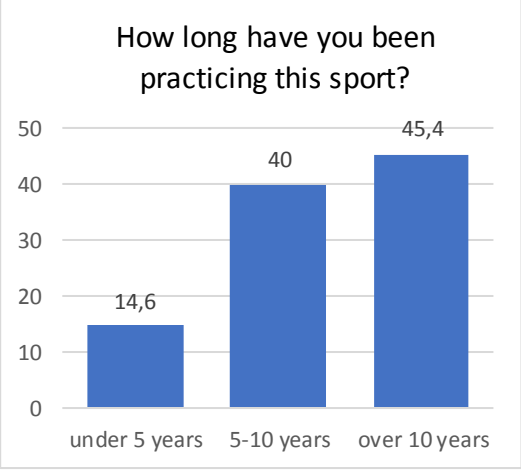

Fig. 3. Practiced sport

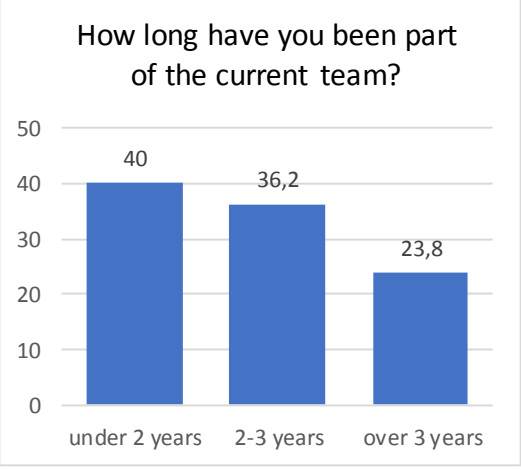

Fig. 4. Time spent at the team

The distribution of responses to the social distance scale applied to teammates is as follows:
Q. To what extent would you accept a person as part of your team.

Table 1. Acceptability' level

	To a very small extent	To a small extent	To a suitable extent	To a large extent	To a very large extent	Weighted average	tolerance (%)
From another country	0,8		8,5	23,1	64,6	4,55	91
From another part of the country	1,5		8,5	24,6	64,6	4,52	90,4
Of another ethnicity		1,5	12,3	25,4	60	4,45	89
Of another religion	0,8	0,8	11,5	25,4	58,5	4,44	88,8
Of other sexual orientation	16,2	7,7	16,2	16,2	40	3,58	71,6

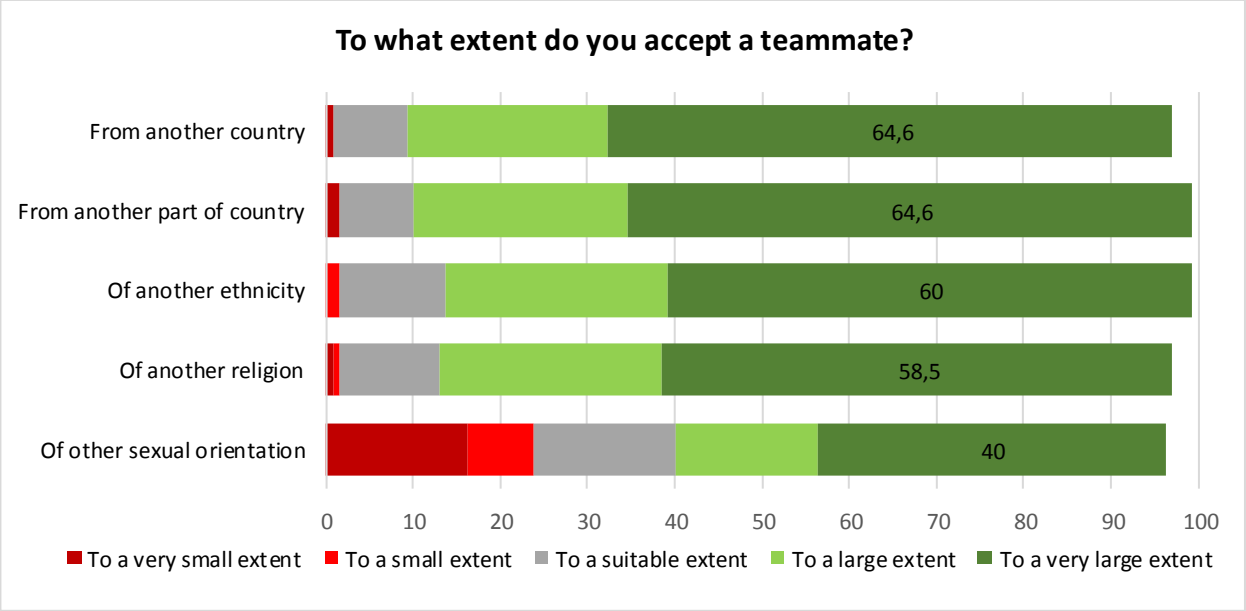

Fig. 4. Differences in acceptability

According to these distributions, there is a significant difference between the degree of tolerance towards teammates from another country, another region of the country, another ethnic group or another religion on the one hand (all with values around the 90% threshold) and tolerance towards teammates with a different sexual orientation (71.6%). There is also a clear differentiation by gender of the responses for the 5 aspects assessed, with female subjects being more tolerant than male subjects, with statistically significant values for all variables except religion

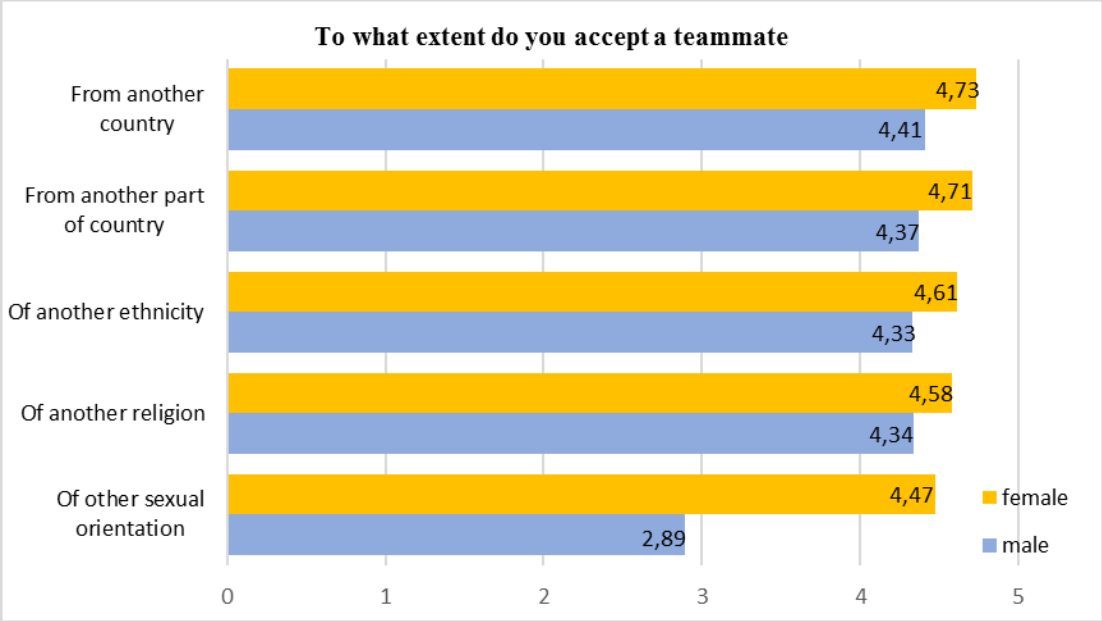

Fig. 5. Procent of acceptance

Table 2. Anova test

Q5. To what extent would you accept a person to be part of your team? - ANOVA test by gender		Sum of Squares	df	Mean Square	F	Sig.
of another ethnicity	Between Groups	2,456	1	2,456	**4,245**	**,041**
	Within Groups	73,467	127	,578		
	Total	75,922	128			
of another religion	Between Groups	1,842	1	1,842	2,956	,088
	Within Groups	77,269	124	,623		
	Total	79,111	125			
from another part of the country	Between Groups	3,759	1	3,759	**6,413**	**,013**
	Within Groups	74,442	127	,586		
	Total	78,202	128			
from another country	Between Groups	3,143	1	3,143	**6,290**	**,013**
	Within Groups	61,968	124	,500		
	Total	65,111	125			
with different sexual orientations	Between Groups	77,573	1	77,573	**47,050**	**,000**
	Within Groups	202,795	123	1,649		
	Total	280,368	124			

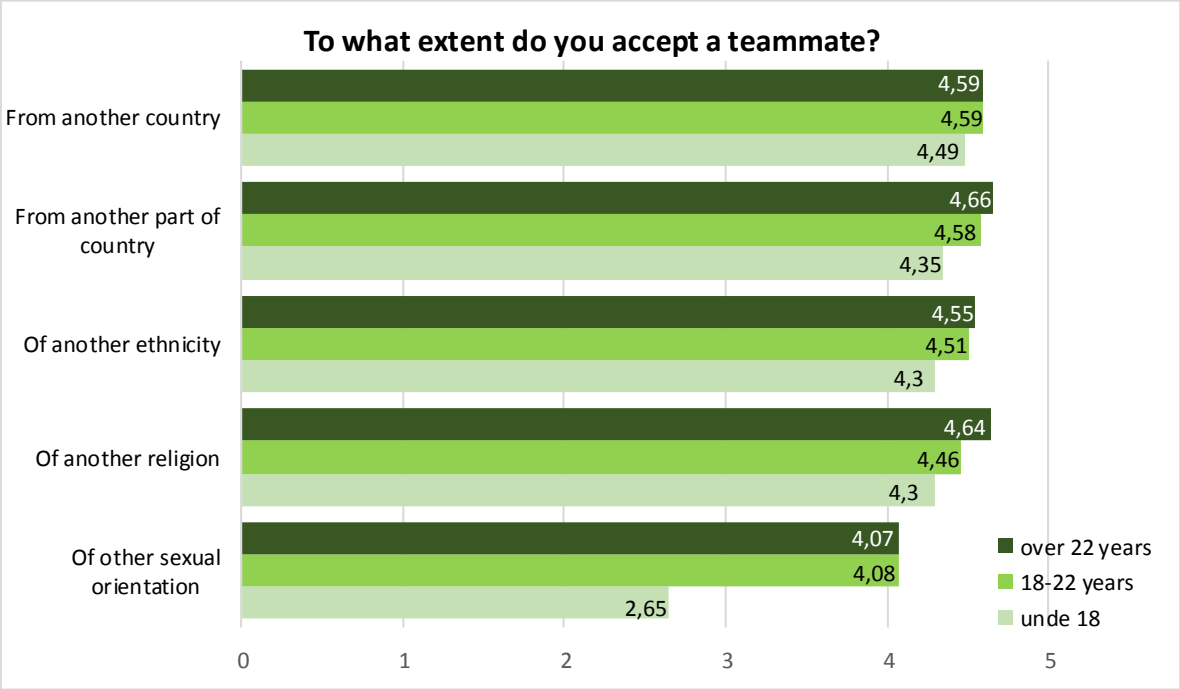

Fig. 6. Level of acceptance by age

Playing experience in the current team is not a factor for differential treatment of teammates in the 5 categories analyzed, with the Anova test reflecting statistically insignificant differences:

Table 3. Different outcomes

Q5. To what extent would you accept a person to be part of your team? - ANOVA test according to team seniority		Sum of Squares	df	Mean Square	F	Sig.
of another ethnicity	Between Groups	,005	2	,003	,004	,996
	Within Groups	75,917	126	,603		
	Total	75,922	128			
of another religion	Between Groups	,444	2	,222	,347	,707
	Within Groups	78,667	123	,640		
	Total	79,111	125			
from another part of the country	Between Groups	,697	2	,348	,566	,569
	Within Groups	77,505	126	,615		
	Total	78,202	128			
from another country	Between Groups	,167	2	,084	,158	,854
	Within Groups	64,944	123	,528		
	Total	65,111	125			
with different sexual orientations	Between Groups	,088	2	,044	,019	,981
	Within Groups	280,280	122	2,297		
	Total	280,368	124			

Discussion

From social network research, the investigation of social homogeneity in groups has become a priority [6]. According to V. Barash there are mechanisms within the group that cause individuals to adopt things already adopted by others, the most visible being social influence and exclusion. Influence refers to the fact that "if one or more others have a certain belief or adopt a certain product, then the chances increase that the ego will do the same"[7]. On the other hand "social exclusion is a social contagion mechanism that discourages the tendency of individuals to prefer not to adopt a certain behaviour, idea, value, belief"[8].

Sports performance is primarily conditioned by the physical and tactical preparation of each team member, the climate of the small group is also a factor that can contribute more or less to its achievement. Involving coaches in strengthening group cohesion and facilitating communication between players (not just during matches) can increase cohesion, which is an important resource for professional sports teams. In general, there is a high degree of acceptance for people of other ethnicity, religion, from another part of the country or from another country, but significantly lower for other sexual orientations.

Conclusion

Although all of these factors do not directly condition individual performance within the team, the activation of stereotypes (prejudices) can lead to a degradation of the working climate and therefore the commitment and involvement of each individual player.The significant differences between female (more tolerant) and male (less tolerant) respondents, as well as between adults and the elderly on the one hand (more tolerant) and the under-18s (more reluctant), reflect a particular situation that needs to be treated with care, especially when it comes to integrating new players into U18 men's professional teams. Although the 5 variables analysed by the social distance scale (religion, ethnicity, locality, nationality and sexual orientation) are not key elements of sporting performance, a low degree of tolerance on the part of players for newcomers with such characteristics can generate tensions and limited involvement. It remains primarily a challenge for coaches to give full attention to such cases and try to help the team reach a maximum tone of engagement and collaboration.

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Interdisciplinary Approaches in the Physical Education Lesson to Optimize the Physical Condition of Students

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Abstract

The field of physical education and sports is a complex one and has the role of contributing to the maintenance of the health of the school population as well as the formation of skills to support their own health by obtaining physical condition. At the same time, it has a specific implementation methodology which, during the instructive-educational process, is based on disciplines with which it interacts. The discipline of physical education has the role of training students in specific skills so that they know how to use physical exercise to ensure an optimal physical condition reflected in the quality of life. Essentially, for the human body to function at optimal parameters, it is necessary for it to possess a superior level of motor skills and physical development specific to age.

The Purpose of the Study is to identify the ways of interdisciplinary approach in the physical education lesson in order to obtain the optimal physical condition at the level of the school population.

Materials and Methods: The study is carried out at the level of the school population and involves highlighting the main methods and means of action by which students acquire and consolidate theoretical and practical knowledge. The longitudinal analysis carried out by us highlights that the interactive method is one of the most effective, as it has the role of supporting and involving students in their own training. The study involves interventions by teachers to fix theoretical information and to ensure compliance with the methodology from an application point of view. As an independent variable, information from related disciplines is used, realizing their usefulness and importance in the process of harmonious physical development and the formation of general motor skills.

Results: Following the analysis, it was found that the students from the groups in which the training process was based on awareness, connections with other disciplines, and practical applicability obtained superior results compared to the students who did not follow the same experimental route. Reflecting the skills gained in physical education lessons in real life, resulted in a deeper involvement in their own training process. The results obtained in the measurements and motor tests as well as the level of knowledge internalization in the medium and long term confirmed the importance of the interdisciplinary approach.

We **conclude** that the training process must be active, flexible, and adapted to the conditions, age level, and perception of the students. The methods used will be adapted so that the students are aware of the process and actively participate in their own training. It is recommended that students realistically know their motor potential as well as that related to physical harmony and be able to fit these two realistically into the optimal physical condition. We can argue that

maintaining health is an aspect that concerns specialists in the field and that requires new approaches to improve the quality of life.

Keywords: Interdisciplinarity, physical education, physical condition, health, quality of life.

Introduction

The field of physical education and sports is a complex one and has the role of contributing to maintaining the health of the school population as well as to the formation of specific skills. In this sense, the field has a specific implementation methodology which, during the instructive-educational process, is based on the relationship with some disciplines with which it is interconnected. The discipline of physical education and sports has the role of educating and forming specific skills so that students know how to use physical exercise in different forms and contents, in order to optimize the quality of life. In order for the human body to function at optimal parameters, it is necessary for it to have a higher level of motor skills and physical development, specific to the age. The process of obtaining the physical condition is based on specific knowledge and is supported by the awareness of the benefits obtained from the practice of continued physical activities and their adaptation to the age level.

School physical education as an educational process, together with other subjects included in the national curriculum, contributes to the formation of general knowledge; social integration, the choice of a profession, presupposes the multilateral training of students, offering the possibility of adaptation to different life contexts. The interdisciplinary approach is essential in the process of achieving the objectives of school physical education, found in the contents of the discipline, which will be designed in such a way as to help the student to form a realistic image of life. Thus, the interdisciplinary approach involves the contribution of several disciplines to achieve a common objective, this being found as an intersection of different curricular areas. Interdisciplinarity implies the interaction between certain skills or interdependent contents from two or more disciplines, based on an epistemological support that involves the intersection of disciplines. C. Cucoș claims that "Interdisciplinarity is a form of cooperation between different disciplines regarding an issue whose complexity can only be captured through a convergence and a prudent combination of several points of view" (4), and in the opinion of G. Văideanu, interdisciplinarity "implies a certain degree of integration between the different fields of knowledge and different approaches, as well as the use of a common language allowing conceptual and methodological exchanges". (12). The usefulness and necessity of the interdisciplinary approach in physical education lessons is also highlighted by Chan Woong Park, Minhyun Kim, Myung Ha Sur & Jun Hyung Baek (2022), Ivanitskaya, L., Clark, D., Montgomery (2022), John Solomon & Nathan M. Murata (2008).

As a longitudinal process, education is a long-term activity that starts from the first days of life and continues throughout the individual's life. Its purpose is the improvement and self-improvement of the individual, the improvement of his individual performances in all fields of activity. The etymology of the term education comes from the Latin term "educo-educare" which means to take care of, feed, grow. Thus, "education is a social phenomenon, specifically human, consisting of a conscious, organized and planned system of lasting influences, exercised by the adult generation on the young generation, in order to achieve a certain type of man, according to the requirements of an era and society concrete" (3). Education is what ensures the culture of a people, a culture that is always enriched, depending on the requirements and external requests.

Physical education, as a formative process, has as its main objective the maintenance and strengthening of health and implicitly obtaining an optimal general physical condition, which guarantees the quality of life. In this process, the interdisciplinary approach is an essential one, because the use of physical exercise without awareness of its application, does not represent a guarantee of knowing the benefits and implicitly practicing them in the long term. The optimal physical condition is obtained following the realization of a physical preparation that takes shape in achieving harmonious physical development, maintaining an optimal state of health, efficient functionality of the body, and prevention of diseases, etc. Specific to the training process is the adaptation of means of action and didactic methods to the age level, understanding capacity, and motor potential of the students. In this context, Zhonglin Z., Jiajia X., Chenggen P. & Yuping C. (2022) claim that "in the process of physical training, compared to mature athletes, children's bodies show a more special state of random physical movement, complexity, and diversity."

In the educational process, with the implementation of specific exercise programs that lead to the achievement of physical condition, emphasis is also placed on the awareness of the effects that physical exercises have on the human body, in order to strengthen the student 's motor, intellectual and mental skills. Oja L. and Jaanika P. (2022) are of the opinion that "regular physical activity promotes growth and development and has multiple benefits for physical, mental and psychosocial health that undoubtedly contribute to learning(10). To improve children's physical activity, two approaches are mainly used: physical education lessons or interventions in school and activities outside of school." Piaget (1967) states that "there is no epistemology independent of the sciences, because epistemology is based on a scientific analysis . Therefore, the future of epistemology must, without a doubt, be located on the ground of specialized interdisciplinary research rather than isolated speculative reflection". Epistemology is interested not so much in the results of knowledge, as in knowledge itself, constituting a critical study of the principles, hypotheses, and results of various sciences in order to determine their logical origin, their objective value and importance. Epistemological reflection is based on the results of one or more sciences, approached multidisciplinary or interdisciplinary.

According to E. Joiţa, the connection with other sciences can be achieved at an interdisciplinary level - theoretically and practically - by identifying themes, concepts, principles, and methods that are also presented in other disciplines, thus achieving transfer of meanings, characteristic notes, solutions. Over time, references have been made to the educational phenomenon regarding physical training, to the need to harmonize spiritual, moral, and physical training. Although the contributions from that time do not have a scientific character, being expressions of philosophical reflections or sometimes very inspired intuitions, they retain their relevance even today, being verified by scientific methods.

A synthesis of the reflections of philosophers who were also creators of pedagogical systems or doctrines regarding the role of the physical dimension in the formation of the complete, harmonious personality and its forms of realization is offered by N. Ceauşescu (1), as follows, the great creators of pedagogical systems, I. A. Comenius, J. Locke, J. J. Rousseau, I. H. Pestalozzi, I. Fr. Herbart, Fröebel, A. Diesterweg pass physical education from the field of medicine to that of the school; sports activity is conceived as a means of strengthening health, developing the body and the intellectual, moral and aesthetic faculties, thus making sport an integral part of education; in the 18th-19th centuries, practical pedagogues such as Basedov, Salzmann, Guts Muths theoretically founded the school physical education system - originally named with the term gymnastics, which denoted the adjacent school discipline. By referring to bodily activities, they connect interdisciplinary with various sciences of bodily activity, itself

being part of this category (5,6). In this sense, we refer to the physiology of sport, the psychology of sport, the sociology of sport, the theory of physical education and sport, the methodology of sports training, the management of sports activity, etc.

In order to make the instructional and educational process more efficient, it is necessary to continuously update the contents of the programs, which must reflect the consistency of the specific means and methods. Thus, the goal of the undertaken study is to identify the ways of an interdisciplinary approach and the implementation of specific means in the physical education lesson in order to obtain the optimal physical condition.

Materials and Methods

The study addressed by us is carried out at the level of the school population and involves the highlighting of the main methods and means of action by which students acquire and consolidate theoretical and practical knowledge. The intervention process in this approach had as its starting point the premise that the practice of physical sports activities will be done throughout life, falling within the permanent education of the individual.

The subjects of the research are 20 high school students from Iași - Romania, who were evaluated from a somatic and motor point of view, in order to highlight the level of physical development and general motor skills in relation to their age. For the somatic assessment, height and weight were measured, analyzing the results in relation to the particularities of growth and development specific to the age of the students. For the assessment of general motor skills, control samples were applied to reveal the level of development of basic motor qualities (strength, speed, resistance, and skill).

After the analysis of the initial assessment, the independent variable was implemented in the physical education lessons, the content of which includes the interdisciplinary approach of the means and methods used, the subjects taking part in a general physical training program lasting 9 months, for 50 minutes. The content of this variable was embodied in a sequence of means of action (specific exercises), using different methods of application and teaching. During this approach, the interactive method was used, in particular, proving to be one of the most effective, the students being permanently involved in their own training process, through their own opinions, creativity, awareness of the movement and the actions performed, etc. Within the independent variable, information from related disciplines (anatomy, physiology, psychology, pedagogy, etc.) is used, realizing their usefulness and importance in the process of harmonious physical development and general motor skills. In addition to the actual training program, workshops (workshop, focus group, etc.) were also held, in which the emphasis was placed on interdisciplinarity and the connections of the disciplines involved in the process of the physical, mental, and general personality development of the students. After the implementation of the proposed program, the final evaluation was carried out to observe the effectiveness of the means and methods proposed by us.

The study undertaken was carried out through the permanent observation of the students, direct and indirect, both within the lessons and during the extracurricular activities, with the teaching staff intervening to fix the theoretical knowledge and to ensure the observance of the methodology from a practical point of view.

Throughout the investigative process, the students were made aware of the benefits of the applied methods and means of action and how they influence functionality, physical development, general motor skills, and implicitly general physical training.

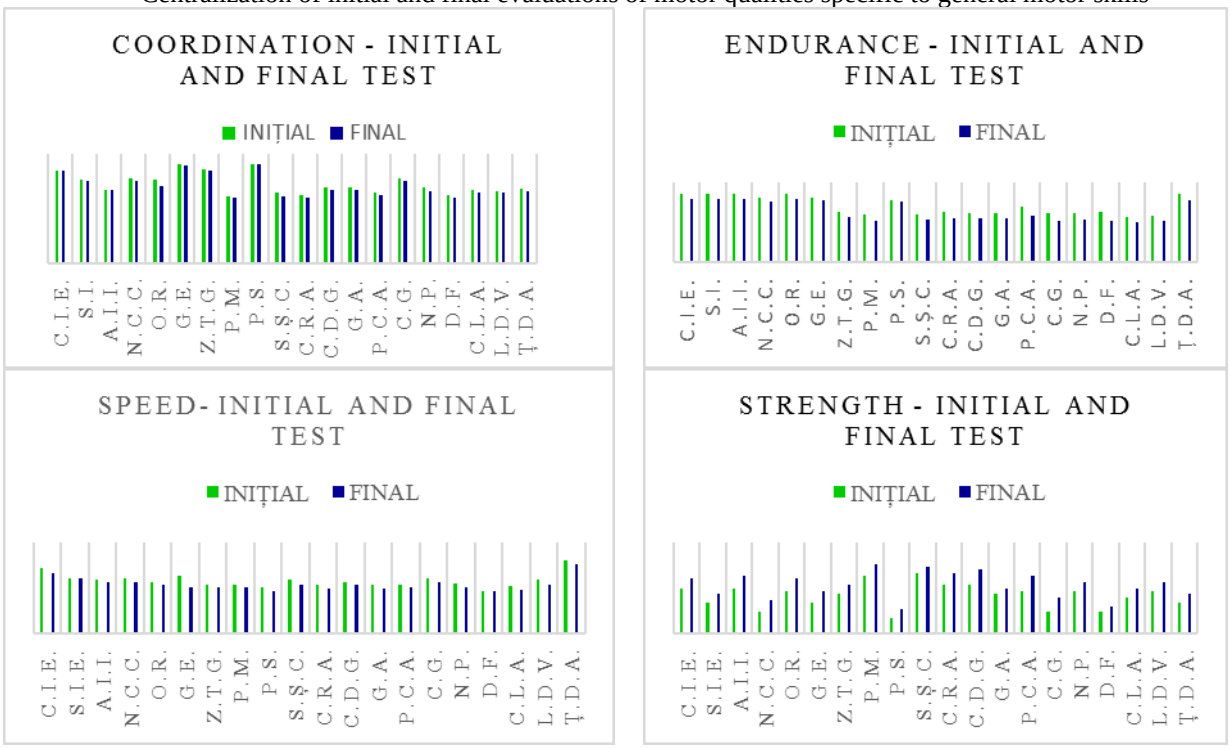
The longitudinal analysis carried out by us highlights that the interactive method is one of the most effective, as it has the role of supporting and involving students in their own training, calling on previous knowledge but also having the possibility to make associations with the supporting disciplines.

The interactive method is centered on the student, on his interests, needs, and ideals, therefore the teacher must expand the scope of traditional methods and techniques, adapt them, and add modern, interactive ones so that the teaching-learning process is constructive. To apply the interactive method, the teacher must be a good organizer, who at the same time encourages and stimulates the students to participate with interest in classes and to search and discover solutions, through their own effort. Interactive methods and techniques encourage group work, involve participatory learning, and facilitate skills development. Students will participate in their own training, they can present ideas, and opinions, which they can compare with their colleagues, and they will exchange knowledge, making progress from one period to another.

Results

Following the analysis, it was found that students in classes where the training process was based on awareness, connections with other disciplines, and practical applicability obtained superior results compared to students who did not follow the same experimental route. Reflecting the information and skills gained in physical education lessons in real life resulted in a deeper involvement in their own training process. The results obtained in the motor measurements and tests as well as the level of knowledge internalization in the medium and long term confirmed the importance of the interdisciplinary approach.

Centralization of initial and final evaluations of motor qualities specific to general motor skills



As a result of the evaluations, there is a progress reflected in the improvement of motor qualities specific to general motor skills, as a result of the application of the specific program whose content included physical exercises as well as interventions by the teacher in order to raise awareness of the instructional-educational process. Bringing information from related disciplines into the lesson, enhanced and raised the quality of the lessons, the results being reflected in the attitude of the students in relation to the discipline of physical education and to the benefits offered by physical sports activities practiced in different forms.

Exemplifying the results obtained, we can highlight the following data obtained as a result of the evaluations carried out. It was found that following the application of the program and the use of interactive methods, progress was made especially in the skill test by passing the T-test, the best result being 12.10 seconds; in the endurance test 2.03 minutes; speed 50m- 7.80 seconds, the strength of the upper limbs - push-ups in 22 seconds, the best result was 23 executions; lower limb strength, standing long jump with a result of 2.08 meters; throwing the sheep ball, with a result of 33.45m; when throwing the 2kg medicine ball, the best throw is 10.30m.

The improved results are due to the applied program as well as the interdisciplinary approach within the lessons held during the entire school year.

Conclusions

Following the study, we can conclude that the training process must be active, flexible, and adapted to the conditions, age level, and perception of the students. The methods and means used will be adapted so that the students are aware of the process and actively participate in their own training. It is recommended that students realistically know their motor potential as well as that related to physical harmony and be able to realistically frame the optimal physical condition. We can argue that maintaining health is an aspect that concerns specialists in the field and that requires new approaches to improve the quality of life. Education itself is a long-term process that prepares the educated to face the challenges of life. After studying the specialized literature of the research undertaken and the application of the program, with the objective of general physical development, we conclude that the respective methods are updated and adapted.

It was found that during the application of the program proposed by us, the students became more and more involved and participated with high interest, thanks to the interventions by the teachers, the explanations, the connections made with other disciplines, and the transposition of the created situations into the possible reality of life.

Through the implementation of the physical exercise program as well as their awareness exercises, consistent progress can be observed in terms of the student's involvement in their own development process, an aspect also reflected in the results obtained in the control tests aimed at their general motor skills.

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Rationalisation of Means in Order to Educate Dynamic Balance in the Instructional Process in 6-7 Years Old Pupils

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Abstract

Introduction: In the instructional process of primary school pupils, the psychophysical characteristics of each age group must be taken into account so that they can benefit from a maximum level of age-specific motor learning ability. The development of postural control in children, in terms of lower limb balance, requires a transitional phase around the age of 6-7 years.
Aim: The aim of this study is to analyse the improvement of dynamic balance by applying a specific intervention program on students aged 6-7 years.
Material and method: The study group was composed of 25 pupils composing the experimental sample (EG), 13 boys (52%) and 12 girls (48%), pupils in the first grade (6-7 years old) and in parallel in the experiment tests were applied on a control sample (CG) which was composed of 25 pupils, 13 boys (52%) and 12 girls (48%). Both the age of the children and the results of anthropometric measurements were recorded: body weight, height, body mass index - (BMI). For the measurement of balance, the "Y-Balance Test" (YBT) was used, which is a valid and reliable instrument to measure dynamic balance and neuromuscular ability to maintain balance and body coordination. It measures anterior/posterior (AP), posteromedial (PM) and postero-lateral (PL) direction.
Results: It was identified that there is a correlation between age, gender and anthropometric data (body mass, height and lower limb length) in terms of dynamic balance in children aged 6-7 years, which will optimise and improve the reliability of postural control. The results of the forward balance test showed a significant difference on the right leg in the experimental group ($P=0.002$) and on the left leg ($P<0.0001$).
Conclusions: There is a significant relationship between fundamental movement skills (FMS), balance, bilateral coordination activities and activities based on spatial awareness of students aged 6-7 years.

Keywords: dynamic balance, children, static balance, balance test, psychomotor skills.

Introduction

Physical education taught in schools plays a key role in providing opportunities for students to be directly engaged in diverse learning experiences through systematic physical activity, sport and health. Proper balance will enable a person to perform activities or movements efficiently and effectively with minimal risk of falling - two types, consisting of static balance and dynamic balance [2]. Static balance is the ability of the body to maintain balance in a stationary position when standing on one leg or standing on a balance board [1]. Dynamic balance is the ability of the body to maintain its position while moving [5]. Balance is not a finite skill, but underpins our ability to perform various daily activities. Balance is a complex integration of somatosensory (visual, vestibular, proprioceptive) and motor systems whose overall activity is regulated by the brain according to the body's internal and external responses or influences [8]. Factors that influence balance are sensory factors (sensory-motor organs, peripheral nervous system, plant system and kinaesthetic sensations) and mechanical factors (force of weight, centre of gravity, base of support, body weight and other factors such as motivation, ability to concentrate, motor intelligence, self-confidence).

In everyday life, as well as in sporting activities, dynamic balance performance (i.e. the ability to maintain postural stability while body parts are in motion) is a key determinant for safely managing weekday activities and specifying the risk of lower limb injuries in young people. Control of dynamic balance is considered an essential indicator of musculoskeletal health, and the ability to maintain postural and balance control under dynamic conditions is an important fundamental component of physical activity.

Aim

The aim of this study is to examine the development of dynamic balance through the application of a program to improve it in students aged 6-7 years.

Material and Method

The group of subjects was composed of 50 students, 25 G.E.-13 boys (52%) and 12 girls (48%) and 25 G.C.-13 boys (52%) and 12 girls (48%) aged 6-7 years old from "Nikolaus Lenau" High School in Timișoara in which both age and anthropometric data were recorded: body weight, body height, BMI-(Table 1). The length of the left and right leg was determined by measuring the distance from the anterior superior iliac crest to the level of the external malleolus, with the participant lying supine.

Table 1. Descriptive analysis of the experimental and control groups.

EXPERIMENTAL GROUP	GIRLS(nr total-25)		BOYS (nr total-25)		STUDENTS GE(nr total-50)		
	x̄	SD	x̄	SD	x̄	SD	R
Age (years)	6,94	0,13	6,93	0,17	6,93	0,02	
Height (cm)	129,25	4,33	133,92	4,82	131,58	0,34	
Weight (kg)	24,8	3,66	27,76	3,76	26,28	2,09	0,06

CONTROL GROUP	GIRLS(nr total-25)		BOYS (nr total-25)		STUDENTS GC(nr total-50)		
	x̄	SD	x̄	SD	x̄	SD	R
Age (years	7,02	0,12	7,07	0,17	7,04	0,03	
Height (cm)	125,75	4,78	132,07	3,72	128,91	0,74	
Weight (kg)	**25,94**	**5,15**	**27,65**	**2,21**	**26,79**	**2,07**	-0,12

G.E. boys have an arithmetic mean (x̄) age of 6.7 years and G.C. boys 7.1 years. At the same time, G.E. boys have an arithmetic mean (x̄) of height of 133.92 cm and G.C. girls have an arithmetic mean (x̄) of age similar to the boys in this sample (6.7 years), an arithmetic mean (x̄) of height of 129.25 cm for G.E. and an average of 125.75 cm for G.C.

Table 2. Intervention plan of the experimental and control group

Nr. Crt.		PERIOD	HOURS/WEEK	BIRTH YEAR	Age (years)
1	GRUP EXPERIMENT	11-17.04.2022 - 02-05.06.2022	2	2015-2016	6-7
2	GRUP CONTROL				

We drew up a calendar planning (Table 2), according to which the intervention plan was applied for 6 weeks, twice a week, at the "Nikolaus Lenau" High School in Timisoara. According to the planning, in the first week we applied the initial test (T.i.) (11 - 17.04. 2022), followed by 5 weeks in which we implemented the intervention plan (02.05 - 05.06.2022), and on 07.06.2022 we retested the sample (T.f.).

The intervention plan was composed of 7 exercises with the following objectives:

1. Develop the ability to maintain balance in dynamic actions;
2. Development of the ability to maintain dynamic balance with changing body segment positions;
3. Development of the ability to maintain dynamic balance using objects that can be: held, carried or manoeuvred;
4. Improving the sense of orientation in space;
5. Develop the ability to maintain dynamic balance on a high surface with carrying objects;
6. Improving the ability to coordinate movements of segments;

The evaluation method used to observe whether there were significant differences between the experimental and control groups was: "Y-Balance Test" (YBT). It measures the anterior/posterior (AP), posteromedial (PM) and posterolateral (PL) direction while standing supported on one leg and pushing the mobile platform with the other leg (Neves, 2017). The balance test kit consists of the lower leg test with full trials performed on the 3 directions: anterior (AT), posteromedial (PM) and posterolateral (PL).

Fig. 1. YBT directions for left leg positions. and right leg (PHYSICAL EDUCATION AND SPORTS SCIENCE - NIE SPORTS BIOMECHANICS LABORATORY Prepared by Yeo Jie Min)

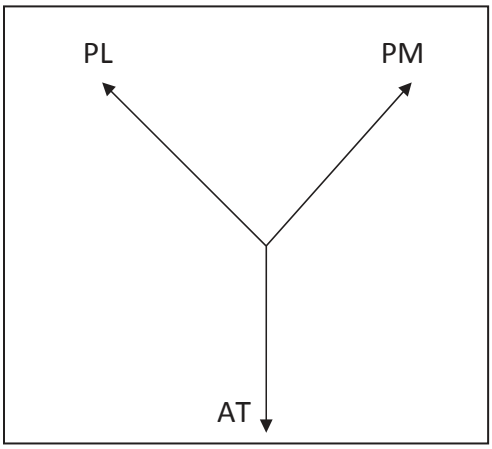


Fig. 2. YBT device

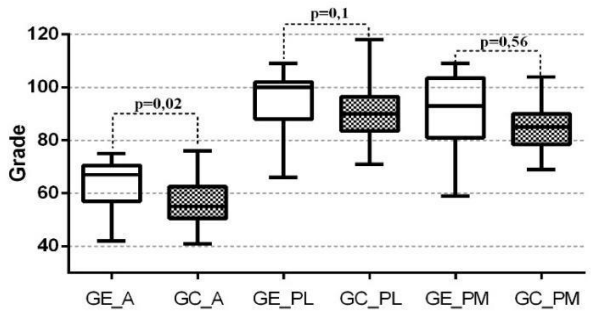
***Protocol*:** Participants are given two trial runs before recording the actual measurements for each lower limb.
Actual testing: Two successful trials for each lower limb; Participants must perform each trial completely continuously; Barefoot performance (no socks allowed).
The test is considered successful when: Participant has maintained throughout the trial; Participant stretches the lower limb to the maximum to push the touch pointers;

Results

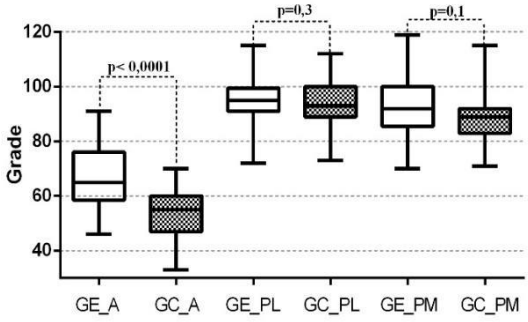
H1-Right Leg - H1-Left Leg

Following the experiment between GE and GC there was a significant difference, so the experiment group improved their balance on the right leg by (P=0.02) (graph 1) respectively on the left leg anterior direction by (P<0.001) (graph 2)

Regarding the intervention on the postero-lateral direction on the right leg (P=0.001). respectively the left leg (P=0.3) there is no statistical difference between the experimental and the control group, (P=0.001). Also, on the postero-medial direction there is no statistical difference on both the right leg (P=0.56) and the left leg (P=0.1).



Graph 1. Results of the balance test between pre-test and post-test on the anterior, postero-lateral and postero-medial direction of the GE and GC when **testing**

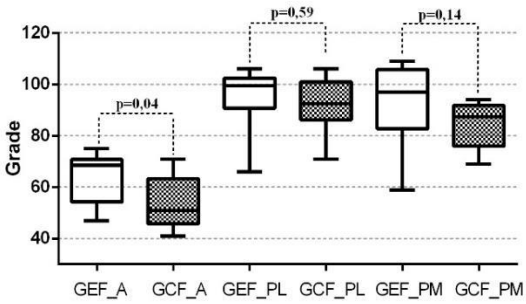


Graph 1. Results of the balance test between pre-test and post-test on the anterior, postero-lateral and postero-medial direction of the GE and GC when testing

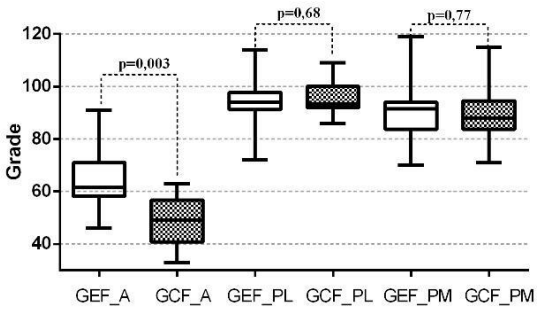
GE-experiment group, **GC**-control group; A-anterior; **PL**-postero-lateral; **PM**-postero-median

H3- Right Leg - H3- Left Leg

After applying the intervention plan, there was a significant difference between the GE and GC girls, so that they improved their balance on the right leg by (P=0.04) and on the left leg by (P=0.02) on the anterior direction. For the balance test on the postero-lateral direction respectively postero-median there were no statistical differences. Postero-lateral-right foot- (P=0.59); Postero-median-right foot- (P=0.14) respectively postero-lateral-left foot- (P=0.68) and postero-median-left foot- (P=0.77).



Graph 3. Results of the balance test between pre-test and post-test on the anterior, postero-lateral and postero-medial direction of the GE and GC when



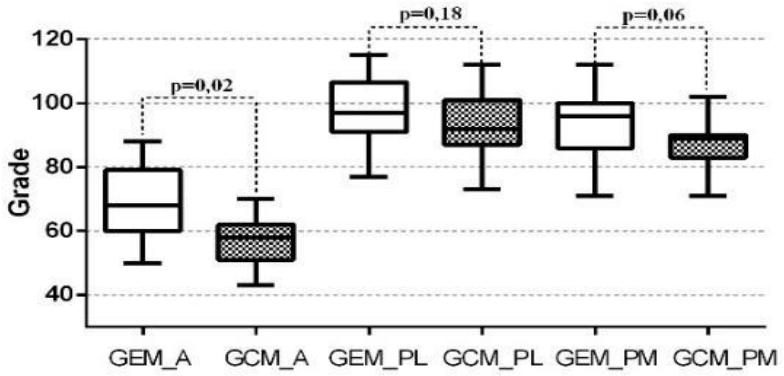
- **Graph 4.** Results of the balance test between pre-test and post-test on the anterior, postero-lateral and postero-medial direction of the GE and GC when

H4- Left leg

After applying the left leg intervention between GE and GC there was a significant difference, so the experimental group improved their balance on the left leg in the anterior

Regarding the intervention on the postero-lateral (P=0.18) and postero-medial (P=0.06)

direction, there was no statistical difference between the experimental and control groups.



Graph 5. Results of the balance test between pre-test and post-test on the anterior, postero-lateral and postero-medial direction of the GE and GC when

Discussions

Studies on the effect of a dual task on postural control have shown a deterioration of postural stability in children due to the fact that they shift their attention to the secondary task, which leads to a more inappropriate postural control [7].

Age was the best predictor explaining the balance score in all SOT (sensory organization test) conditions. When the weight variable was added as a predictor, there was reduced variability in SOT balance scores [3], used SOT to assess balance in children, finding no correlation with height and weight, and Nolan et al. [6], suggested that although postural stability may be partially modified by anthropometric data (height and weight), age is the variable responsible for the development of the visual, somatosensory and vestibular systems. The results of studies examining the effect of static and dynamic balance training in children have been documented and confirmed by Gebel et al. [4].

The results obtained in the present study are similar to those found by Ruiz et al. [9], who also obtained better results for girls in terms of static balance, but did not obtain gender differences in terms of dynamic balance in students over 9 years of age.

Conclusions

Assessment of static and dynamic balance using motor assessment batteries does not require a large infrastructure or space to perform, provides information about the current state of the assessed subject's balance, is inexpensive and easy to apply. The knowledge of the subjects under study on static and dynamic balance, helps to plan and design an intervention appropriate to their psychomotor and functional conditions related to body balance which is very applicable in school context.

The relationships between balance and other motor skills and the impact of regular physical activity on the maintenance of different types of balance is one of the main reasons why this

motor skill should be improved and developed during the process of teaching physical education through the use of physical education content.

There is a significant relationship between fundamental movement skills (FMS), balance, bilateral coordination activities and activities that rely on spatial awareness of students aged 6-7 years.

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Study on the Factors that Condition the Achievement of Performance in Rumba Dancesport at National and International Level

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Abstract

Introduction: Dancesport is a constantly changing and evolving sport, which means that the evaluation system is also constantly adapting to the requirements. With the development of dance styles, their form and variety have changed. The most important criterion, which has remained unchanged to date, is that the ranking is carried out on the basis of direct comparison of pairs (direct and comparative analysis of sporting and artistic performance).
Aim: At this stage of the preliminary study, we aimed to identify coaches' opinions on the applicability of specific artistic training methods for developing lower limb strength in youth dancers.
Materials and Methods: The main methods used to fulfill the tasks proposed for the research are the following: Studying specialized literature; Remark; The questionnaire survey; The statistical-mathematical method of data processing and interpretation; Graphical and tabular method.
Results: Applying a questionnaire to coaches in the field of dancesport is an effective way to capitalize on the existing body of knowledge in our country on the use of specific means of artistic training for the development of lower limb strength.
Conclusions: Through the questionnaire applied to coaches and instructors in the field of dance sport we obtained valuable information about the methods and techniques used in training for the development of lower limb strength. This information can serve as a basis for improving training programs and developing new and innovative methods.

Keywords: Rumba, dancesport , lower limb strength, artistic training, achievement of performance

Introduction

Dancesport is a constantly changing and evolving sport, which means that the evaluation system is also constantly adapting to the requirements. With the development of dance styles, their form and variety have changed. The most important criterion, which has remained unchanged to date, is that the ranking is carried out on the basis of direct comparison of pairs (direct and comparative analysis of sporting and artistic performance).

The particularities in dancesport differ according to the level of dance of the dancers (value class) and are intended to objectify the assessment. The criteria, according to which the judging process is carried out, have undergone various changes, starting with 5 criteria[***]:

- Movement to music,
- Balance and coordination,
- Quality of movement,
- Relationship as a couple and leadership,
- Choreography and presentation.

An extensive review of such studies was carried out by Mestek (2022) [6], who selected from the main bibliographic resources found (3961) 56 that referred to Latin dances. Of these only in 13 was Rumba dance among the dances used as a means to determine some parameters or characteristics of the dancers. This research made us understand, once again, that there is a need, both nationally and internationally, for studies that shed light on the ways in which dancers' sports training is carried out and, in particular, on the ways in which coaches come to shape the couple of dancers physically and artistically as a whole.

Through specific motor actions, sport dance conveys a wide range of affective feelings, which makes us notice the correlation between the technique of execution of dance steps and figures and their artistic value. The effort of the dancers, the rhythm of the music, the dynamics of the steps, are part of the spectacular choreography, where the two partners must resonate so that the appreciation is of a whole full of virtuosity (Howard, 2002)[2].

Aim

At this stage of the preliminary study, we aimed to identify coaches' opinions on the applicability of specific artistic training methods for developing lower limb strength in youth dancers. The approach to a very sensitive subject such as the physical training of dancers and specifically, the verification of the means used by romanian coaches in the development of lower limb strength can represent a valuable research with multiple practical applications.

Materials and Methods

The main methods used to fulfill the tasks proposed for the research are the following: Studying specialized literature; Remark; The questionnaire survey; The statistical-mathematical method of data processing and interpretation; Graphical and tabular method.

Study Hypothesis

A. Is physical training one of the factors that condition the performance of youth dancers in dance sport?

B. Does the development of lower limb strength through the means of artistic training ensure the effectiveness of competitive training?

The term investigation refers to the application of various techniques to observe, measure and describe the object(s) of investigation. The survey techniques are questionnaire and interview (Chelcea, 2004)[1].

The questionnaire survey method is based on a large number of interviewees, since the aim is to identify phenomena or situations that can be generalised to the whole population from which the sample has been drawn. As Francois de Singly (1998, p. 21)[7] points out, the questionnaire

survey serves to produce explanatory data that highlight both social facts and the factors that determine them.

The role of the survey is to verify the opinion of specialists on:

- the weight given to physical training (general and specific) in the different training periods;
- the extent to which the means of artistic training are used to develop lower limb strength;
- the usefulness, in the opinion of the specialists, of the development of lower limb strength using the specific means of artistic training in dancers at youth level, particularly for Rumba dancing.

Our survey aimed to find out the level of theoretical knowledge of the respondents about the role and importance of general and specific physical training in dancers and the stage of approach to training and testing the motor quality of lower limb strength in youth dancers (16-18 years) in our country. The basis for the processing and interpretation of the obtained data was exclusively the information provided by the investigation.

Romania is internationally recognized for its results in dancesport, with representative pairs in the finals of top competitions. Dancesport is constantly evolving, with new techniques, training methods and artistic means being introduced. Research in this area can help to understand how coaches integrate these innovations into the training of dancers. Dancers need to combine intense physical demands with authentic artistic expression. Survey research can clarify how these aspects are balanced and integrated into training. Coaches and instructors have a significant impact on the development of dancers. Understanding their practices, approaches and methods can help to improve the quality of dancers' training.

Latin dancers have radically different biomechanical requirements than standard dancers (McCabe, T. R., Wyon, M., Ambegaonkar, J. P., Redding, E., 2013)[4]. In Latin American dances, both men and women follow a similar step pattern and often mirror each other's movements (Laird, W. & Laird, J., 2003)[3].

McCabe et co, (2014)[5] found that the majority of Latino dancers had injuries to their lower limbs, torso and spine. In Latin American dance, steps are composed of movement patterns that typically involve rotational dislocations through the lumbar spine and pelvic belt.

Although only 92% of the coaches surveyed believe that the means of artistic training can contribute to the development of lower limb strength (Fig. 1.), only 50% use these means frequently, 30% rarely and 20% never (Fig. 2.). We can affirm from the analysis of the answers received that the development of the strength of the lower limbs is done during the training sessions with the help of the specific means of artistic training representing part of the physical training specific to sport dance.

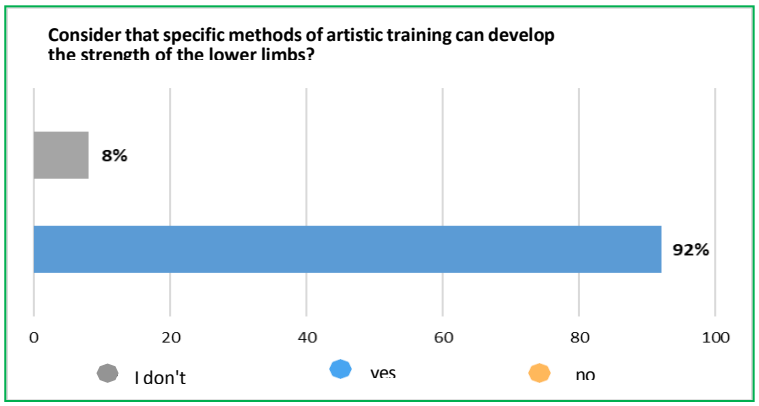

Fig. 1.

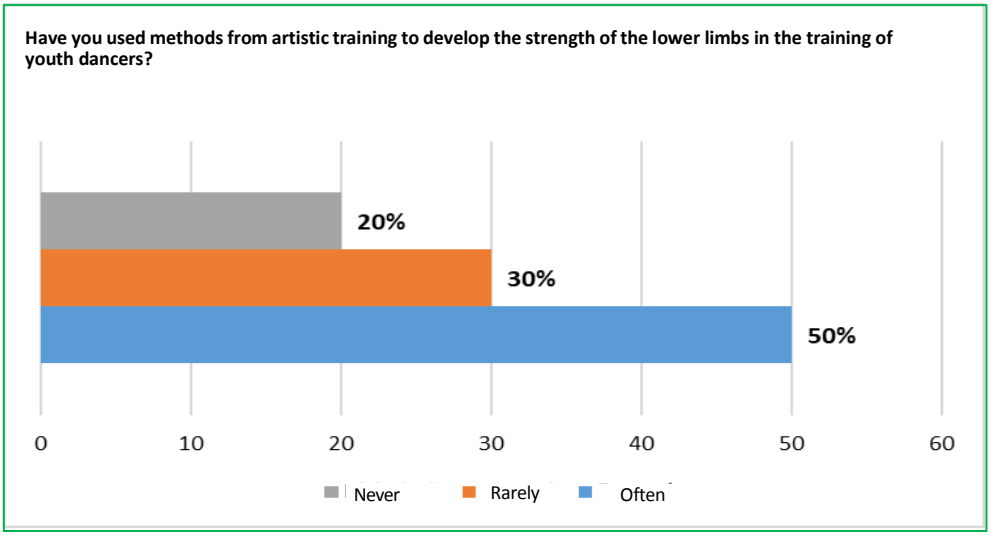

Fig. 2.

Plyometric exercises represent for 30% of the coaches and instructors included in our research the main specific means of artistic training for lower limb development. For 20% of the respondents isometric elements, elements from classical or contemporary dance and rehearsing choreographies with weights are the means that can be recommended for lower limb development (Fig. 3.).

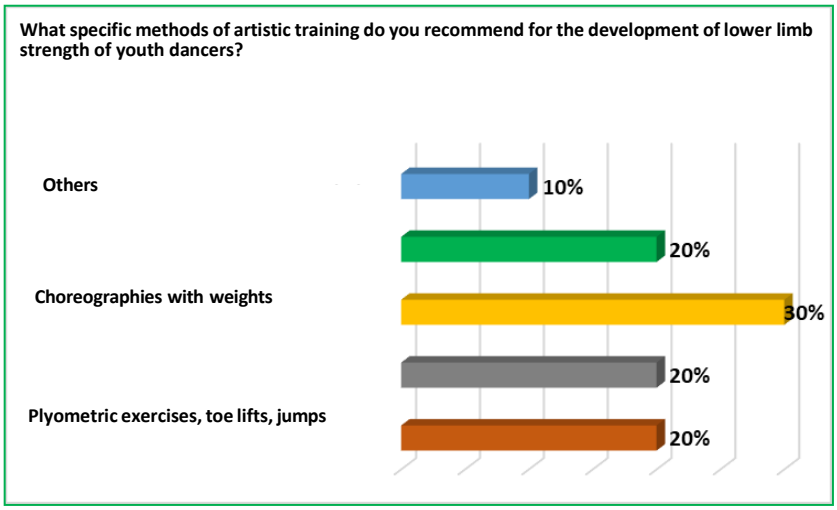

Fig. 3.

Results

Applying a questionnaire to coaches in the field of dancesport is an effective way to capitalize on the existing body of knowledge in our country on the use of specific means of artistic training for the development of lower limb strength.

The answers given by the respondents are consistent with the sports training literature, and provide a general picture of the performance conditioning of youth-level dancers. Addressing all

factors in the training and physical preparation of dancers in an integrated and balanced way can lead to success in national and international competitions.

They unanimously agree that the importance of lower limb strength in training is a strength in Latino dancing and especially in Rumba dancing. The methods used to develop the strength of the lower limbs are those specific to expression sports with emphasis on plyometric exercises and those specific to artistic training.

Conclusions

Through the questionnaire applied to coaches and instructors in the field of dance sport we obtained valuable information about the methods and techniques used in training for the development of lower limb strength. This information can serve as a basis for improving training programs and developing new and innovative methods.

The application of the questionnaire among coaches and instructors in dance sport can significantly contribute to the valorisation of existing knowledge and experience in the country regarding the development of lower limb strength, which confirms the research hypothesis. This initiative can lead to the improvement of dancers' training and the promotion of innovation in this domain, demonstrating once again Romania's position in the international dance sport ranking.

Physical training is a fundamental element in dancesport. Dancers must have good cardiovascular endurance, muscular strength, flexibility and coordination (Teodorescu, S. 2009) [8]. Without these physical qualities, dancers will not perform to a higher performance level and the risk of injury can increase significantly .

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Impact of QiGong Training on Psychological and Oxidative Stress, a Short Review

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Abstract

Beckground: Through Qigong (QG) a harmonious flow of vital energy is achieved, Qi and the functional activities of the body are regulated by breathing, conscious concentration and gentle movements.
Aims: The objective of this review is to highlight the impact of QG training on psychological and oxidative stress.
Methods: The main review source used is PubMed.
Results: QG consists of exercises of holistic consciousness that improve the symptoms of chronic physical states and emotional disorders. Regular practice, focusing on the mind and breath leads to a balanced and improved state of mind. Practicing QG exercises has a significant effect on the hypothalamic-pituitary-adrenal axis: plasma concentrations of ACTH, aldosterone and cortisol decrease and anxiety is improved. QG decreases urinary noradrenaline excretion, heart rate and temperature by reducing sympathetic nervous system activity. QG also has an important antioxidant effect, a fact proven by the reduction of oxidative stress markers in those who practice QG.
Conclusions: QG causes stress reduction through the nervous, endocrine and immune systems and also has antioxidant actions, so QG can significantly improve the quality of life and has beneficial effects on stress.

Keywords: QiGong, depression, anxiety, oxidative stress

Introduction

Asian therapeutic practices such as Qigong (QG), Tai chi and Yoga are increasingly used to manage psychological stress. They have proven effective in reducing the blood concentration of one of the most important stress hormones, cortisol [1]. Although scientific evidence to support the therapeutic effects of QG is still scarce [2], it is practiced in Chinese communities by a large number of people for health promotion. This article is a continuation of previous research of the authors, regarding the topic of Ginseng [3].

Definition of QG

According to the encyclopedia Wikipedia [a], "Qigong (Chi Kung) is an ancient Chinese system of cultivating health, vitality and longevity, as well as spiritual evolution. Based on the classical principles of Taoism, QG offers a path of self-cultivation that involves harmony between all levels of the human being (physical, psychic and spiritual), harmony with nature and constant and natural progress, avoiding the excesses and accidents possible in other physical disciplines and, in the same time, avoiding the withdrawal from the world characteristic of other spiritual paths."

Characteristics of the QG

QG is widely practiced to improve physical health, mental balance, but also to manage stress or symptoms of depression/anxiety, control emotions and enhance general well-being [4], [5], [6], [7], [8]. The distinctive feature of QG for health is the integration of focused attention, coordinated breathing and body movements, which causes the circulation of vital energy, called "Qi" within the energy meridians [9].

Types of QG

Early forms of QG constitute one of the historical roots of contemporary Traditional Chinese Medicine (TCM) theory and practice [10]. Many branches of QG have been around for over 5000 years and focus on health and medical issues [11]. These include:

a) Play five animals (Wuqinxi) [12]
b) The eight-section brocade (Baduanjin) [13], [14], [15], [16], [17], [18], [19]
c) Guolin Qigong [20]
d) Dejian technique, based on the traditional Shaolin QG practice [21], [22]
e) Jichu Gong [23]
f) ChunDoSunBup Qigong [24]
g) Chan Mi Gong [25]

PubMed Information on QG

When searching for information on Qi Gong (2023.09), PubMed displays different numbers of publications depending on the keywords used: QiGong - 1131; QiGong and depression - 241; QiGong and anxiety - 161; QiGong and oxidative stress - 3.

QG and Depression

The duration of QG intervention in depression studies varied between 4 weeks [22] and 16 weeks [19], [20].In the studies of QG applied to depression, different depression rating scales were used, such as:

a) Beck Depression Inventory [20], [21], [22]
b) Hamilton scale for depression [19], [22]
c) Geriatric Depression Scale [9], [18], [19]
d) Self-rating depression scale [12], [15]

There are studies that confirm the favorable effect of using QG in depression. We present some of them.

a) Mind-body intervention based on the Chinese Chan method built on the Dejian technique, has been shown to have positive effects on improving the mood and health conditions of people with major depressive disorder [22].

b) The results of applying both Dejian mind-body intervention (DMBI) and cognitive-behavioral therapy to adult volunteers with varying degrees of depression demonstrated a significant reduction in depression for both methods. But only with DMBI treatment did people with moderate to severe depression experience a significant reduction in depression [21].

c) Another study concludes that the antidepressant effect of QG exercises could be explained by improving psycho-social functioning and by reducing hypothalamic-pituitary-adrenal axis hyperactivity [9].

d) Regular practice of QG by older people with chronic physical diseases and depression could provide them with protection against depression, and improve their self-efficacy and personal well-being [19].

e) Eight-section Brocartul QG exercises could significantly reduce depressive symptoms in the elderly who suffered from comorbid chronic diseases and mild to severe depression [18], [19], [26].

f) In one study comparing QG with an inactive control group, for example reading a newspaper, depression status was significantly improved [19], and in another study, depression improved but without significant differences between groups, for QG and regular exercise [20].

g) Mind-body exercise can improve cognitive performance, depressive status in middle-aged and older adults with mild cognitive impairment [27].

QG and Anxiety

Due to its potential therapeutic effects, Qigong can be considered as a useful non-pharmacological alternative therapy in achieving biopsychosocial health for those suffering from anxiety [28]. In studies of QG applied to anxiety, different anxiety assessment scales have been used, such as:

a) Beck Anxiety Inventory [20]
b) Hospital Anxiety and Depression Scale [29]
c) Self-Rating Anxiety Scale [12] and
d) State-Trait Anxiety Inventory [23], [24], [17], [30].

There are studies that confirm the favorable effect of using QG in anxiety, of which we mention a few.

a) QG exercises have beneficial effects on anxiety, following the program: a single QG practice session [23], [24]; after a period of QG practice [14], [17], [25], [30]

b) After QG training, it was found that anxiety was reduced, plasma concentrations of ACTH, cortisol, and aldosterone decreased, and in the control group the parameters did not change [24].

c) In another study, anxiety was significantly reduced in participants who practiced QG compared to an active exercise group [20].

d) Traditional Baduanjin Qigong and five-elements music therapy help to relieve anxiety and depression, and improve the sleep quality in patients with COVID-19 infection [31].

QG and Oxidative Stress

There are only some studies related to QG and oxidative stress up to the date of the present study:

a) 8 weeks of Qigong training in sedentary young women led to a reduction in oxidative stress and an increase in antioxidant protection [32].

b) 8-week QG training in middle-aged and elderly women with DZD resulted in decreased

oxidative stress markers and improved oxidant/antioxidant balance) [33].

Conclusion

QG causes stress reduction through the nervous, endocrine and immune systems and also has antioxidant actions, so QG can significantly improve the quality of life and has beneficial effects on stress.

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The Importance of Regular Physical Activity, Between Theory and Practice

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Abstract

In the world report concerning the physical activity (2022) it is shown that 81% of adolescents and 27.5% of adults have a physical activity level inferior to that recommended by WHO, which has negative consequences both for them and for their families, for the health services and for society altogether. Although from a theoretical point of view people, regardless of their age, know the benefits of practicing physical activity and are aware of the importance of doing it, very few of them are involved in physical activities and even less are those who practice them regularly.
Our article proposes as aim to highlight the level of the students' physical activity in the UC of UBB Reșița related to the awareness level of its achievement importance and the benefits of individual involvement in this type of activity. The information was analysed based on the answers received to the questions in the International Questionnaire of physical activity from 368 students. All of them agreed that their personal data they provided should be used only for scientific purposes, according to the Law 679/2016. We took into account the following aspects: a. vigorous physical activity, b. moderate physical activity, c. walking and d. time spent sitting. The objectives of the research aim at: O1. The differential identification of the activity achievement according to the gender and environment the student comes from and O2: proposals supporting the involvement of as many young people (from the pre-university and university system) in physical activities. The results indicate a major discrepancy between the awareness level of the importance to practice physical activity and that of the students' involvement in this type of activities, this aspect leading to the conclusion that we must put a lot of effort for the people's involvement, regardless of age, in achieving physical activities.

Keywords: physical activity, involvement, awareness

Introduction

Physical activity is defined as any body movement produced by skeletal muscles that requires energy spending [1, 2], in the category of movements can be included walking, dancing, climbing stairs, etc. Practiced regularly, physical activity [3] has countless physical, psychological and physiological benefits, playing a special role in preventing the body from getting sick [4, 5, 6], being able to treat and prevent depressive symptoms [7], mental health

problems [8], having effects on long term [9] and generating a good quality of life [10]. On the contrary, studies establish a correlation between low levels of physical activity and symptoms of anxiety and depression in both community-dwelling older people [11] and other age groups [12]. For example, globally, 80% of adolescents are insufficiently active, which leads to global health problems, including cardiometabolic and mental health disorders [13, 14]. At the same time, there is evidence that practicing sustained physical activity reduces the risk of cancer [15] in six different sites (bladder, breast, colon, endometrial, oesophageal adenocarcinoma, gastric cardia), while moderate evidence inversely associates physical activity with problems of health of the lungs, ovaries, pancreas and kidneys [16]. All these benefits [17] contribute to improving national health, reduce healthcare costs and increase labour productivity [18]. At the global level, campaigns to raise awareness of the importance of physical activity took place in more than half of the world's states, practice proving that they remained only at a theoretical level [19].

The purpose of this study is to highlight the level of physical activity among the students of the Reșita CU of UBB, related to the level of awareness of the importance of its performance and the benefits of the individual's involvement in this type of activity. ***The objectives*** of the research aim at: O1. the differentiated identification of physical activity according to gender and the environment from which the student comes, and O2: formulating proposals to support the involvement of as many young people (from the pre-university and university system) and adults in physical activities as possible.

Materials and Methods

A questionnaire survey was used to carry out the study. The information was analysed based on the answers received to the questions of the *International Physical Activity Questionnaire* from 368 students. All participating students agreed that the personal data provided will be used for scientific purposes only, in accordance with Regulation 679/2016.

The questionnaire is structured in six sections, the first comprising identification data, the second the level of awareness of the importance of practicing physical activity; sections 3-6 took into account the following aspects: **a**. vigorous physical activity, **b.** moderate physical activity, **c.** walking, and **d.** time spent sitting. The questionnaire was applied in March of the academic year 2022-2023 to students from the undergraduate (302) and master's (66) study programs within the University Reșita UBB Centre. Participating students are aged as follows: between 18 and 20 years old, 73 students; between 21 and 23 years, 89; between 24 and 26, 32 students; between 27 and 30, 32 students, and over 30, 142 students (an average of 27.20 years). It can be seen that the age of the student respondents covers a wide range, from 18 to over 30 years old.

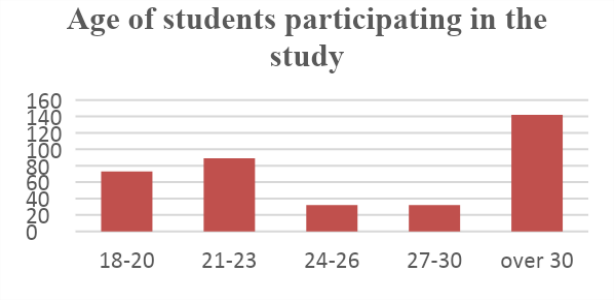

Fig. 1. Age of students participating in the study

Among the student respondents, 237 are female and 131 are male. 129 students come from the rural environment, and 239 from the urban environment.

Results and Discussion

Through the answers given to the question *To what extent do you consider physical activity important for health*? the students of the Reșita UBB University Centre demonstrated that they are aware of the importance of practicing physical activities as follows: to some extent, 15, to a large extent, 44, to a very large extent, 309.

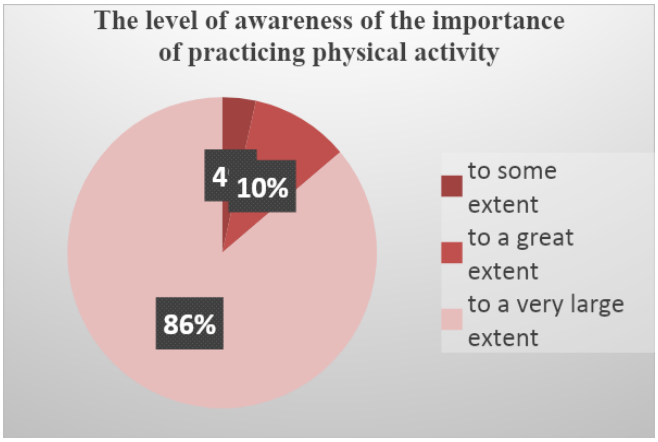

Fig. 2. The level of awareness of the importance of practicing physical activity

When asked about the number of days they do vigorous physical activity, 100 students (27%) answered zero days (29 boys and 71 girls). Among the 100 students, 29 are from rural areas (20 girls and 9 boys), and 71 from urban areas (51 girls and 20 boys), only 13 students (3.5%) stating that they carried out activities physically vigorous in the last seven days (eight boys: seven from the urban area and one from the rural area, and five girls, all from the urban area). The average of the vigorous activity carried out by the student respondents over the seven days considered is 2.1 days. The time spent by students on such activities varies between 10 minutes and several hours.

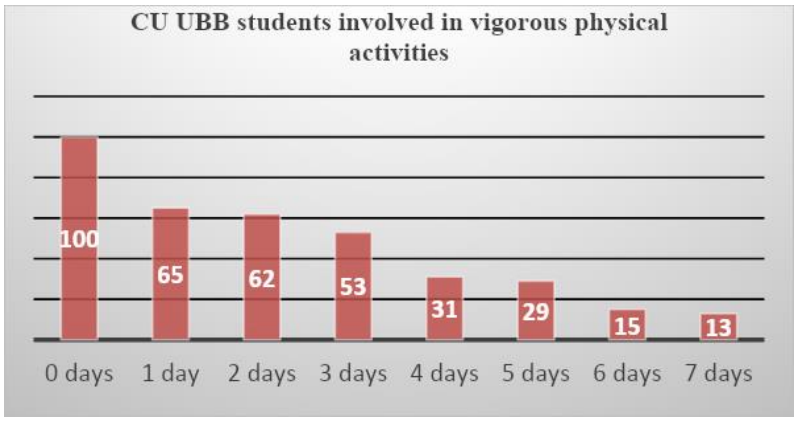

Fig. 3. CU UBB students involved in vigorous physical activities

Regarding the number of days they performed moderate physical activities, 95 students (25%) stated that they did not perform such activities in the last seven days (23 boys and 72 girls), only

16 (4, 3%) of the 368 student respondents declaring that they performed in the entire mentioned interval (six boys and 10 girls). The average of the moderate activity carried out by the responding students at the level of the seven days considered is 2.1 days. The time spent doing moderate physical activities varies between 10 minutes and four hours.

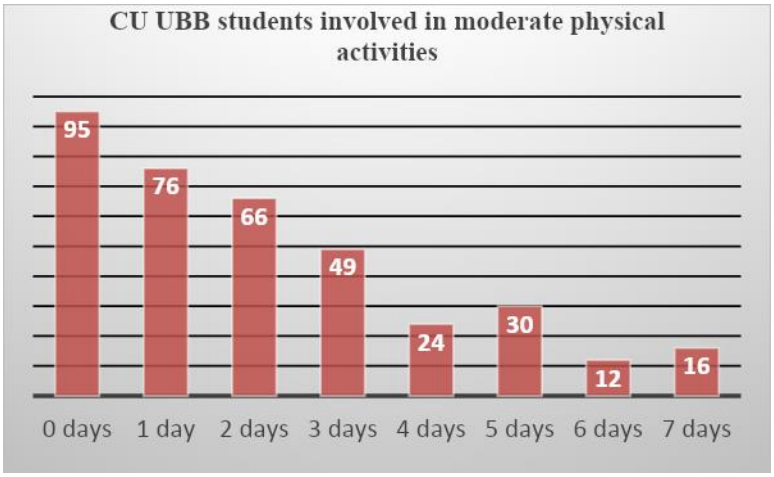

Fig. 4. CU UBB students involved in moderate physical activities

As regards walking, only nine of the respondents stated that they did not walk for 10 minutes on any day (one boy and eight girls), while 184 did so on each of the seven days (112 girls and 72 boys), and 18, six days, the time allocated to walking, on average, being between 10 minutes and three hours. The student respondents walked, on average, at the level of the seven days considered 5.2 days.

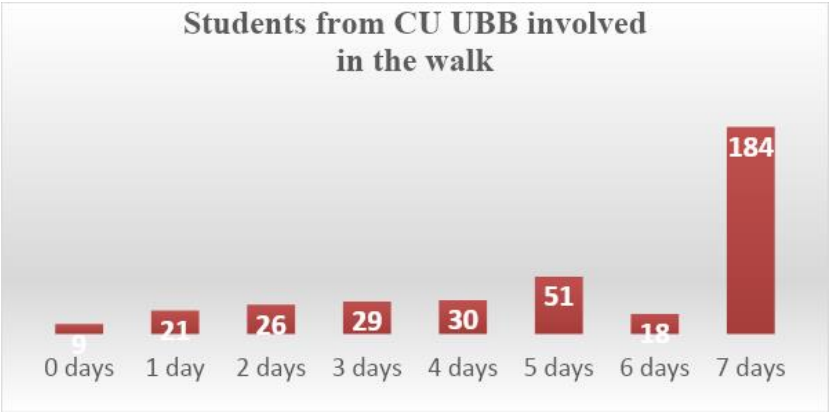

Fig. 5. Students from CU UBB involved in the walk

The answers regarding the time spent in the sitting position is, according to the data completed by the students, between 1-2 hours (41 students – 11%) and eight hours (74 students – 20%).

Summing up, the physical activity of the students from the University Reșita UBB Centre who answered the questions of the questionnaire is as follows:

Table 1. Distribution of CUUBB students from Resita in physical activities

Type of physical activity	No. days / Gender	Students no.						Students no.						Average
		18-20	21-23	24-26	27-30	> 30	Total, from which rural/urban	18-20	21-23	24-26	27-30	> 30	Total, from which rural/urban	
Vigorous activity	0 days	10	21	6	4	30	**71** 20 | 51	4	6	1	3	15	**29** 9 | 20	**2.1 days**
	7 days	1	-	-	2	2	**5** - | 5	2	1	-	1	4	**8** 1 | 7	
Moderate activity	0 days	10	22	4	6	30	**72** 19 | 53	3	2	2	3	13	**2. 3** 10 | 13	**2.1 days**
	7 days	1	1	1	2	5	**10** 1 | 9	2	1	-	1	2	**6** 1 | 5	
Walking	0 days	1	1	1	1	4	**8** 3 | 5	-	-	-	1	-	**1** - | 1	**5.2 days**
	7 days	2. 3	29	5	11	44	**112** 32 | 80	16	16	7	4	29	**72** 26 | 46	

Comparing the results with similar studies [20, 21, 22, 23], where male students hold the primacy in terms of involvement in each of the four types of activities considered by IPAQ, and in the case of CUUBB from Reșita, based on the answers received, the male gender is the one that engages in regular physical activities [24], the greater number being owned by those over 30 years old, from the urban environment [25].

The data presented indicate a low level of physical activity carried out, according to the CIAF (IPAQ), by students from Reșita UBB University Centre, which places them in the same trend of physical inactivity mentioned by WHO documents worldwide, and this, in despite the fact that over 85% of respondents are aware of the importance of practicing physical activities.

Beyond the WHO recommendations regarding increasing the time allocated by the population to physical activities [26], we consider several proposals important, which we enunciate here, namely: **a.** From the teaching staff's perspective, increasing the number of hours of physical education allocated weekly (3-4), both at the pre-university level and at the university level, aiming, at the same time, to decrease/reduce the number of reasons/exemptions granted by doctors, by observing the criteria for granting them. Moreover, even exempt students (of course, depending on the severity of the health problem) would be advised to carry out physical activities for parts of the body that are intact/healthy, under the supervision of the teaching staff; **b.** The involvement of physical education and sports teachers in the implementation of extracurricular activities programs that include as many physical activities as possible with students. In the same vein, it would be desirable for physical education and sports teachers to get involved in the organization of specific sports camps; **c**. At the university level, in the educational plans of the sports-specific study programs, internships in skiing, tourist orientation, etc. are included. Such activities/internships could also be carried out with students from the other study programs, thus finding as many students as possible involved in physical activities; **d**. Finally, we propose the introduction, in the daily work schedule, of an hourly interval in which employees can carry out at least 30 minutes of physical activities, of their choice, depending on the (diversified!) offer of the employer.

Conclusions

If we consider the theme of this conference, then the data presented in this article, according to the information obtained from the 368 students who participated in the survey proposed by us, are not at all encouraging. That is precisely why it is more important than ever that, beyond the awareness of young people in relation to the benefits of movement, they move on to put into practice the theoretical information, so well known, in order to have the certainty of a physically healthier society.

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Study on the Level of Anxiety Present in Volleyball Players, within the National Volleyball Championship Juniors-Men 2022-2023

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Abstract

Introduction: Anxiety is a topic included in the psychosocial dimension of sport and is sometimes directly and sometimes indirectly related to performance. As high pre-competition anxiety is a major factor preventing athletes from achieving high performances, athletes' anxiety levels should be taken into account when analysing performance and studies should be planned according to these values [1]. Mistakes must be kept to a minimum, as every unsuccessful action during the match, especially at the end of a set, can result in the loss of a set. This competitive stress very often causes an increased level of cognitive and somatic anxiety in volleyball players and can also lead to loss of self-confidence [2]. The scientific **aim** of the present research is showing the results of the Competitive State Anxiety Inventory (CSAI-2) on the Juniors-Men volleyball team from CSȘ Viitorul Cluj-Napoca players.
Materials and Methods: In this research we compared the answers to the CSAI-2 (Competitive State Anxiety Inventory) and SCAT (Sport Competitive Anxiety Test) on the CSȘ Viitorul Cluj Napoca male volleyball team's Junior group. This gruop consisted of 13 male players within age of 15-18 years. The survey was applied twice, firstly it was applied after the first match of the championship to find out the starting scores of anxiety level. Secondly they completed the survey after 5 months of trainings and after they reached the final tour of the championship.
Results: In all cases, SCAT index and CSAI-2 index has increased by 0.8 and 0.11, except the level of self confidence wich decreased with 0.7 point at the first filling, and with 0.8 after the third examination. With these results we can say that anxiety level is present in elite volleyball players at a junior level too, and it needs to be well interpreted and resolved by the team coach.
Conclusions: Our study showed that cognitive anxiety and somatic anxiety increased prior to competition, while self-confidence decrease. In addition to the physical and technical characteristics of athletes, it is essential to know and assess their psychological characteristics in order to develop appropriate training and competition strategies.

Keywords: Volleyball, competitive anxiety, cognitive anxiety, junior level.

Introduction

Anxiety levels pose a significant challenge in contemporary sports performance, exerting a notable influence on the outcomes of athletic teams. Frequently, anxiety emerges before crucial competitions or official matches, underscoring insufficient mental readiness or limited experience.

This psychological barrier can detrimentally impact team performance, and reducing anxiety levels has demonstrated positive effects on sports team achievements. Competitive athletes inevitably face a considerable amount of pressure, typically leading to elevated levels of stress and anxiety. Anxiety stands out as one of the most frequently assessed aspects in the field of sport psychology, with at least 22 established scales designed specifically for its measurement [3]. Among these measurement tools, the Competitive State Anxiety Inventory-2 (CSAI-2), developed by Martens, Burton, Vealey, Bump, and Smith in 1990 [4], is widely recognized and utilized. It has made appearances in more than 35 published research articles examining anxiety in sports, making it perhaps the most renowned instrument for assessing anxiety in the realm of sport psychology. The examination of emotions within the context of sports holds significance because these emotions exert a significant influence on athletic performance and offer valuable insights into the athlete-environment relationship. This knowledge can be instrumental in gaining a deeper understanding of athletes and crafting programs aimed at enhancing the performance of specific individuals. Anxiety can manifest in two primary forms: as a trait, representing a consistent personality characteristic, and as a state, signifying a temporary reaction to specific circumstances.

Both manifestations of anxiety can be effectively managed and treated, depending on their impact on an individual's overall well-being and functioning [1]. Anxiety as a state is a transient and fleeting response to a stressful situation, characterized by feelings of tension, fear and physiological changes. It is a normal reaction of the body to challenges or threats and can vary in intensity and duration. Competitive anxiety and its influence on sports performance rank as a significant focal point within the domain of sport psychology, [5]. Typically, high levels of anxiety symptoms, referred to as anxiety intensity, tend to be debilitating and exert a detrimental effect on an athlete's performance [6]. However, it is worth noting that research findings have begun to challenge the notion that anxiety invariably obstructs athletic performance.

Aim

The aim of this research was to examine the state of pre-competitive anxiety starting from the first-round phase of the competition and after the final tournament phase in elite junior volleyball players of CSȘ Viitorul Cluj-Napoca club in the 2022-2023 competitive season in Romania.

At the same time, the objective of the research was to determine the type of anxiety present in the volleyball players of the club, and to compare its level at the beginning of the tournament and after the final tournament of the competitive season.

Subjects and Methods

The research sample consisted of 13 volleyball players, presented in Table 1., from the junior-male team of the sports club CSȘ Viitorul Cluj as follows:

Table 1. Research sample

Nr.	Initials	Age	Player role
1.	S. L.	16	Outside hitter
2.	M. R.	17	Outside hitter
3.	G. B.	18	Opposite hitter
4.	Z. M.	18	Outside hitter
5.	K. S.	16	Opposite hitter
6.	A. I.	17	Middle blocker
7.	C. A.	17	Setter
8.	B. A.	17	Libero
9.	Sz. G. H. U.	17	Outside hitter
10.	H. F.	16	Setter
11.	D. M.	15	Middle blocker
12.	O. G.	17	Libero
13.	B. F.	15	Setter

The research commenced on October 2022, coinciding with the initiation of the junior team of CSȘ Viitorul Cluj's participation in Phase I of the National Championship. During this phase, the team competed in the elite group and, upon conclusion, secured a third-place ranking, thereby earning qualification for the final tournament. Over the course of 10 matches played during this period, the team amassed a total of 20 points in the standings, securing victory in 7 matches while suffering defeat in 3. Additionally, during these matches, the players accumulated 22 sets won and 11 sets lost, as reported in FRV, 2023. Subsequent to the first competitive phase, the players from the club completed a questionnaire, administered for the first time through the Google Forms platform. The Final Tournament took place from May 17 to May 21, 2023, with CSȘ Viitorul Cluj's junior team participating in 5 matches against 6 other teams, all vying for the title of national champion at the junior men's level. The primary research tool employed in this study was the Sport Competition Anxiety Test (SCAT), which served to evaluate the anxiety levels of the athletes both before the first stage and after the conclusion of the competition. The data gathered from the questionnaire were subjected to analysis using descriptive statistical measures. To assess anxiety in the context of sports competition, we utilized the Sports Competition Anxiety Test (SCAT).

Prior to administering the test, all participants were provided with a brief explanation of the questionnaire process and the test's objectives to ensure better comprehension and motivation. The SCAT questionnaire consisted of fifteen questions, with participants required to indicate how they generally felt during competition by selecting one of the following response options: rarely, sometimes, or often. The scores associated with each question were calculated and summed, resulting in an individual's overall score on sports competition anxiety, referred to as the SCAT index. Each response was assigned a predefined number of points, and the final score

was computed and interpreted accordingly. The rating scale showed that subjects scoring less than 17 points had low anxiety, subjects scoring between 17 and 24 points had medium anxiety, and subjects scoring more than 24 points had high anxiety. Descriptive statistics (mean, standard deviation), independent t-test was applied to analyze and compare the degree of sports competitive anxiety of volleyball players from CSȘ Viitorul Cluj. The significance level of p was set at 0.05. CSAl-2 is a 27-item inventory that measures cognitive anxiety, somatic anxiety and self-confidence in a competitive environment. Each item in the CSAl-2 is anchored by a 4-point Likert scale (1: not at all, 2: not very much, 3: often, 4: very much). ltem 14, a reverse-scored item, was reflected prior to data analysis. The 27 items are distributed in 3 subcategories of the questionnaire: cognitive anxiety, somatic anxiety and self-confidence, each of which contains 9 items. Following the conclusion of these matches, the team clinched the third position, earning the bronze medal.

Out of the 5 matches played during the tournament, the juniors emerged victorious in 3 and faced defeat in 2. Following the culmination of this tournament, the players once again completed the designated questionnaire to assess their anxiety levels throughout the various phases of the competition. The next step was the statistical-mathematical analysis in order to graph the data obtained on the players' anxiety level. To perform the statistical analysis we used IBM SPSS Satistics software (v. 26) and Microsoft Excel (2016) to graph the results. The last step was to interpret the results obtained and formulate conclusions about the presence of anxiety in the volleyball team.

Results

Table 2. Results after the first examination

Initials	Anxiety score	Anxiety level	Cognitive anxiety average	Somatic anxity average	Self confidence average
S.L.	20	Medium	1,77	1,66	3
M.R.	15	Low	1,11	1,44	3,66
G.B.	21	Medium	2,33	1,44	3
Z.M.	15	Low	1,55	1,77	2,88
K.S.	19	Medium	2,22	1,88	3,44
A.I.	17	Medium	1,44	1,55	4
C.A.	16	Low	1,44	1,55	3,55
B.A.	18	Medium	2,88	2,66	2,22
Sz.G .H.U.	16	Low	2,33	1,55	2,66
H.F.	17	Medium	1,66	1,33	3,88
D.M.	19	Medium	1,88	2	3,33
O.G.	18	Medium	1,77	1,88	2,33
B.F.	15	Low	2,66	1,77	2,55

Table 3. Results after the second examination

Initials	Anxiety score	Anxiety level	Cognitive anxiety average	Somatic anxity average	Self confidence average
S.L.	21	Medium	1,33	1,44	3
M.R.	18	Medium	1	1,55	3,88
G.B.	22	Medium	2,33	1,22	3,22
Z.M.	16	Low	1,44	1,77	3,44
K.S.	20	Medium	1,44	1,55	3,44
A.I.	18	Medium	1	1,55	4
C.A.	19	Medium	2,11	1,66	3
B.A.	20	Medium	2,55	2,55	2,22
Sz.G.H.U.	16	Low	2	1,55	2,55
H.F.	20	Medium	2,55	2,77	2,55
D.M.	23	Medium	3	1,77	2,77
O.G.	18	Medium	1,77	1,55	2,88
B.F.	18	Medium	2,77	2,77	3

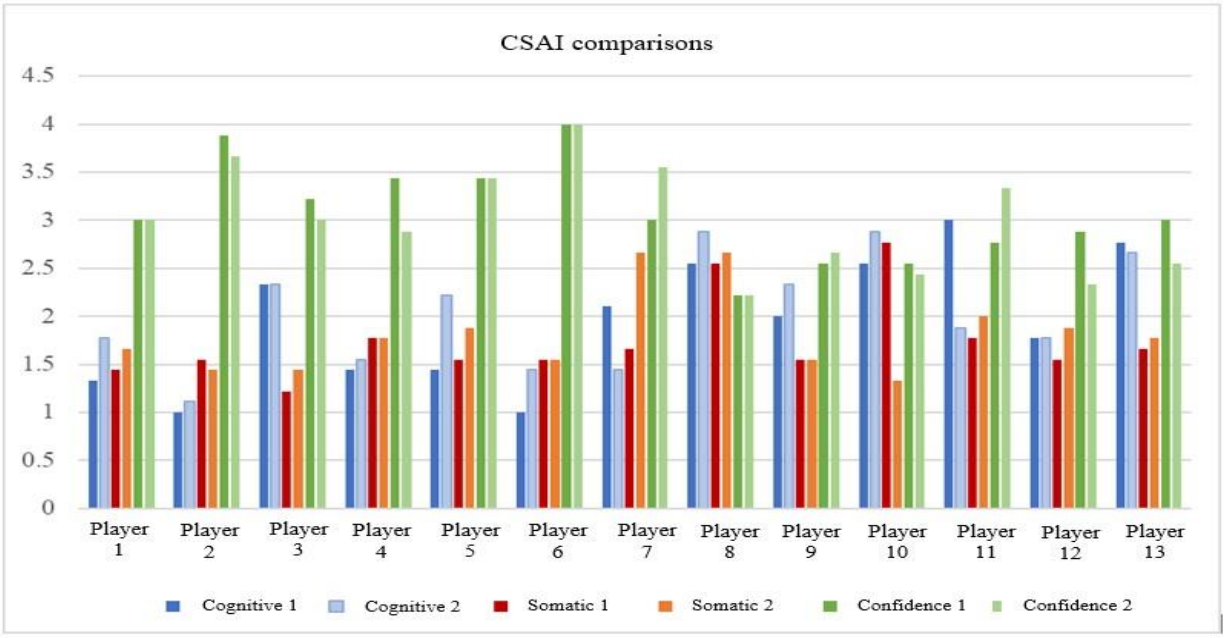

Fig. 1. Comparison between cognitive and somatic anxiety levels, respectively self-confidence, after initial and final testing

Discussion

The research findings indicate that anxiety levels can impact sports performance, with the degree of influence varying depending on an individual's level of experience and skill. Graph 1 illustrates that the initial anxiety level, as assessed in the October 2023 test (with a mean of 17.38), was categorized as medium. This suggests that the players on the CSȘ Viitorul Cluj team harbored concerns about the onset of the second round of competition. However, after five months of training and competitive engagement, the subsequent evaluation of anxiety, as depicted in Table 2., revealed a notable increase in anxiety levels (with a mean of 19.73). This underscores the importance of implementing specialized psychological preparation training, as participation in official and friendly games can potentially enhance mental resilience and reduce anxiety levels [1].

Table 2. shows the differences between the two tests of anxiety level determination, and we also examinated the means of the SCAT tests which are: initial = 17.38 and final = 19.73 (std = 1.98 & 2.49). Considering that a point is gained by each successful action, players must be constantly focused on the successful performance of the technical-tactical elements. Mistakes must be minimized, as every unsuccessful action during the match, especially at the end of a set, can result in the loss of a set. This competitive stress very often causes an increased level of cognitive and somatic anxiety in volleyball players and can also lead to loss of self-confidence. The results of the current study were similar to those found in other studies based on the topic of anxiety in sportsmas perfomance [7], which was conducted to determine the pre- and post-competition anxiety status of players in different branches. Researchers [9], found a significant difference between players' pre- and post-competition cognitive anxiety scores and also between their somatic anxiety scores. Other studies have shown that high-anxiety situations cause athletes to engage in excessive error monitoring [8] and reduce anticipatory timing performance.

The present study was conducted to gain a better understanding of the relationship between competitive anxiety and sport performance in a sample of volleyball players from CSȘ Viitorul Cluj club at the Junior-Men level. In particular, this study examined the moderating effects of self-confidence on the relationship between competitive anxiety and sport performance. The results of the present study showed that self-confidence had a significant positive correlation with sport performance. Self-confidence also had a moderating effect on the association of competitive anxiety with sport performance. The use of effective coping strategies to deal with competitive anxiety helps the athlete to better control and manage the stressful situation, thereby improving their sporting performance. The effect of self-confidence on the control and mitigation of negative emotions has been confirmed in various studies [9]. Based on this, one possibility is that self-confidence helps the athlete to control and mitigate negative emotions specific to sport competition, such as competitive anxiety. This ability strengthens the athlete's sense of dominance and merit during the match and improves his/her sport performance. Due to the fact that the level of competitive anxiety changes depending on the quality of the opponent and the importance of the match, it is recommended, in order to better explain the relationships between competitive state anxiety and situational effectiveness, to collate data on a larger number of matches during the training and competition period.

Conclusion

Anxiety levels are a major issue in sports performance today, with a significant impact on the performance of sports teams. Anxiety often manifests itself prior to key competitions or official games, highlighting a lack of mental preparation or a low level of experience. This mental block can affect team performance, and lowering anxiety levels has also been shown to improve the results of sports teams. The study focused on the analysis of anxiety levels of a volleyball team at the Junior-Men level in Romania. In this study, a decline in players' self-confidence levels was observed as the final tournament approached, and an increase in cognitive and somatic anxiety was observed after the end of the competition.

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Functional Connection of Sports Recreation and Tourism the Example of the Eco Center Ljekarice

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Abstract

This research delves into the preferences, attitudes, and interests of visitors at the Ljekarice Eco Center concerning sports and recreational facilities. It evaluates their opinions on various aspects of the center's sports and tourism offerings. The study, conducted between July 1 and July 3, 2019, included 97 participants, ensuring gender balance (55 female and 42 male) and spanning ages from 18 to 65. A structured questionnaire anonymously gathered demographic information and explored sports and recreational knowledge, habits, motivations, and satisfaction with the center's services. The data were processed using standard statistical procedures, revealing key trends. Most visitors hail from nearby demographic centers, with the majority aged 18-35 and secondary or university-educated. Despite recognizing the benefits of active rest, many Ljekarice Eco Center visitors do not engage regularly in sports and recreational activities, potentially due to a lack of habits and perceived benefits. Participation motives vary, with 65% seeking to utilize free time productively and 28.9% valuing the development of a competitive spirit. Personal recommendations significantly influence tourists' choices, with approximately 50.5% believing that sports and recreational facilities are unnecessary at the center. Visitors predominantly select sports and entertainment games, expressing desires for additional activities like tennis and aqua aerobics. Limited facilities and infrastructure hinder participation in desired activities during vacations.

Keywords: tourism, recreation, animation, attitudes

Introduction

Eko-centar Ljekarice is nestled in the serene landscapes between Banja Luka and Prijedor, to the south of Omarska. It is conveniently located 30 kilometers from Prijedor and 40 kilometers from Banja Luka. This strategic positioning allows easy access for visitors coming from these major cities and neighboring areas and provides a versatile and eco-conscious destination for a wide range of recreational activities and nature exploration. Its mission encompasses promoting health, environmental preservation, diverse tourism experiences, and community engagement in the heart of natural surroundings. Hypokinesia, characterized by a significant reduction in physical activity, has emerged as an urgent concern in modern society.

As our lifestyles become increasingly sedentary, with extended hours spent in front of screens and desks, the harmful effects of hypokinesia on our health have come to the fore.

Fortunately, engaging in recreational activities offers a powerful antidote to combat the harmful effects of hypokinesia. Prolonged periods of inactivity are associated with a range of health problems, including obesity, cardiovascular disease, diabetes, musculoskeletal disorders, and mental health disorders such as depression and anxiety [1], [2], [3]. Recreational activities, which cover a wide range of physical activities, effectively combat hypokinesia and related health risks. Engaging in activities such as swimming, cycling, hiking, dancing, or team sports increases physical activity levels and promotes general well-being. Regular participation in these activities is associated with improved cardiovascular health, increased muscle and bone strength, weight management, and reduced risk of chronic disease [4],[5]. Engaging in these activities releases endorphins, natural mood enhancers in the body, which can alleviate symptoms of depression and anxiety [6]. One of the critical benefits of recreational activities is their adaptability to different fitness levels and interests. They serve people of all ages, genders, and fitness levels, making physical activity accessible and enjoyable for a wide demographic [7]. This inclusiveness encourages individuals to overcome the inertia of hypokinesia and adopt a more active lifestyle. Sports tourism is a thriving sector that draws travelers to destinations worldwide. This form of tourism involves individuals or groups traveling to participate in or witness sports events and activities. However, it goes beyond mere spectating, often incorporating active participation in recreational sports and physical adventures. Recreational activities associated with sports tourism stimulate local economies through the provision of services and facilities such as sports equipment rental, guided tours, and wellness services [8].

Recreational activities, whether it's skiing in the Alps, scuba diving in tropical waters, or cycling through scenic landscapes, are major attractions for sports tourists, influencing their choice of destination [9]. Sporting events and recreational activities have proven to be potent marketing tools for destinations. Hosting sports events or offering unique recreational experiences can increase a destination's visibility and desirability [8]. Local communities often play a vital role in facilitating recreational activities for sports tourists. Their involvement in providing authentic experiences, such as guided hiking tours or cultural interactions, can lead to mutual benefits [9]. In conclusion, the relationship between tourism and recreational activities, particularly in the context of sports tourism, is symbiotic. Travelers seek destinations that offer a wide range of recreational pursuits, and these activities, in turn, contribute significantly to the economic, social, and cultural aspects of the destination. This research aimed to check whether the general hypotheses presented are valid at the local level, specifically through the example of Eco Center Ljekarice.

Materials and Methods

The research aimed to analyze the preferences, attitudes, and interests of visitors towards sports and recreational facilities at the Ljekarice Eco Center, while also evaluating their opinions on various aspects of the center's sports and tourism offerings. The study was conducted during a specific timeframe, from July 1 to July 3, 2019, within the premises of the sports and recreation complex Eco Center Ljekarice, with a total of 97 participants. The participants were chosen to ensure a balanced representation in terms of gender, with 55 female and 42 male examinees', spanning ages from 18 to 65. For the purpose of this research, a structured questionnaire was employed, and the survey was administered anonymously. The questionnaire was designed to

elicit two categories of information. The first category pertained to demographic details, including place of residence, gender, age, marital status, educational background, occupation, and economic circumstances. The second category of questions focused on sports and recreational knowledge, habits, motivations for selecting the Ljekarice Eco Center as a destination, participation in sports and recreational activities during their stay, assessment of attitudes, and overall satisfaction with the services provided at the center.

Additionally, participants were encouraged to offer suggestions and proposals aimed at enhancing the tourism experience. All collected responses underwent rigorous processing utilizing standard statistical procedures in SSPS 25 software. Descriptive statistics were employed to summarize the data, providing an overview of the key trends and patterns within the responses. Additionally, the frequency of occurrence method was utilized to ascertain the prevalence of specific preferences, attitudes, and interests among the participants. This methodical approach ensured a comprehensive analysis of the needs and opinions of visitors to the Ljekarice Eco Center, shedding light on their expectations and satisfaction levels, while also providing valuable insights for the improvement of the center's tourism offerings.

Results

Based on the data obtained through survey research, an analysis of the demographic character that reflects the structure of the population of service users was performed. The expressed needs, attitudes and interests of service users towards sports and recreational facilities, their application, as well as suggestions for improving this type of tourism in the area of the Eco Center were analyzed.

Table 1. Basic demographic data of examinees

gender		**vicinity from EC**			
Female	56,7%	< 50 km	56%		
Male	43,3%	> 50 km	44%		
	18 - 25	26 – 35	36 - 45	46 - 55	56 - 65
age group	37,1 %	30,9%	16,5%	13,4%	2,1%
	Regularly	**Periodically**	**no recreation**		
recreation/time1	18,6%	60,8%	19,6%		
	>2hours/day	**1-2 hours/day**	**3/week**	**1/week**	**<1/week**
recreation/time2	4,1%	14,4%	27,8%	24,7%	28,9%

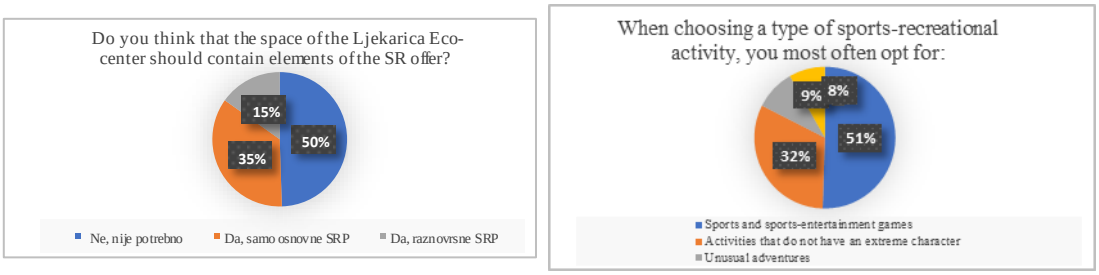
The examination of the demographic characteristics of examinees at the Eco Center Ljekarice yielded significant insights, as summarized in Table 1. Most examinees' (56%) originated from locations 50 kilometers or less distant from the Eco Center Ljekarice. In contrast, gender distribution among examinees was nearly evenly balanced, with 56.7% being female and 43.3% male. We found that the predominant age groups among examinees were individuals aged 18-25 and 26-35, collectively accounting for 68% of the total examinees. A substantial portion of examinees' (50.5%) indicated their marital status. In terms of educational backgrounds, the majority of examinees possessed a high school degree (39.2%), closely followed by those with a university degree (30.9%). Regarding occupations, educators constituted the most significant demographic segment (17.5%), followed by healthcare workers (14.4%) and students (13.4%). The largest number of examinees stated that in their place of permanent residence, they engage

in sports or recreation occasionally (60.8%), while the percentage of examinees who regularly (18.6%) or do not engage in recreation at all (19.6%) is significant lower. Results shows that 74% of examinees set aside time 1-3 times a week to use sports and recreational facilities in their place of permanent residence.

Examinees who affirmatively expressed themselves regarding active vacations spent more hours a day using sports and recreational facilities (graph 1) and expressed that such free time during a tourist stay is rational. The same graph shows that the need to compete motivates 14.4% of examinees, while socialization and enjoyment of the game motivate 7.2% of examinees. According to 28.9% of examinees, the importance of sports and recreation for a person is reflected in the balanced development of a competitive and fair play spirit. At the same time, it is almost equal to the percentage of examinees (27.8%) who see the importance of sports and recreation for a person in establishing contact and getting to know other people. When choosing a tourist destination, the most significant number of examinees indicated that the choice is influenced by suitable recreational facilities (60.9%). In comparison, previous experience with sports and recreational services minimal (39.2%) influences the repeated choice of tourist destination destinations.

Graph 1. Attitude toward recreational activities

Graph 2 shows results in which 50.5% of the examinees do not consider the presence of sport-recreational content in the tourist offer of the Eco Center Ljekarice necessary, while 35 % of them only consider the need for basic sport-recreational programs such as hiking, shaping exercises. Examinees who expressed interest in sports and recreational activities in the surroundings of the Ljekarice Eco Center most often chose sports and entertainment games (51 %) and activities that do not have an extreme character (32 %). In comparison, less often, they choose unusual adventures (9 %) and use the services of recreation centers (8 %).



Graph 2. Suggestions for the development of the center

Based on the data obtained (Figure 1), examinees indicated the need to introduce new sports and recreational facilities such as tennis, table tennis and badminton, basketball, aerobics and water gymnastics, darts and bocce. Examinees pointed to the need to expand infrastructure facilities that would support the desired activities, such as running trails, a greater number of bodies of water, bike paths, a miniature golf course, mini soccer, outdoor gyms.

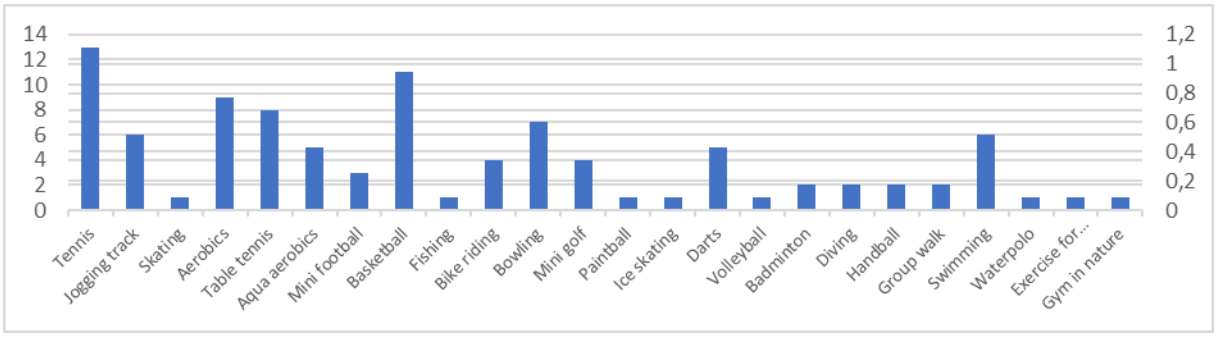
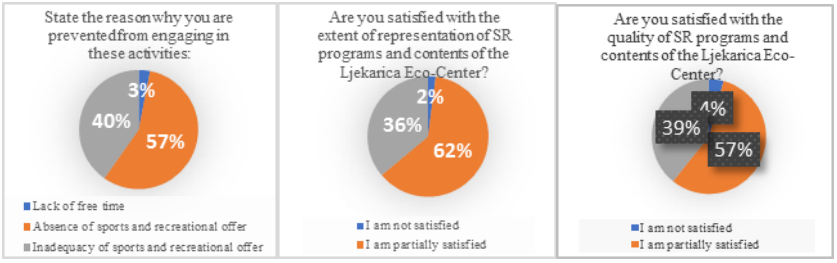


Figure 1. Proposals for new sports and recreational activities in SRC

The largest number of examinees (Graph 3), cite the lack of sports and recreational activities as the reason for not engaging in the desired sports and recreational activities during their tourist stay (56.7%), while the inadequacy of sports and recreational activities (40.2%) is also a frequently cited reason. not participating in the desired activities. At 61.9%, examinees are partially satisfied with the extent to which sports and recreation programs and content are presented. The situation is similar with 56.7% partially satisfied and 38.8% satisfied examinees regarding the quality of the same.



Graph 3. Examinees satisfaction with the center's offer

It is crucial to note that the rising demand for active holidays in modern tourism often outweighs natural or cultural-historical attractions [10]. However, the underrepresentation of high-quality sports and recreational content, animation, and entertainment negatively affects the Eco Center's tourist appeal, leading to decreased traffic, shorter stays, and changes in the visitor profile. Most visitors came from nearby demographic centers, particularly Prijedor and Banja Luka. Tourists' local-regional profile aligns with similar findings [11]. The predominant age group among visitors was 18-35, with secondary and university-educated individuals making up the majority. Educators and health workers were the most frequent users, often representing middle-income populations. Tourists who engaged in regular recreational activities at home were likelier to participate during their vacation stays. Summer and the pre-season were favored for trips due to better weather conditions and fewer booking conflicts.

Despite recognizing the benefits of active rest, many visitors at the Ljekarice Eco Center did not regularly engage in sports and recreational activities, potentially due to a lack of habits and perceived benefits [12]. The reasons for participation varied, with 65% seeking to make productive use of free time and 28.9% valuing the development of a competitive spirit. Personal recommendations played a significant role in tourists' choices, while around 50.5% believed that sports and recreational facilities were unnecessary at the Ljekarice Eco Center. Visitors predominantly selected sports and entertainment games, desiring additional activities like tennis, basketball, and aqua aerobics. Limited facilities and infrastructure hindered participation in

desired activities during vacations. Solutions, such as the model proposed by [13], may address these challenges. Diverse attitudes towards recreation may stem from lower and irregular physical activity at home. Leisure experts should promote the health benefits of regular leisure activities, especially in tourist destinations. Acknowledging study limitations, including a small sample size and a short data collection period, is essential.

Conclusions

This study delved into the needs, attitudes, and behaviors of tourists who visited the center, shedding light on the interplay between sports recreation, tourism, and visitor demographics.

Our study revealed that the Ljekarice Eco Center faces challenges providing higher-quality organized sports and recreational content, animation, and entertainment. This underrepresentation harms the center's overall appeal, resulting in a decrease in tourist traffic, shorter stays, and changes in the visitor profile. In conclusion, the Ljekarice Eco Center is a promising destination for sports recreation and eco-conscious tourism. To enhance its appeal, we recommend focusing on infrastructure development, raising awareness about the center's offerings, and tailoring activities to meet the diverse interests of visitors. Despite the study's limitations, including a small sample size and a short data collection period, the insights gained provide valuable perspectives for optimizing the Ljekarice Eco Center's role in promoting health, well-being, and eco-friendly tourism in the region.

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The Relationship between the Self-perceived Psychological State of Tennis Linemen and the Accuracy of their Calls

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Abstract

Introduction: The technological progresses of tennis officiating represent an important part of this sport, especially through the electronic line calling (ELC) system.
Aim: The purpose of this study is to measure the relationship between the self-perceived psychological state of tennis linemen and the accuracy of their calls.
Materials and Methods: The research took place during the ATP 250 Sofia 2022, where fifteen-line umpires have been tested by the ELC. Before every shift of 60 minutes, they have filled in a questionnaire regarding their concentration and stress level on a scale of 1 to 5. The correlation between the data regarding the mental state of the line umpires and the accuracy of their calls during the match was then studied. The numbers were analyzed by using the Pearson correlation.
Results: The Pearson coefficient has shown a level of correlation of .533, which is considered medium. There are many aspects to take in consideration, like the small number of subjects, the length of the study or the fact that only the decision tested by ELC have been counted.
Conclusions: A correlation between concentration and stress level in relation with the decisions of officials has been found. This can be just the beginning of a new research regarding line umpires and the ELC system.

Keywords: tennis, line umpire, accuracy, ELC

Introduction

Technological development is becoming an increasingly sensitive point on the map of professional sports. This also happens in tennis, where digitization elements at the level of refereeing make their presence felt increasingly, and, in many cases, come to replace the human factor in refereeing. More precisely, Electronic Line Calling (ELC), which is the most important technological advance used in tennis today, can establish with great accuracy and objectivity the correctness of the referees' line announcements.

The Electronic Line Calling (ELC) system is the biggest innovation in professional tennis. This system was officially used for the first time in 2006 at the Hopman Cup, the team (country) tournament leading up to the first Grand Slam of the year. In short, ELC aims to increase the fairness of decisions made by referees in matches, as players have the right to request the official replay of balls close to the line. So, still the chair umpire together with the line umpires decide in the first instance whether the ball was out or in, and if the player believes that the umpires were

wrong, he can call for the official replay. Of course, in order not to abuse this system and to avoid situations where after each point the player wants to see the replay, it was decided by the Rules of Tennis [1] that each player has the right to three unsuccessful attempts within a set, plus one additional in the event of a tie-break. Also, in advantage set matches, at 6-6 the players will start again with three unsuccessful attempts, this aspect is reset every twelve games played [2]. At first, the ELC system was used on all surfaces except clay courts. 2021 was a landmark year, as this system was also approved for clay courts as a trial, so several tournaments held on this surface benefited from the ELC system. In other words, the chair umpire no longer had to get out of his chair to inspect the mark, as the decision was to be made by the system, of course if the player called for an official replay.

It should be noted that at the level of professional tennis, according to the ITF Player Analysis Technology [2], there are two approved electronic review systems, respectively: Hawk-Eye and FOXTENN Diamond-Player Pro-Performance Court. For ease of expression, the term FOXTENN will be used briefly throughout the text. First, the Hawk-Eye system was created by the British Paul Hawkins and is also known as "Instant Replay". This system is composed of high-speed cameras, computers, and various electronic screens. For a better understanding of how this system works, we will categorize the entire process into several stages. Thus, with the help of the computer, the three-dimensional image of the tennis court is converted into millimeters as the fundamental unit of measurement. Then, using the 8-10 cameras, which reach speeds of over 2000 FPS [3] and are strategically located outside the field (for example: in the stands, etc.), the aim is to record the trajectory of the ball, the three-dimensional placement of the image containing the impact of the ball with the surface, respectively the transmission of data to the computer's operating system. Finally, using real-time image processing technology, the official replay is displayed on the screen, the entire process taking no more than 10 seconds [4]. The first Hawk-Eye system was used as early as 2001, but not in tennis, but in cricket, appearing unofficially only on television broadcasts of the matches [5]. It should be appreciated that starting from December 2004 a long series of tests on the effectiveness of the Hawk-Eye were carried out, meeting the standards and norms imposed by the ITF, which meant a historic moment for professional tennis, because it was just about to be officially approved the first electronic review system. So, on 14 October 2005 the Hawk-Eye system was officially approved by the ITF and was introduced to the Hopman Cup in January 2006. The results showed that the system has an error of 2.6 mm [6], in the case of comparison with a high-speed camera located on the ground surface. It should be remembered, as we stated in the previous paragraph, that all the high-speed cameras of the Hawk-Eye system are located outside the field, at variable heights, depending on the configuration of the arena, not at all inside the playing surface [7]. From the moment of official approval, the system is tested in advance at each tournament, taking into account all disruptive factors that may arise.

For example, in open-air tournaments, the following essential aspects must be taken into account: the wind (so as not to move the cameras which must have a fixed position), the influence of the sun and the shadows that may appear on the field, related to different times of the day, darkness and cloudiness, respectively artificial light [6].

On the other hand, FOXTENN represents a much newer system like Hawk-Eye and was approved by the ITF in 2017 [8], the first tournament in history using this system being the ATP Moselle Open in Metz. The main feature is the display on the screen of the impact of the ball exactly with the ground ("real bounce"), thanks to the forty high-speed cameras and ten high-speed lasers, which capture 100,000 images every second [9]. Furthermore, there is no system

that has the cameras synchronized with a set of lasers on the ground. According to the information provided by FOXTENN, they consider the system to be 100% working with no error at all.

For better understanding, Hawk-Eye replays the official replay, based on the trajectory of the ball and impact with the surface, while FOXTENN replays the exact impact of the ball with the surface ("real bounce").

Aim and Hypothesis

In all this context, the aim of the paper is to present some of the technological advances in world refereeing in tennis, but also to use the information provided by ELC as objective measurements of the accuracy of tennis linesmen who make decisions under emotional stress.
The hypothesis of this study is that there is a correlation between concentration and self-perceived emotional stress of tennis linesmen and the accuracy of their decisions.

Materials and Methods

The study was conducted during the ATP 250 tournament in Sofia, in the year 2022, for one day, on the central court of the competition. The subjects of the research were fifteen line referees, representing two teams of seven referees each, respectively one reserve. At the tournament in Sofia, ELC was represented by Hawk-Eye, but only in the center court. The two teams of linemen each had three rotations at center court on the Tuesday of the tournament, with each rotation lasting 60 minutes. They, before each entry, completed a questionnaire on their self-perception of their psychological state (level of concentration and stress). The level of concentration and stress were measured on a scale from 1 to 5 and later, based on a mathematical formula (arithmetic mean), were included in the psychological state variable (PS):

Regarding the variable, the accuracy of the line referees' decisions, the ATP provided us with the ELC statistic to conduct this study. It should be noted that the line referees can be found in three basic positions on the line: the side lines, the baselines, respectively the service line. Sideline umpires have the advantage of being able to watch the ball coming perpendicularly and anticipate the direction and where the ball lands, unlike those on the end and service lines who have the diametrically opposite perspective, and anticipating the ball's impact with the surface can often be misleading. The difference between baseline and service line umpires is that those on the service line have the heaviest balls, with some services reaching over 220 km/h, and the umpires on that line are the most experienced, possessing a particularly good ability of determining the announcement [10]. At the opposite pole, there are those on the sidelines. Thus, the following bonus system was proposed (Table 1):

Table 1. Difficulty coefficient depending on the line where the calls were made.

Calling line	Correct call coefficient	Wrong call coefficient
Lateral	1,00	1,50
Baseline	1,25	1,25
Service	1,50	1,00

In this context, if the player called for a challenge, the Hawk-Eye system determined how the ball was, and if the referee was right, then the coefficients for the correct call were used, and in case of a mistake, those for the wrong call were used, which are rendered inversely

proportionally, depending on the complexity of the line they were on. The formula below shows the mathematical expression used for the calculation of the accuracy score (ACC) of the close calls made by the line umpires:

$ACC = 1 + X_C * L_C - X_W * L_W$, where: X_C represents the number of correct challenged calls, L_C, the difficulty coefficient of the line where the correct challenged call happened, X_W, the number of wrong challenged calls, L_W, the difficulty coefficient of the line where the wrong challenged call happened.

The calculation of the indicators consisted in the creation and processing of a database in Microsoft Excel, containing records of the responses of the subjects, respectively of the results within the challenges. It should be noted that all the tournament results recorded by hawk-eye were made available to us by the ATP, following a request we sent them.

The correlation between the data obtained from the measurement of the two variables (PS and ACC) was studied by calculating and interpreting the Pearson coefficient using the Social Science Statistics platform. This coefficient can take values between -1 and 1 and the closer the values are to 1, the stronger the correlation.

Results

After centralizing the subjects' responses and the official data provided by the ATP regarding the ELC we obtained the results presented in this section.

Regarding the PS (Table 2) the fifteen-line referees (14 selected and one reserve), noted by codes S1, S2, etc., provided 42 answers, according to the table:

Table 2. Psychological state (PS) of the linesmen

Rot.	Variable	Subject														
		S1	S2	S3	S4	S5	S6	S7	S8	S9	S10	S11	S12	S13	S14	S15
1	Concentration	5	5	5	4	5	4	5	5	4	5	3	R	5	5	4
	Pressure/stress	3	2	4	2	5	4	3	1	3	4	1	R	1	4	5
	PS	4	3,5	4,5	3	5	4	4	3	3,5	4,5	2	R	3	4,5	4,5
2	Concentration	5	5	5	5	5	4	5	5	5	5	5	5	5	5	R
	Pressure/stress	3	2	5	3	5	3	2	2	3	2	2	2	2	3	R
	PS	4	3,5	5	4	5	3,5	3,5	3,5	4	3,5	3,5	3,5	3,5	4	R
3	Concentration	5	4	5	5	5	5	R	5	5	5	5	5	5	4	5
	Pressure/stress	4	3	3	3	5	5	R	3	3	5	2	2	2	4	5
	PS	4,5	3,5	4	4	5	5	R	4	4	5	3,5	3,5	3,5	4	5

Table 3 presents the accuracy of the decisions of the referees on the field, revealed by the results of the challenges requested by the players. Of the 42 responses, 20 were excluded because some referees had some rotations where there were no challenges from the players, so they could not have calculated the accuracy (ELC). The table below sets out the remaining 22 records that were considered for the actual study.

Tabel 3. The accuracy of the decisions of the referees on the field

Subject	X_C	X_w	Line	L_C	L_W	ACC
S1	1	0	S	1,5	1	2.5
	1	0	S	1,5	1	2.5
	1	0	S	1,5	1	2.5
S2	1	0	B	1,25	1,25	2.25
	1	1	B	1,25	1,25	1
S3	1	1	L	1	1,5	0.5
	1	0	L	1	1,5	2
S4	0	1	L	1	1,5	-0.5
	1	0	B	1,25	1,25	2.25
S5	1	1	L	1	1,5	0.5
S6	2	1	L	1	1,5	1.5
S7	1	1	L	1	1,5	0.5
S8	2	0	S	1,5	1	4
S9	1	0	B	1,25	1,25	2.25
S10	1	0	L	1	1,5	2
S11	0	1	L	1	1,5	-0.5
	1	0	B	1,25	1,25	2.25
S12	1	0	L	1	1,5	2
S13	1	0	L	1	1,5	2
S14	1	0	L	1	1,5	2
	1	0	L	1	1,5	2
S15	1	0	L	1	1,5	2

Like those mentioned in the methodology section, each challenge for the referee was quantified through a credit rating system based on the complexity of the line it was on. Thus, L means lateral line, considered the easiest, followed by B, which expresses the baseline, and finally S, respectively the service line, being seen as the most difficult.
After calculating the two variables, PS and ACC, a Pearson correlation coefficient of .533 was obtained, which means that we are within a moderate positive correlation [11]. In other words, there is a correlation between the psychological state and the accuracy of the announcements made by the referees, after checking with the electronic review system.

Conclusions

The results of this study establish the existence of a relationship between the studied variables. The hypothesis of the existence of a significant correlation between the self-perceived psychological state (concentration and psychological pressure) and the accuracy of decisions is therefore confirmed.

This study can be the early stage of a larger study, which could integrate a larger volume of subjects and a greater precision of measurements taking into account some limitations such as the fact that there is a certain note of subjectivity regarding to the answers given by the subjects,

because the terms "concentration" and "pressure" define a qualitative rather than a quantitative expression. However, for the purpose of the study we used the quantitative data provided by the subjects.

Also, in a tennis match there are countless boundary balls that are not required to be evaluated by the ELC system. And here comes a certain limitation of the study because the umpire can have, for example, two boundary balls called correctly, but without a challenge, while on a single ball the player calls the system, and it is proven that the umpire missed a ball 2 mm out. But, for this study we only included the cases where the ELC system confirmed or denied the linesman's decision, following the appeal made by the player.

Moreover, the lack of data on the distance in millimeters of the mistakes was a limitation of the study, because in the current context, an error of one millimeter mattered as much as one of three centimeters or even more.

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Study on the Use of CrossFit in the Physical Training of Judo Athletes

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Abstract

Introduction: The physical preparation of the athletes is the basis of the development of the motor capacity, without which they cannot carry out their activity in good conditions.
Aim: The paper aims to review the specialized literature to identify the CrossFit tools used in the training of judo athletes.
Materials and Methods: A search was carried out with the term "CrossFit" in the Web of Science database applying the following filters: period 2020 - September 2023; the Web of Science Sport Sciences or Hospitality and Leisure Sport Tourism categories; articles or review papers, fitting into sustainable development objectives and the English language. The obtained results were analyzed, systematized, and inte rpreted bibliometrically with the help of the Vosviewer program.
Results: From the total of 565 results obtained, after applying the filters specified above, 205 articles or review papers were retained for analysis. Of these, only 5 present results regarding the use of CrossFit elements in the physical training of judoka, hence the need for research in this direction. Identified: the most influential authors who presented the use of CrossFit (number of articles and citations), the countries and organizations from which they come, the results obtained by them. Conclusions: The use of CrossFit elements in the training activities of athletes of various types of combat, allows to achieve a significant increase in the level of special fitness. The design of the training programs will bring a plus in capitalizing on the most effective exercises and their use in the development of the motor capacity of the athletes. The use of CrossFit elements in judo aims to improve general physical qualities: strength, power, endurance, flexibility, speed, precision, balance, coordination, agility and cardiovascular endurance.

Keywords: CrossFit, physical preparation, judo

Introduction

The popularity of CrossFit-type workouts, which include different patterns of constantly varied movements performed at a certain intensity [18], has been booming for the past twenty years [9]. Different authors show that monitoring the performance achieved by athletes during training using CrossFit means allows recording the progress made and predicting performance

[8]. CrossFit involves the use of a variety of exercises that engage various muscle groups and activate their functions [19]. Recent studies show that in CrossFit training, neuromuscular performance depends on gender and is directly proportional to training frequency [17].

Materials and Methods

A systematic search was conducted in the Web of Science database on CrossFit. The filters applied were: the period 2020 – September 2023; Web of Science categories researched: Sport Sciences and Hospitality and Leisure Sport Tourism categories; articles or review papers, fitting into sustainable development objectives and the English language. The obtained results were analyzed, systematized and interpreted bibliometrically with the help of the Vosviewer program.

Results

Bibliometric analysis

Of the total of 565 results downloaded from the Web of Science database, 535 were published in English. Their distribution by year of publication demonstrates a growing interest in CrossFit. Thus, 78.70% (421) of the articles were published in the period 2018-2023 (September 15). After applying the filters specified above, 205 papers were retained for analysis, of which 187 articles, respectively, 18 review papers. They belong to the Web of Sciences Sport Sciences and Hospitaly, Leisure Sport Tourism domains. The 205 papers are original articles (187) or review papers (18).

The fields of sustainable development to which they fall are: Gender Equality, Good Health and Well Being, Zero Hunger or Quality Education. Only 5 papers present results regarding the use of CrossFit elements in the physical training of judoka, hence the need for research in this direction.

The 205 papers have 784 authors, affiliated to 347 organizations. The most influential authors are: Ferito Yuri (31 papers and 220 citations), Heinrich Katie (28 papers and 327 citations), Mangine Gerald (15 papers and 132 citations), Tibana Ramires (11 papers and 123 citations) and Stone Whitley (9). In table no. 1 it is presented the distribution of the analyzed works according to the country of origin of the authors. It is noted that the most (83) were written by authors from the USA, 33 from Brazil, 18 from Spain, 13 from the UK, 12 from Australia, while 46 papers have authors from various other countries. Depending on the affiliation of the authors to different organizations (Figure 1), Faculty Estacio Vitoria stands out (6 documents, 119 citations and 6 total link strength); Univ. Catolica Brasilia (6 documents, 95 citations and 6 total link strength); Kemesaw State University (20 documents, 289 citations and 3 total link strength); Kansas University (7 documents, 42 citations and 1 total link strength); University Sao Paulo (5 documents, 142 citations and 0 total link strength). From Figure 2 it can be seen that the most citations of the analyzed articles come mainly from the magazine Sports (419), followed by the Journal of Sports Medicine and Physical Education (199).

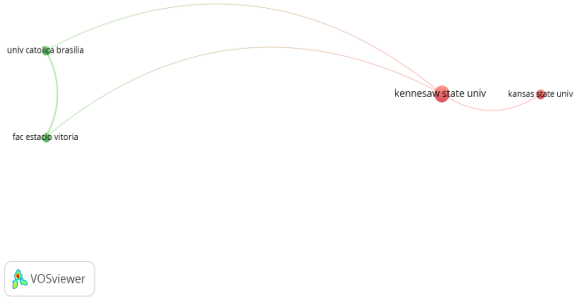

Fig. 1. The main organizations from which the authors come

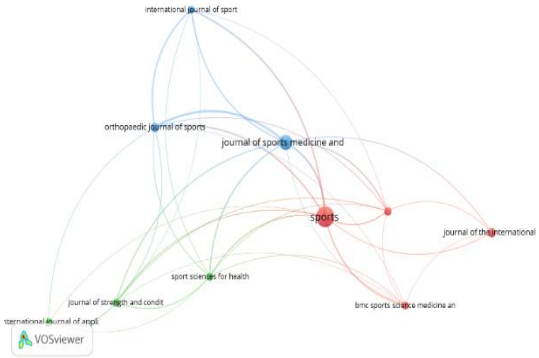

Fig. 2. Journals citing articles retained for analysis

Source: Own processed data based on VOSviewer, version 1.6.15 [10]

Table 1. Distribution of the analyzed works according to the authors' country of origin

Country	Number of documents	Number of citations	Total link strength
Brazil	33	442	16
USA	83	1408	13
Australia	12	385	8
Spain	18	216	8
Great Britain	13	182	6
Canada	9	107	5
New Zeeland	5	298	5
Netherlands	6	79	4
Germany	10	54	3
Denmark	5	160	1
Italy	11	82	1

Source: Developed by authors, based on Voswiewer version 1.6.18 [10]

The most cited authors of CrossFit-related articles (Figure 3) are: Claudino (130 citations), Smith (113), Bellar (70), Sprey (67). Among the 784 authors of the articles, 19 published at least 3 articles on this topic. Among them, a group of 11 authors who collaborate with each other emerges, among which we mention: Feito Yuri, Frade de Sousa Nuno Manuel, Tibana Ramires Alsamir, Voltarelli Fabricio, Mangine Gerald (Figure 4).

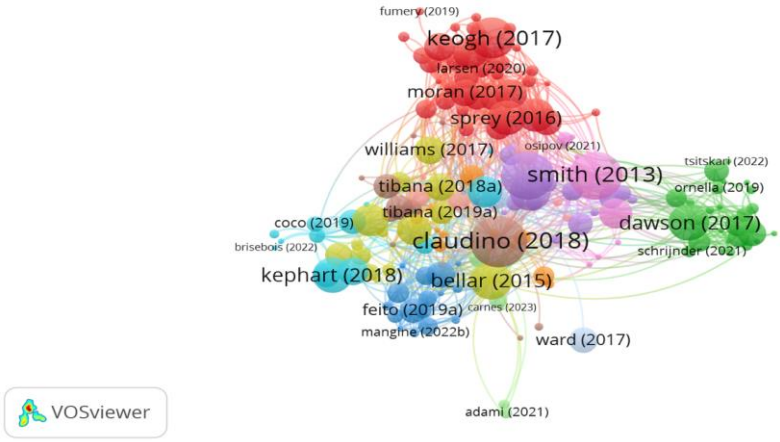

Fig. 3. The most cited authors
Source: Own processed data on VOSviewer, version 1.6.15 [10]

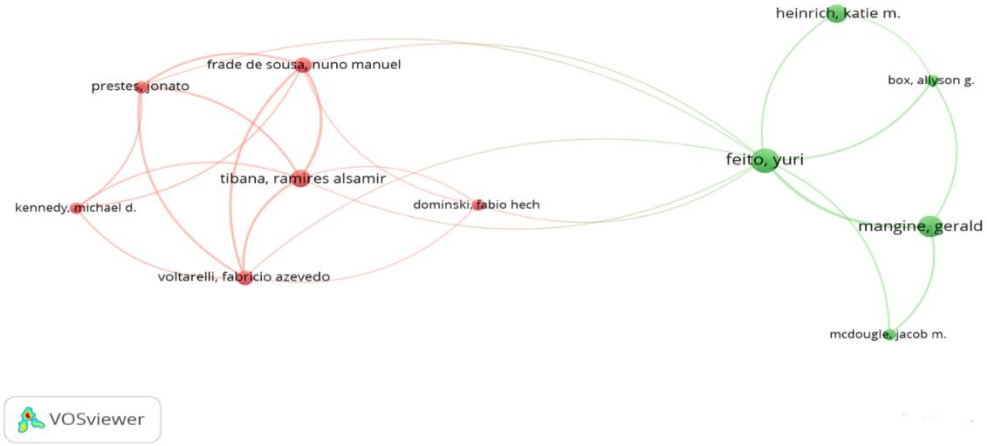

Fig. 4. Links between authors
Source: Own processed data on VOSviewer, version 1.6.15 [10]

The co-occurrence of all keywords identified in the selected articles (minimum 5 co-occurrence) was determined. (Figure 5). From the total of 999 keywords identified, 68 have an occurrence of at least 5. They are grouped into 6 clusters. Table 2 shows the main keywords identified and their occurrence.

The keywords identified are grouped into six clusters: 1. Red, with 16 items (behaviour, benefits, body composition, physical activity, physical fitness, resistance training); 2. Green, with 14 items (aerobic capacity, strength, power, responses, high intensity functional, endurance, supplementation); 3. Blue, with 12 items (body composition, CrossFit, elite, functional training,

sports, weight, weightlifting); 4. Mustard, with 11 items (athletes, exercise, fitness, performance, resistance, recovery); 5. Purple, with 8 items (body, CrossFit, gender, impact, men, participation, program, sport); 6. Blue, with 7 items (athlete, hip, high-intensity function, injury, profile, risk factors, training).

Table 2. All key words occurrence and their total link strength in the identified papers

Key words	Occurrences	Total link strength
CrossFit	88	302
Exercise	62	285
Performance	40	188
Fitness	42	185
Power	29	140
Strength	30	128
Health	24	103
Body composition	18	99
Sports	18	96
Responses	16	80

Source: Developed by authors, based on Voswiewer version 1.6.18 [10]

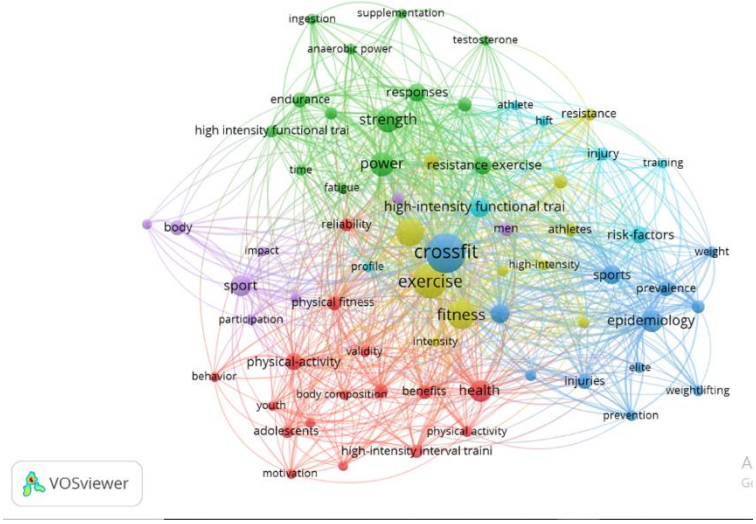

Fig. 5. Key words occurrence in analysed papers
Source: Own processed data on VOSviewer, version 1.6.15 [10]

The keywords identified are grouped into six clusters: 1. Red, with 16 items (behaviour, benefits, body composition, physical activity, physical fitness, resistance training); 2. Green, with 14 items (aerobic capacity, strength, power, responses, high intensity functional, endurance, supplementation); 3. Blue, with 12 items (body composition, CrossFit, elite, functional training, sports, weight, weightlifting); 4. Mustard, with 11 items (athletes, exercise, fitness, performance, resistance, recovery); 5. Purple, with 8 items (body, CrossFit, gender, impact, men, participation, program, sport); 6. Blue, with 7 items (athlete, hip, high-intensity function, injury, profile, risk factors, training).

Systematic analysis

CrossFit ® allows improving the general fitness of athletes and the simultaneous development of strength and endurance [20]. Several authors have emphasized the importance of CrossFit on improving the physiological and psychological characteristics of athletes, it can improve physical flexibility and motor coordination.

Physiologically, the cardiovascular fitness, anaerobic capacity and body composition of CrossFit practitioners improve [7]. Heart rate monitoring during training involving constantly variable and multifunctional movements (CrossFit-type) and after series of exercises, allows the assessment of how the athlete's body reacts to physiological stress and fatigue [2]. The use of technology in sports allows monitoring the physiological parameters of athletes and involves the use of various devices and work techniques [3].

From a psychological point of view, the use of CrossFit elements in training creates enjoyment for athletes, makes them motivated, feel challenged, have a high level of self-determination, which leads to feelings of satisfaction by achieving goals, enjoyment and belonging to the community. [4], [6], [11]. All of these stimulate the body's proprioceptors and can make training more efficient and useful. Osipo A. et al.. [12-16] published over time the results obtained in the use of CrossFit-type training in judoka or sambo practitioners. Thus, they applied various special tests and demonstrated an increased improvement in the special physical fitness of the athletes after a minimum of 12 weeks of CrossFit training. These trainings must include series of exercises aimed at developing the athletes' high speed and strength skills, as well as special endurance. Dias et al. [5] shows that monitoring the CrossFit training load is necessary to facilitate training results and to avoid overtraining. The results reported by Avetisyan et al. [1] showed that the use of CrossFit-based training in young judoka led to improvements in general and special fitness, leading to improvements in speed and strength skills and judo-specific performance (O Soto Gari and O Goshi).

The main tests identified in the analyzed papers are: Special Judo Fitness Test (SJFT); Uchi Komi Fitness Test (UFT); the Santos test (ST); the Ten-Station Judo Skill test (SJA); test with the execution of 30 ippon-seoi-nage (throw); test with 60 throws of 2 sparring partners; simultaneous evaluation of the execution of combat methods; pull ups test; standard running test; analysis of competition results.

Conclusions

In the training process in combat sports, general and specific physical training play an important role, constituting an essential factor for achieving performance at the highest level. Experts believe that the level of development of athletes' special resistance to intensive training and competitive influences are the decisive factors of success in the competitive activity of athletes in the current context. The application of CrossFit training to the training activities of athletes who practice different types of combat sports (judo and sambo) allows a significant increase in their motor capacity.

The effort in combat sports is dynamic, requires all motor skills and favors the formation of special motor skills and dynamic stereotypes. The final decision for a specific strength training intervention (strength or CrossFit) can be made according to the individual challenges of a combat sports practitioner (judo and sambo) during the competitive season.

The final decision for a specific strength training intervention (strength or CrossFit) can be made according to the individual challenges of a combat sports practitioner (judo and sambo) during the competitive season; tests during training that include series of exercises aimed at developing athletes' high speed and strength skills and special endurance; determination of competition coefficients (number of technical actions won and lost, duel activity and time intervals between attacking actions).

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Comparative Analysis of Body Mass Index Among Urban and Rural School Children in Moldova: An Anthropometric Study

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Abstract

Obesity and overweight have become significant health problems in Romania. The ***aim*** of this study was both to examine the growth trends of female and male secondary school children and to compare the differences that develop among them according to their environment of origin and gender using the body mass index and comparing the BMI of the sample with WHO (World Health Organization) norms.
Material and Methods: The study focused on aspects related to anthropometric measurements: *height (cm)* and *weight (kg)* and included 154 students aged 12 - 14 years, who were divided into 4 groups according to their environment of origin and gender as follows: 0.50% (77 students) from *urban areas* (0.57% *female* and 0.42% *male*) and 0.50% (77 students) from *rural areas* (0.33% *female* and 0.66% *male*). Prevalence of overweight and obesity were assessed according to WHO 2023 standards (Overweight: >+1SD; Obesity: >+2SD; Thinness: <-2SD) Results were analyzed using the *Independent - Sample T Test.*
Results: The mean for BMI values of *urban girls* (M = 2.04, SD = 3.25) is significantly higher (t = 1.23, DF = 68, Sig. 2-tailed p = 0.221) than *rural girls* (M = 1.25, SD = 0.23). And for BMI values of *urban boys*, the mean (M=1.40, SD = 0.23) is significantly higher (t=1.53, DF = 82, Sig. 2-tailed p = 0.129) than *rural boys* (M=1.32, SD = 0.23).
Conclusions: It was found that there was a significant correspondence between BMI and environment of origin and gender of the subjects. The BMI of the sample included in the research is close to WHO standards. Thus, it was found that *urban boys* and girls show higher values of BMI, therefore, tend to be overweight, while *rural girls* and boys show lower values and closer to WTO standards. Thus, BMI proved to be a good tool for predicting the well-being and nutritional status of secondary school students.

Keywords: Body Weight, Obesity, Urban environment, Rural environment, Secondary school

Introduction

Obesity and overweight have become significant health problems in Romania.

Globally, the prevalence of overweight and obesity is also increasing and becoming a major public health problem; reported in both developed and developing countries [5], [10], [12], [15].

According to a 2010 study by De Onis, M., Blossner, M., Borghi, E., obesity increased from 4.2% in 1990 to 6.7% in 2010 worldwide and is expected to reach 9.1% in 2020. Worldwide 43 million children were estimated to be obese in 2010, of which 35 million (81.4%) in developing

countries. Another study in 2014, emerges that overweight and obesity have become a major public health problem in India as well, also childhood obesity increases morbidity and also the risk of obesity in adulthood.

Obesity may have implications in terms of increased prevalence of diabetes, hypertension, coronary heart disease, orthopedic conditions, orthopedic problems, mental disorders and impaired quality of life [2], [18], [7], [16], [6], [3], [10], [8], [9], [17], [4].

Aim

The aim of this study was both to examine the growth trends of female and male secondary school children in the Moldavian area and to compare the differences in their environment of origin and gender using the body mass index and comparing the BMI of the sample with WHO (World Health Organization) norms.

Material and Method

The study focused on aspects related to anthropometric measurements: height (cm) and weight (kg) and included 154 students aged 12 - 14 years, who were divided into 4 groups according to their environment of origin and gender as follows: 0.50% (77 students) from urban areas (0.57% female and 0.42% male) and 0.50% (77 students) from rural areas (0.33% female and 0.66% male). Prevalence of overweight and obesity were assessed according to WHO 2023 standards (Overweight: >+1SD; Obesity: >+2SD; Thinness: <-2SD) Results were analyzed using the Independent - Sample T Test.

Table 1. Classification IMC (Source: WHO)

Z-scores	BMI (kg/m^2)
Overweight	> +1SD
Obesity	> +1SD
Thinness	< -2SD

Finding and Discussions

Table 2 shows that the distribution is 45.45% girls and 54.54% boys from both urban and rural areas.

Table 2. Sample distribution by gender (n=154)

GENDER	%
Girls	45,45
Boys	54,54

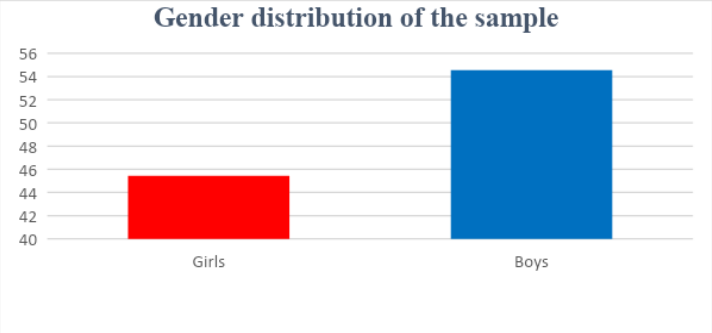

Fig. 1. Sample distribution by gender (n=154)

Table 3 shows that the distribution is 28.57% urban girls and 16.88% rural girls and 21.42% urban boys and 33.11 rural boys.

Table 3. Sample distribution by environment of origin (n=154)

GENDER	ENVIRONMENT OF ORIGIN	%
Girls	Urban Environment	28,57
	Rural Environment	16,88
Boys	Urban Environment	21,42
	Rural Environment	33,11

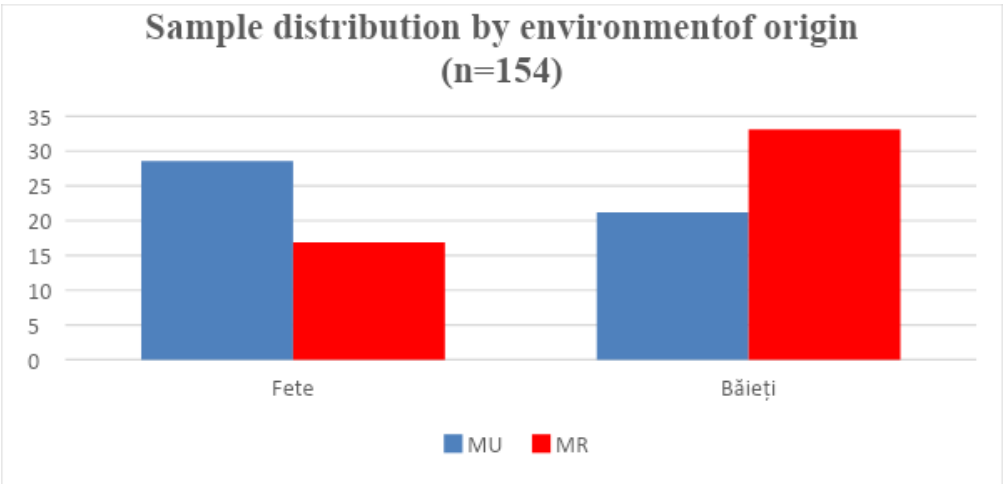

Fig. 2. Sample distribution by environment of origin (n=154); *MR = rural environment*; MU*= urban environment

In Table 4 we see that the mean for BMI values of urban girls (M = 2.04, SD = 3.25) is significantly higher (t = 1.23, DF = 68, Sig. 2-tailed p = 0.221) than rural girls (M = 1.25, SD = 0.23). And for BMI values of urban boys, the mean (M=1.40, SD = 0.23) is significantly higher (t=1.53, DF = 82, theo-tailed p = 0.129) than rural boys (M=1.32, SD = 0.23).

Table 4. Results obtained at the tests applied

Subjects	BMI (kg/m²)				
	n	**Mean (Std. Deviation)**	***t***	**DF**	***Sig. 2-tailed p***
Girls MU	44	2,04 (3,25)	1,23	68	*p = 0,221*
Girls MR	26	1,25 (0,23)			
Boys MU	33	1,40 (0,23)	1,53	82	*p = 0,129*
Boys MR	51	1,32 (0,20)			

**MR* = rural environment*; MU* = urban environment

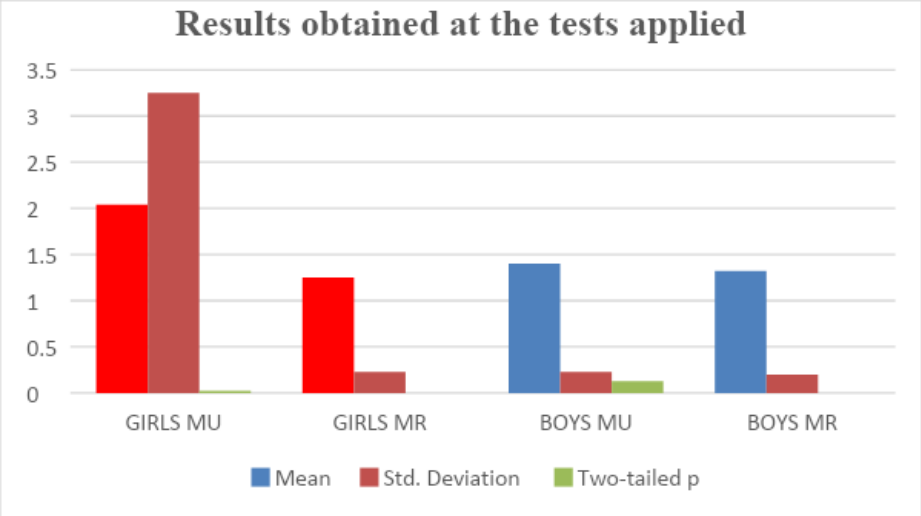

Fig. 3. Results obtained at the tests applied

In another simulated study conducted in Kochi, Kerala in which students aged between 6 - 15 years from 3 schools and belonging to lower and upper middle-income families were included, it was observed that a reported 3% of the boys and 5.3% of the girls were blind [2]. And in another study that included 123 students, the average BMI of Caucasian students was 19.7 at age 9 and 21.5 at age 14, compared to 16.4 at age 9 and 23 at age 14 for African American children [1].

Our study is supported by another study conducted in 2019 by Mahalakshmi S. and Abirami, M. J. who wanted to analyze the growth trends of children aged - 21 years, both female and male, using BMI and comparing the recorded values with WHO norms. From the results recorded, we can see that the prevalence of underweight was the highest at 88.9%. especially in the age group 3-8 years; children aged 15-21 (46%) years were found to be relatively healthier; 17.66%. are prone to overweight and 7.21% are obese. The finding of this study is supported by a cross-sectional study conducted in four regions of Puducherry to study the prevalence of obesity and overweight among children aged 6-12 years. The study results reported that overweight is prevalent among 4.41%. of children and obesity 2.12% [14].

Conclusions

It was found that there was a significant correspondence between BMI and environment of origin and gender of the subjects. The sample BMI included in the research is close to WHO standards. Thus, it was found that urban boys and girls have higher BMI values and therefore tend to be overweight, while rural girls and boys have lower values and closer to WTO standards. Thus, BMI has proven to be a good predictor of the well-being and nutritional status of secondary school students.

Other Specifications

All the authors had equal contributions to this research.

This work was co-funded by the European Social Fund, through Operational Programme Human Capital 2014-2020, project number POCU/993/6/13/153322, project title "Educational and training support for PhD students and young researchers in preparation for insertion into the labor market".

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Reaction Time in Sprint Events at the European Athletics Games in Poland 2023

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Abstract

Introduction: The speed of reaction immediately after the auditory signal given by the referee's gun, in an athletics speed race involving the starting from the blockstart. In athletics, the ideal reaction time is located at the level of 0.100s, and the values that fall below this value specify a break of the laws and implicit elimination from the race.
Aim: The objective of this study was to identify whether there are significant differences in start reaction time between sprint events at the European Athletics Games in Krakow, Poland.
Materials and Methods: The subjects of this research are the female and male athletes from European countries who participated in the 100 dash, 200 dash, 110, 100 hurdles, 400 dash, 400 hurdles and the 4x100 and 4x400 relays of the U23 European Athletics Games. All data was taken from European games [1] and was created a database with the reaction times of each individual athlete who participated in the mentioned above tests, and a comparative analysis of the averages between the tests was carried out, with the help of the SPSS statistical and mathematical platform. This comparative analysis was carried out separately by gender (male and female), but also at the group level, including both genders within the same athletic tests.
Results: The results recorded following the comparative analysis highlighted the fact that there are significant differences between the 100 and the 110 male and women's 100 meters hurdles ($p<0.05$). Another comparison of means demonstrates that there are no significant correlations between the 4x100m and 4x400m relay events.
Conclusions: In conclusion, we mention that reaction time is an important aspect in athletic speed events and that the objective proposed above has been achieved, namely the fact that there are differences in reaction time between athletic tests.

Keywords: athletics, reaction time, European games, race

Introduction

Speed in general mode represents an indispensable motor quality for an athlete who practices performance athletics, regardless of the event in which he participates. When we discuss sprint events 100m, 200m, 400m, then we must mention that an important role is reaction time. Speed is one of the components of engine quality, which also includes reaction time. This is the human ability to react as quickly as possible in a short time under already predetermined conditions [2]. Other authors argue that reaction time is one of the most important parameters influencing

performance sports. This represents the amount of time that drains between the occurrence of an instantaneous signal and the response provided by the athlete's reaction [3].

This form of manifestation is present at the time of the start, namely at the moment of the trigger of the pistol (action carried out by a referee). We remind you that the ideal reaction time at the start after the trigger of the gun click is 0.100 s. If this value is lower than the one mentioned above, the regulation states that it is a false start (stolen start) and that the person concerned will be eliminated from the competition [4]. The higher the reaction time is than the ideal value, the slower the athlete has to break away from the starting block, which (in the 100m 110/100 hurdles events) can represent a failure at the end of the event. Some authors argue that reaction time is used to a large extent to identify neuromuscular and physiological responses in certain work areas, but also in medicine and the diagnosis of certain deficiencies and even in environmental safety [5]. Another opinion of other authors regarding a study on basketball players, is that reaction time is the second quality of the human body to defend itself and respond, following a sensory stimulus [6]. Another author Lucaci, P (2019) argues that optimizing the reaction to certain stimuli is reflected and has positive repercussions in order to improve speed [7].

Aim

The objective of this study was to identify whether there are significant differences in start reaction time between sprint events at the European Athletics Games in Krakow, Poland. Based on another study done in the past, we want to test the following hypothesis: We assume that in terms of the reaction time in the sprint events on the dash but also on the hurdles, there are no significant differences at the start.

Materials and Methods

In the framework of this study, a number of 313 results were analyzed in the female speed tests and the same number in the male speed tests, specifying that the same number of results represents the number of participants in these tests. The results regarding the speed reaction when leaving the starting block in the speed trials were taken from the IAAF website where we also find information about the result obtained, the wind speed or the place occupied in the series. Another important clarification would be that only the reaction times from the heats were taken and not those from the semi-final or final because it would have been too large a volume to process. All data were entered into the SPSS platform, by samples, by gender (female and male), but also by pool, which means that the data were analyzed both separately and pooled.

A total of 33 correlations were made between samples and between genres, from which we were able to draw some conclusions in the following. The objective of this study was to identify whether there are significant differences in start reaction time between sprint events at the European Athletics Games in Krakow, Poland.

Results

Regarding Table 1, we made a statistical comparison between the averages of all 7 speed samples classified by gender (female and male). The main idea was to compare samples as close

as possible to their particularities, identifying 3 significant results ($p<0.05$) between the 200m, 400 hurdles and 4x400m relay samples.

Table 1. The statistic difference between field by gender

Nr. crt.	Field	Mean *ms*	Std. dev. +/-	p<0.05
1	4x100mB 4x100mF	195.57 203.70	30.03 37.02	0,4
2	100mB 100mF	158.96 163.13	21.91 20.30	0,29
3	110mhB 100mhF	171.26 170.26	27.56 37.29	0,88
4	200mB 200mF	165.96 181.13	20.09 26.69	0
5	400mB 400mF	200.26 222.09	32.52 46.17	0.1
6	400mhB 400mhF	198.14 241.41	25.22 72.72	0
7	4x400mB 4x400mF	195.88 225.42	29.67 52.11	0

*mh - meter hurdles

Current research has suggested that there are gender differences in reaction time and that it depends on neuromuscular and neurophysiological factors, especially on the strength side regarding the structural and neural properties of muscles [8, 9, 10, 11, 12]. Looking at the average of the results obtained by male and female athletes we can see that the boys' is much closer to the value of 100 ms.

In Table 2, a statistical analysis was performed regarding the female athletes participating in the speed and hurdles events and we identified a number of 3 statistically significant values. The differences are highlighted in the groups of 4x100m relay and 100m dash, 4x100m dash and 200m dash, where the value of the average in the 200 sample is lower and closer to the value of 100 ms. And the group of tests 200m and 400m dash where we identify higher values of reaction time in the test of 400m compared to 200m.

Table 2. The statistic difference between field – female

Nr. crt.	Field	Mean *ms*	Std. dev. +/-	p<0.05
1	4x100m 100m	203.70 162.70	37.02 20.32	**0**
2	4x100 200m	203.70 179.32	37.02 24.91	**0**
3	4x400m 400m	225.42 223.12	52.11 47.61	0.77
4	4x400m 400mh	225.42 240.07	52.11 73.03	0.30
5	400m 400mh	222.68 241.41	47.14 72.72	0.12
6	200m 400m	181.13 222.09	26.69 46.17	**0**

*mh - meter hurdles

In Table 3 from a series of 10 groups of analyzed samples we identified a number of 9 statistically significant results, which represents the fact that, also in the case of female athletes, the objective of the study is achieved, more precisely we demonstrate that there are major differences between the field of speed. We mostly identify differences between the 400m dash, 400m hurdles, 4x100 and 4x400m relays and the 100m dash, 200m dash and 110 and 10m hurdles speed events.

Table 3. The statistic difference between field – female II

Nr. crt.	Field	Mean *ms*	Std. dev. +/-	p<0.05
1	4x100m 4x400m	203.26 225.42	37.33 52.11	**0**
2	100m 400m	163.50 222.09	20.22 46.17	**0**
3	110mh 400m	172.95 223.12	40.85 47.61	**0**
4	4x100	203.7	37.02	**0**

Nr. crt.	Field	Mean *ms*	Std. dev. +/-	p<0.05
	m 400mh	0 241.41	72.72	
5	4x100m 400m	203.70 222.68	37.02 47.14	0.32
6	100m 4x400m	162.35 225.42	20.43 52.11	**0**
7	100m 400mh	162.70 241.41	20.23 72.72	**0**
8	200m 400m	181.13 222.09	26.69 46.17	**0**
9	200m 400mh	179.32 241.41	24.91 72.72	**0**
10	200m 4x400m	178.74 225.42	24.91 52.11	**0**

*mh - meter hurdles

In Table 4, we analyzed the speed samples of male athletes and obtained a number of 7 statistically significant results from a total of 10 groups track and field analyzed.

Table 4. The statistic difference between field – male II

Nr. crt.	Field	Mean *ms*	Std. dev. +/-	p<0.05
1	4x100m 4x400m	197.57 196.16	30.03 29.38	0.8
2	100m 400m	158.96 200.24	21.91 32.89	**0**
3	110mh 400m	171.26 199.36	27.56 32.07	**0**
4	4x100m 400mh	197.57 198.14	30.03 25.22	0.9
5	4x100m	197.5	30.03	0.6

Nr. crt.	Field	Mean *ms*	Std. dev. +/-	p<0.05
	400m	7 200.61	33.17	
6	100m 4x400m	157.25 196.16	18.91 29.38	**0**
7	100m 400mh	158.96 199.82	21.19 27.37	**0**
8	200m 400m	165.96 200.26	20.09 32.52	**0**
9	200m 400mh	165 199.82	19.23 27.37	**0**
10	200m 4x400m	164.36 196.16	18.97 29.38	**0**

*mh - meter hurdles

We can state that there is a difference between the reaction time in the "short" track and field and the "long" ones, and the number of results obtained is relevant to support our objective in this research.

Discussions

Starting from the previously stated hypothesis: we assume that with regard to the time of reaction to the sprint events on the dash but also on the hurdles there are no significant differences at the start, we believe that the hypothesis is null, because a number have been identified of 22 statistically significant results ($p<0.05$) from a total of 34 analyzed. These values represent that there are differences in the start reaction time results between speed events. A study carried out by Alexe, D. (2010) found in his work, on the categories of juniors and youth-seniors, (a total of 173 athletes) that there are differences between the time of reaction in juniors and youth-seniors and that the athletes juniors need an improvement in training in this regard [13]. In another research paper Babic, V. (2004) regarding the Olympic Games in Athens, the author made a comparison between speed and hurdles events, but also between male and female athletes, concluding that the athletes of male gender recorded a better reaction time and that with the increase in running distance the reaction time at the start is weaker [14].

Some authors are of the opinion in the studies carried out that the time passing through the nerve pathways represents the moment of perception to trigger the reaction time and if regular training is followed this reaction time can be improved by 0.12s [15]. This study is based on numerous scientific papers, and in the specialized literature we find articles that were concerned with measuring the reaction time of athletes [16], [17] . Gavkare et al. (2013) in his work, distributed a better reaction time quotient in performance athletes in terms of improving

concentration, motor coordination, neurophysiological changes, delaying the onset of fatigue and increasing connectivity in the body-brain relationship [18, 19]. Other studies conducted on reaction times and accuracy and other such movements have been shown to be of great importance in terms of agility in the game of soccer [20].

We notice that most of the studies are carried out in team games where we find it to be an integral part (reaction time) of the specifics of these sports.

Regarding the limits of the study, we believe that the lack of large-scale competitions held in our country represents a constraint to the collection of much more concrete data, the display of more characteristic data of the samples, on specialized websites. In the future, this information can be approached much more widely, by presenting some graphs, by analyzing several elements that are the basis of the reaction time.

Conclusions

Performing a calculation of all statistically significant values ($p<0.05$) we obtained a number of 22 results and only a number of 11 statistically insignificant values from a total of 33 groups of sports samples analyzed and no less than 313 athletes.

We believe that in the "short" speed events, athletes need and have a shorter reaction time than in the "long" speed events such as the 400m dash, 400m hurdles and 4x400 relay, at the moment of departure from the start. Some results reflected the fact that there are no differences between the short speed events nor between the short fence events, but in the long fence events and the 4x400 relay (comparison made by gender) we find statistically significant differences, which infers that men have a time of reaction better than women in this case. In the future we want to take into account an analysis of the start times compared to the ideal reaction time (0.100/s) of athletes participating in international athletics championships.

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School Bullying: Bullying Behavior and Method of Response Among High School Students

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Abstract

Introduction: Bullying is not a new phenomenon, being quite common in school communities all over the world. However, the current period in which students return to school after a spell of social isolation seems to have accentuated this kind of manifestations.
Aim: In this study, we aim to investigate the presence of bullying behavior, the forms of manifestation and the weights of these manifestations in middle school students, the places where bullying behavior occurs and how to solve these problems.
Materials and Methods: The study was carried out on the basis of a questionnaire to identify bullying that was applied to children from secondary school
Results: The answers to the questions were entered into a database and processed graphically.
Conclusions: The resulting data show that school children face difficulties in differentiating between aggressive and bullying behaviors. However, bullying behavior is reported by an alarming number of young people.

Keywords: school bullying; incidence; bullying manifestations;

Introduction

Within the reality of a social environment loaded with aggressive or violent manifestations, institutions and organizations had to look for solutions to reduce these manifestations. Numerous states have allocated important resources to conducting research that would bring a deeper understanding of social phenomena. Educational institutions have developed a series of regulations and strategies to keep this kind of expression/phenomenon under control. Schools have introduced counseling and behavior modification programs to help young people with concrete solutions to the problems they face. But, despite all of this, the number of violent manifestations does not seem to have decreased and a more serious involvement is needed, from the community and all the stakeholders involved (parents, teachers, coaches and students), which is probably the only approach capable of producing a significant change in social behavior or culture.

Bullying is not a new phenomenon, being quite common in school communities all over the world [1], with an incidence rate between 3 and 27% [2]. However, the current period in which students return to school after a spell of social isolation seems to have accentuated this kind of manifestations. Bullying refers to those behaviors through which a person or a group of people

intentionally and repeatedly intimidates, hurts and humiliates another person, in conditions in which there is an imbalance of power [3].

The Bullying phenomenon seems to affect approximately 20% of the school-age population [4], [5], [1], who are either bullies, victims or witnesses [1]. Among the negative effects of bullying behavior, we find: interpersonal conflicts; decrease in social cohesion; social isolation; discrimination and prejudice; negative socialization; delinquent behavior [2].

Types of Bullying

Bullying can involve many different types of behavior. In specialized works [3], [6], [2], [7], reference is made to the following forms of bullying behavior:

Physical - which comprises coercing another student through direct physical contact, hitting, pushing, pinching, or indirect actions such as stealing or damaging property;

Verbal - which comprises threats, teasing, insults, mockery, blackmail, name-calling;

Relational or Emotional - which comprises actions taken with the intention of causing mental or emotional suffering, destabilizing someone's social position in front of the group and refers to the intentional exclusion of someone from a group or an activity; spreading rumors, manipulation, ridicule;

Cyberbullying - comprising the use of electronic devices and technology (telephones, computers, internet, email s, social networks, text messaging/chat programs, photo and video platforms and internet pages) to spread information and messages with compromising content in the online respective environment. These may include messages of intimidation, insults, sexual harassment, ridicule and humiliation.

Aim

The aim of the study is to analyze the need to implement a prevention and intervention program in schools concerning bullying behavior. In this study, we aim to investigate the presence of bullying behavior, the forms of manifestation and the weights of these manifestations in middle school students, the places where bullying behavior occurs and how to solve these problems.

Materials and Methods

A group of 335 students participated in the study on bullying behavior (of which 167 were male and 168 were female) from the "Dacia" Oradea Middle School and took place between October and November 2021.

In the research, we started from the hypothesis that after the period of isolation due to the Covid-19 pandemic, manifested mainly by through the reduction of social contacts, the bullying phenomenon gained momentum, both in terms of the number of instances of bullying and their forms of manifestation.

The research was carried out by means of a survey using a questionnaire adapted from Amelia Mirea / *Chestionar identificare bullying* [8].

Results

The questionnaire was applied in classrooms under the direct guidance and supervision of the principals and the school counselor. It should be noted that participation in the study was voluntary, with some classes showing a greater involvement of students when filling out the questionnaire.

To the question 'Have you ever been the target of bullying?', 44% of respondents state that they have had experiences related to bullying, while 56% of students claim that they have not had such experiences. This result is above the average taken from other research and we believe it should be interpreted with caution. Following discussions with some of the participants in this study, it should be said that the perceptions of these students related to the phenomenon of bullying is not entirely accurate/correct. In certain situations, the condition of repeatability of bullying behavior was not met, in other cases there was no power imbalance.

Regarding gender, there are 76 cases for the female gender, which represents 22.68% of the total number of students, and 73 cases for the male gender, respectively 21.79%, which shows a fairly balanced distribution (fig.1).

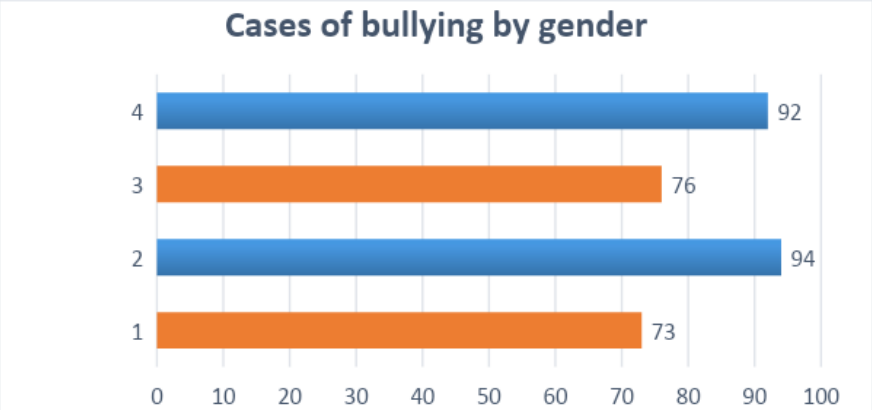

Figure 1. Reports on students' experience in relation to bullying by gender

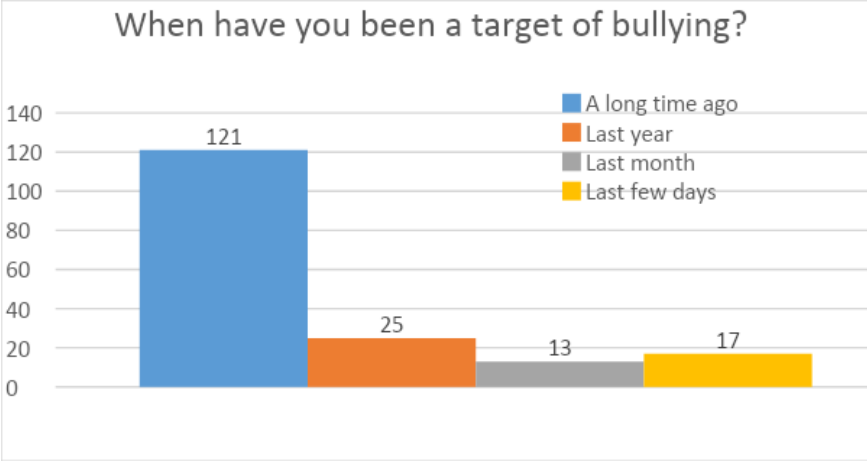

Figure 2. The time frame in which the bullying events occurred

The number of students who were the target of bullying in the last period represents a percentage of 36.91% of the total number of reported cases, specifically 55 cases were reported in total for the last year, last month and the last days (fig. 2). More cases are reported in the last 30 days alone than in the entire previous year. It is possible that the latest events are felt more acutely than the events that happened in previous years, however, the high percentage of for the last period shows us a worrying increase in the phenomenon of bullying.

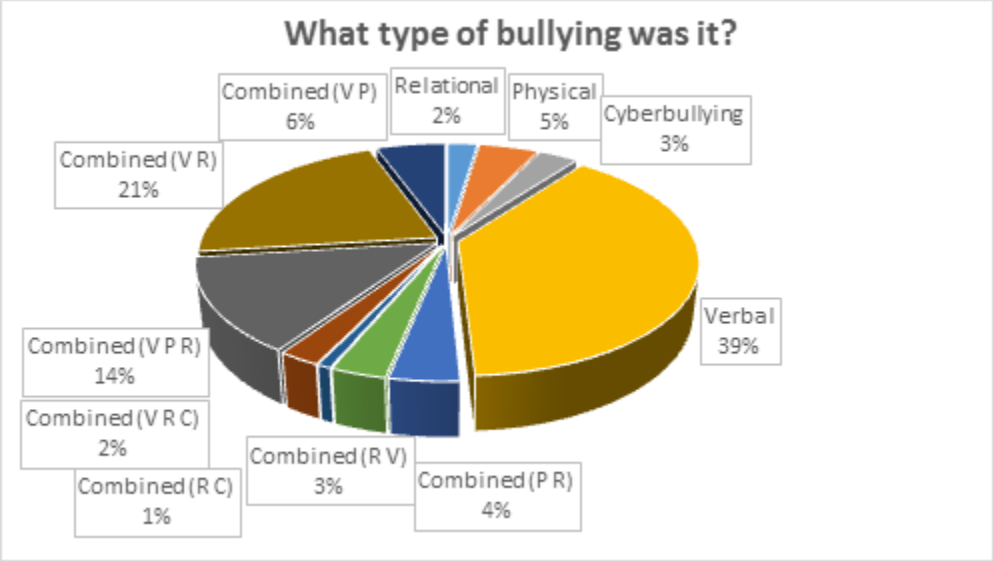

Figure 3. The type of bullying manifestations

In the Fig.3, diagram showing the general picture regarding the type of bullying experienced by the respondents, the largest weight is represented by verbal bullying behavior (with a percentage of 39%), followed by forms that combine the verbal and emotional types (21%), with the third most common being a form that combines verbal bullying with physical aggression and emotional bullying (14%).

Bullying of an emotional type, for girls (fig.4), has the largest share - 35%, for which the amounts referring to verbal, emotional and other combined forms are added: 26% verbal, emotional; 4% verbal, physical, emotional, cyberbullying; 2% of physical, verbal, emotional; 1% of physical, emotional; 1% of emotional, cyberbullying; 2% of verbal, emotional, physical, verbal; 2% of verbal, emotional, cyberbullying- girls tending to cause emotional suffering to people with whom they have negative experiences.

For boys, the amount of physical bullying responses comprises only 5% of the reported situations (fig.5). In reality, in the combined forms of bullying we find this type of bullying in a proportion of 26%, thus the fraction of bullying involving the presence of physical aggression reaches a total of 31%.

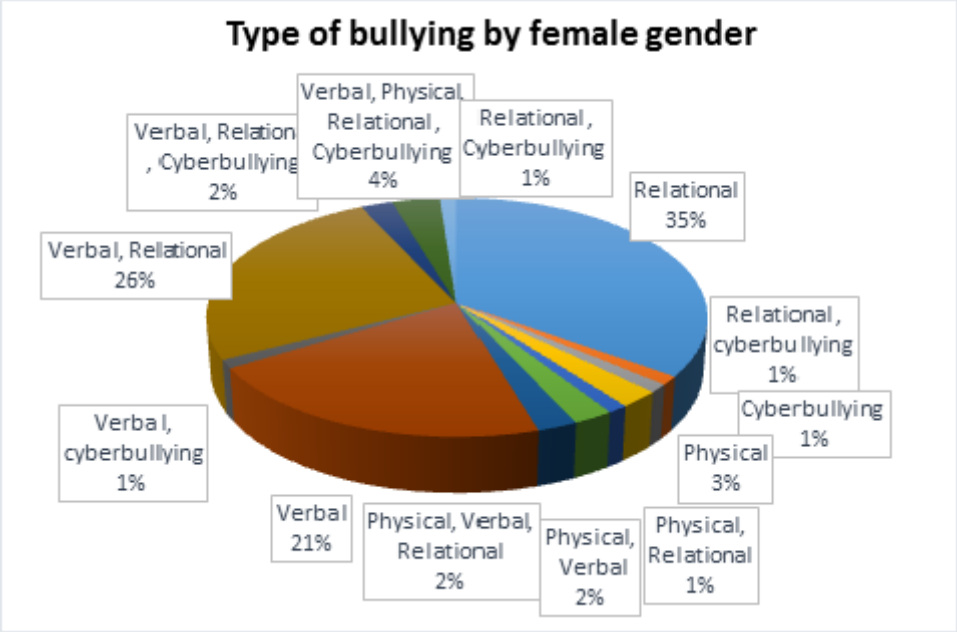

Figure 4. The type of bullying in female manifestations

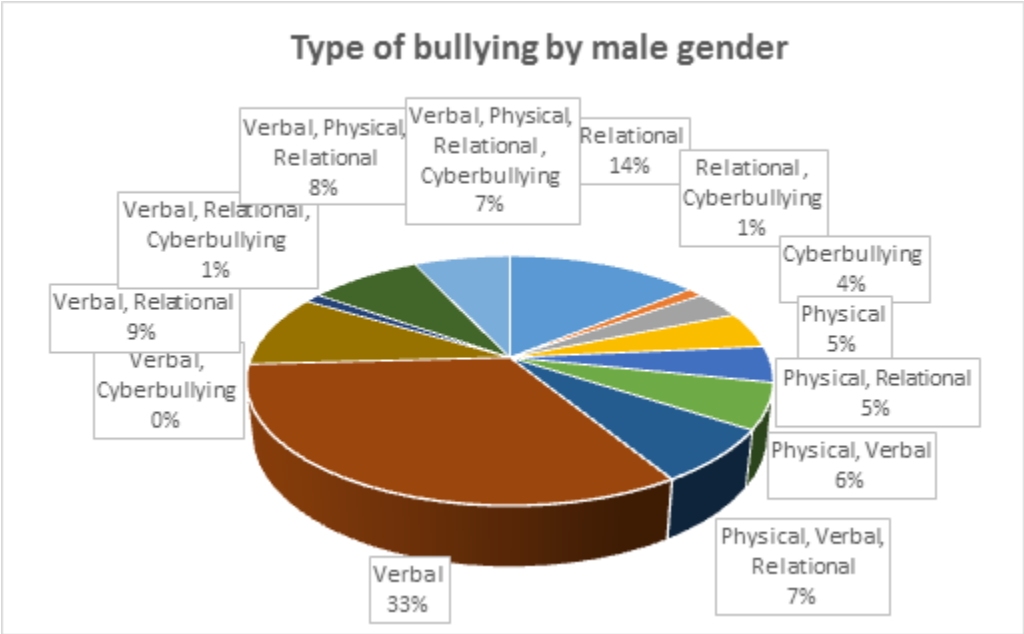

Figure 5. The type of bullying in male manifestations

Fig. 6 show that the most significant percentages regarding the place and time of bullying are recorded during recess, in the classroom and in the school yard for a total of 38%. The relatively low percentage (7%) indicating the location of bullying actions as being in the hallway, can be explained by the presence of teachers on duty in the hallway.

Regarding communicating a bullying situation to an adult or to another person shows that a large percentage of students (76%) turned to someone they trust (parents, teachers, principals,

school counselor, psychologist, brother, sister, friend) to tell them how to/to help them find solutions to the problems they face.

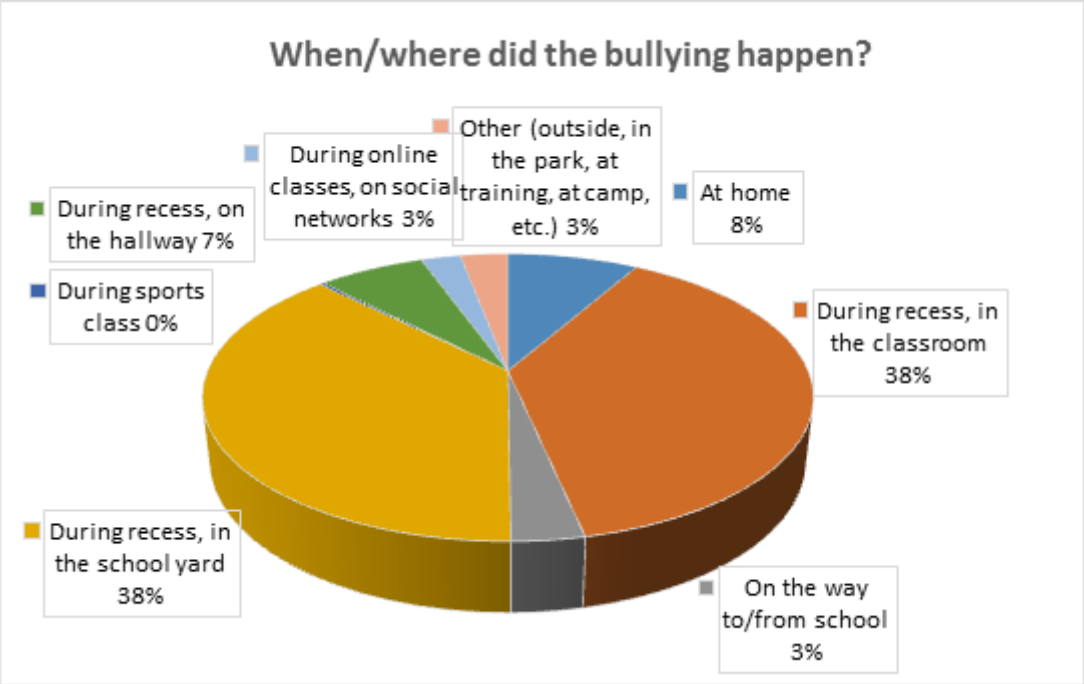

Figure 6. Location of the bullying event

The way students respond to a bullying situation in which they are targets shows that the number of those who choose to ignore is very high, while the number of students who respond in a verbally non-aggressive manner is less than half of that of the first category, and the number of those passive - who did nothing - is slightly below the level of the non-aggressive verbal responders. 17 students respond aggressively verbally and/or physically.

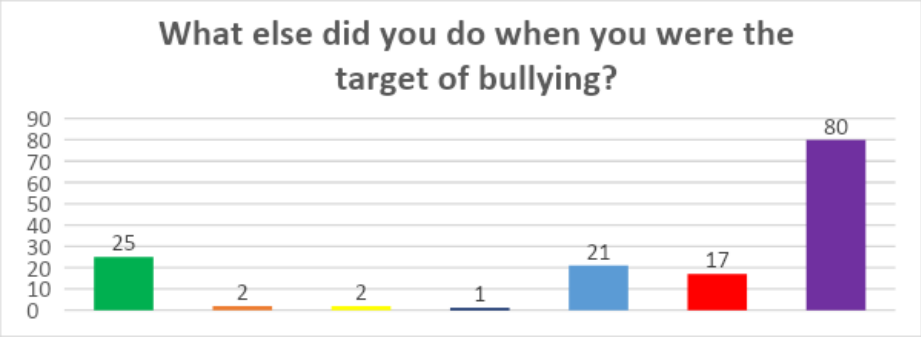

Figure 7. Behavior in bullying situations - the method of response in confronting the bully.

In the Fig. 7, on the x-axis, can be found number of cases for each answer option: verbally non-aggressive (green); verbally aggressive (red); I cried, I ran away (yellow); depends on the challenge (dark blue); I didn't do anything (blue); verbally and physically aggressive (orange); I ignored (purple).

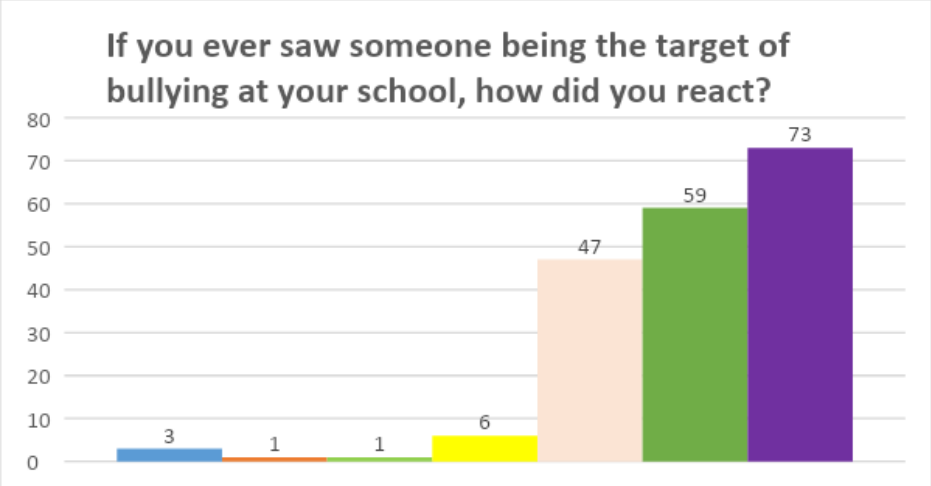

Figure 8. Ways to of responding to bullying situations as a witness.

In the Fig. 8, on the x-axis, can be found number of cases for each answer option: I tried to help them get out of the situation (blue); I tried not to intervene so that something worse didn't happen (red); I tried not to intervene so that something worse would not happen (green); I took a physically aggressive stance toward the aggressor (yellow); I took an aggressive verbal attitude toward the aggressor (pink); I took a non-aggressive verbal attitude; I spoke with the parents, with a teacher, with the school counselor (orange); I had no reaction (purple).

When they saw someone in a bullying situation, the students had no reaction in a fairly high number of cases a relatively large number spoke to someone and a fairly significant number took a non-aggressive verbal attitude. 6 students took a verbally aggressive stance and 1 student took a physically aggressive stance against the aggressor.

Conclusions

The resulting data show that school children face difficulties in differentiating between aggressive and bullying behaviors. However, bullying behavior is reported by an alarming number of young people.

Based on the results, it can be stated that the phenomenon of bullying is present in school in different forms and that these manifestations tend to find new spaces or forms of manifestation. The proportion of 37% of the reported situations being registered in the period of up to one year in the past, shows that the phenomenon of bullying has increased, both in terms of the number of instances of bullying and forms of manifestation.

Middle school students are willing to talk to trusted people to help them find solutions to the problems they face. When asking for support it is good to ensure that the solutions worked and that the problems were overcome, otherwise young people can lose confidence which can lead to isolating and distressing behavior that can lead to long-term consequences or even real tragedies.

The implementation of programs to prevent bullying behavior and to develop social-emotional skills can contribute to equipping students with the necessary skills to find appropriate solutions to respond to and deal with these antisocial behaviors.

We believe that education for life needs more programs or forms of organization that contribute to the development of social-emotional skills. Sport activities can and should significantly contribute to the development of life skills, and for this we cannot limit ourselves to

concerns of achieving physical performance, instead we must pay special attention to those values and skills that we all need to become good citizens.

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Comparison of Handgrip Strength Measured with Two Different Dynamometers in Young People

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Abstract

Introduction: Strength can be used as a reliable indicator of the general capacity for mechanical work that the human body can produce. Numerous studies demonstrate links between handgrip strength and human health. Measurement of this parameter is relevant in the detection of pathological conditions in the medical field. The area of physical education and sport uses handgrip strength to determine the level of muscle tone, an important factor in sustained physical effort. Successive measurements of physical capabilities may have different results, one of the causes being the technical characteristics of the equipment used.
Aim: The present research aims to analyse the differences that may exist between two electronic dynamometers of the same manufacturer (Constant) with different measuring mechanisms: traction and pressure.
Material and Methods: The subjects of the study were 19 girls (19.32±1.29 years, 166.9±7.28 cm, 60.95±9.18 kg) and 82 boys (19.60±1.22 years, 177.4±6.13 cm, 76.08±13.31 kg) who took turns squeezing the two models, with both hands, simultaneously, from a standing position. The dynamometers were used by each subject at 5-minute intervals, changing the level of handle adjustment from one measurement to the next.
Results: Each subject obtained 7 results. T Student and one-way Anova tests revealed significant differences between girls and boys and between the two models used. The tensile dynamometer showed significantly lower results for level 5 compared to 3 and 4. The measurement of handgrip strength with the two dynamometers under study gives different results. The setting levels of the dynamometers have an insignificant effect on the measured strength, except for the values obtained for level 5 of the tension dynamometer. Monitoring of the handgrip strength can be performed with the same dynamometer model.

Keywords: handgrip, dynamometer, Constant, strength, monitoring.

Introduction

Muscle strength is a relevant parameter for the health status of the human individual. Specialists have determined a cross-sectional association between the strength of other body actions and the handgrip strength, so the latter has been widely appropriated as a singular indicator of overall strength.

Other scientists also recommend caution in the use of handgrip strength (HGS) as an indicator of overall strength, suggesting its use in conjunction with lower limb (leg) strength testing. [20]

Muscle strength is important for success in many sports and is an element of motor performance and health. [19, 8] HGS measurement provides an assessment of the whole human musculature. [3] Some studies have suggested that low HGS in the elderly is associated with increased mortality [18] and physical disability. [6, 16, 12]

It was observed that handgrip strength plays an important role in their sports performance and that this test is an indicator for identifying talent and improving player selection for tournaments. Information on the handgrip strength is useful for the development of specific protocols for strengthening the athlete's hand muscles, preventing injuries and, consequently, improving his physical capacity [13].

Different equipment used for the assessment of physical parameters can generate measurement differences through the way they are constructed and used in specific protocols. The Camry digital dynamometer (EH101) demonstrated test-retest reliability compared to the Jamar hydraulic dynamometer, making it valid for use in healthcare facilities and a less expensive alternative to the Jamar dynamometer [2]. In contrast, similarities in results were observed between the Jamar dynamometer and the Bodygrip. The values obtained with the Jamar dynamometer were slightly higher than those recorded by the Bodygrip. [11] The same was also true when comparing the Jamar dynamometer with DynEx [21] and Rolyan. [15] Another investigation aimed to determine the reliability of the values recorded by four dynamometers and to determine their performance. The conclusion shows a significant accuracy of each dynamometer, but their application showed different values, the closest being those determined by Smedlay's and Jamar Hydraulic [10].

The present research aims to analyze the differences that may exist between two types of electronic dynamometers of the same manufacturer (Constant, Guangdong, China): with traction mechanism (model 14192-709E) and pressure (model 14192-760E).

Aim

The main purpose of this research is to compare the results obtained by measuring HGS with two different dynamometers as a model.

Hypothesis 1: We assume that setting the same Constant dynamometer model on each level will result in different HGS values.

Hypothesis 2: We assume that the force measured with two different dynamometers of the same brand will generate significant differences.

Materials and Methods

For the present study, 101 subjects were selected, including 19 girls and 82 boys (Table 1). Eligibility conditions of our subjects included: good health status, unimpaired upper limb integrity (arms) and physically active. Each subject completed and signed the consent to participate in our research.

Evaluation Protocol

The measurement was conducted indoors, with subjects grouped into 5 sets of 20-21 students. Each group was scheduled separately in order to follow the protocol, with members being

measured in turn: height, body mass and handgrip strength.

Height and body mass: subjects, without footwear, in a standing position with the toes apart, had their height measured with an electronic level (Digital Electronic Level) on which a Bosch GLM80 rangefinder was attached. Body mass was taken with Omron BF-511 analyses.

Handgrip strength: for each type of dynamometer (tensile (TD) and pressure (PD)), 2 units were used to prevent differences caused by upper limb (arms) dominance, but also imbalances in the development of HGS caused by daily habits. Subjects were called in turn in front of a table on which the two dynamometers to be squeezed were placed. The anatomical grip position was: standing, with arms oriented obliquely down sideways and palms forward. The students squeezed the dynamometers simultaneously with both hands.

Each dynamometer had several levels of handle size adjustment. The traction one had 4 levels of adjustment (L2, L3, L4, L5) and the pressure one had 3 (L1, L2, L3). The traction dynamometer had a 5th level (L1), but this was blocked by the bandage applied to prevent hands from slipping on the handles. For the pressure one, the levels were delimited according to the full stroke of the handle. The order of measurement of HGS was: TD_ L2, TD_ L3, TD_ L4, TD_ L5, PD_ L1, PD_ L2 and PD_ L3. Each subject within a group was given the first measurement and then moved on to the next. Subjects held the machines for 5 seconds, with a 5-minute break between each assessment.

The result of the test was given by the arithmetic mean of the values obtained for both hands.

Statistical Analysis

Statistical analysis was performed using GraphPad Prism 9.3.0 software (GraphPad Software Inc.), the hypothesis testing test was Anova. We used Anova one-way test to determine whether there were differences between the results obtained by left- and right-handedness of the two types of dynamometers set in several positions. The results of the Anova one-way test were accompanied by those of the Tukey's multiple comparisons test for detailed analysis of the paired comparisons of all processed data sets.

Table 1. Anthropometric characteristics of the participants

	Girls (n = 19)	Boys (n = 82)
Age (years)	19,32±1,29	19,60±1,22
Height (cm)	166,9±7,28	177,4±6,13****
Weight (kg)	60,95±9,18	76,08±13,31****
BMI (kg/m2)	21,82±2,66	24,13±3,72*

Results

Results were recorded for each individual dynamometer and level of the dynamometer. From the data in Table 2, it can be seen that differences are established between the values obtained in the tensile and pressure dynamometer tests, regardless of the setting chosen. Significant differences were found for each data group analysed: girls ($F(18, 108)=81.28$, $p<0.0001$), boys ($F(81, 486)=47.76$, $p<0.0001$) and overall ($F(100, 600)=93.93$, $p<0.0001$). However, there were differences for each group between the levels of dynamometer settings used.

The girls' group in Tukey's multiple comparisons test showed a difference of 1.28 kg between

levels 3 (30.33±5.99 kg) and 5 (29.05±5.56 kg) of the traction dynamometer (p=0.03) (Fig. 1a). Significantly different values in the evaluation with the same dynamometer model were also detected in the boys' group for both apparatus used (Fig. 1b). Three differences were found in the traction dynamometer, indicating levels 3 and 4 with the best results, compared to 2 and 5. The first gap is shown to be between TD_L3 and TD_L2 (47.47±7.50 kg vs. 45.83±7.30 kg; p=0.001). Then between TD_L3 and TD_L5 (47.47±7.50 kg vs. 45.38±6.44 kg; p<0.0001) and between TD_L4 and RD_L5 (47±6. 82 kg vs. 45.38±6.44 kg; p=0.001). The pressure dynamometer gave different results depending on the setting, with PD_L2 being superior to PD_L1 (42.6±7.37 kg vs. 41.17±7.93 kg; p=0.009).

Taken together, all our subjects' results show a trend towards better values using levels 3 and 4 of the tension dynamometer (Fig. 1c). The push dynamometer provided different results only between the first two setting levels (38.38±9.52 kg vs. 39.60±9.40 p=0.03).

Table 2. Handgrip strength of subjects according to gender and dynamometer setting

	Girls	Boys	General
TD_L2 (kg)	29,96±5,58	45,83±7,30****	42.84±9.36
TD_L3 (kg)	30,33±5,99	47,47±7,50****	44.24±9.86
TD_L4 (kg)	29,63±6,01	47±6,82****	43.73±9.52
TD_L5 (kg)	29,05±5,56	45,38±6,44****	42.31±0.89
PD_L1 (kg)	26,33±5,62	41,17±7,93****	38.38±9.52
PD_L2 (kg)	26,66±5,37	42,6±7,37****	39.60±9.40
PD_L3 (kg)	26,94±5,67	41,91±7,58****	39.09±9.32
F	($F_{(18, 108)}$ = 81.28	$F_{(81, 486)}$ = 47.76	$F_{(100, 600)}$ = 93.93
P	p<0.0001	p<0.0001	p<0.0001

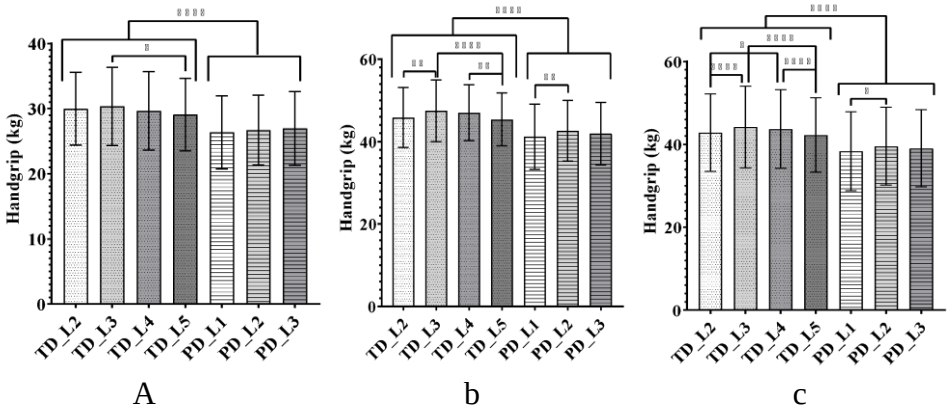

Fig. 1. Handgrip strength as a function of model and dynamometer setting level for: girls (a), boys (b) and all subjects (c); TD/ PD=traction/ pressure dynamometer; L=level

Discussion

The starting point of this research was the interest in the possibility of measuring handgrip strength with two dynamometers different in model but from the same manufacturer.

As expected and demonstrated in the literature, the gender of the participants influences the handgrip strength measured by dynamometry. [22, 7, 17, 14, 4] Vivas-Díaz et al. (2016) compared the results of 5647 students (2330 males and 3317 females; 20.6±2.7 years) in order to

determine baseline values for handgrip strength and to establish differences between girls and boys (24.2±8.1 kg vs. 37.1±8.3 kg; $p<0.001$).

It turns out that the different setting levels of the two dynamometers result in significantly different values of the HGS. This partially confirms the first hypothesis of our study because the force changes occur only between some settings of the devices.

The tensile dynamometer has close values between levels 2 and 5, respectively 3 and 4. From this it follows that positioning the handle at 3 and 4 will result in the best results regardless of the gender of the subject. Between the girls' and the boys' group, the analysis of the differences between the data series obtained by tightening the traction dynamometer shows more gaps for the boys' group between the settings used.

The push-pull dynamometer, having fewer adjustment possibilities, shows only one change in the value of the measured force. The increase in the indicated value at the tightening is made when moving from level 1 to 2. From 2 to 3 the decrease in force is insignificant.

The force obtained by tightening the two compared dynamometers, however each of them is adjusted, is different and confirms the second hypothesis involving our initial practical observation. This can be motivated by differences in shape, construction characteristics, biomechanics of the squeezing motion and others. Hence the need to relate the results to the proposed models to make it possible to equate the data.

Analysis of the Jamar and the Martin vigorimeter indicates a maximum value obtained at settings 2 and 3 (Jamar), respectively the size 3 balloon (Martin) and a moderate to strong correlation of the two instruments. [7] Jamar was reported to the K-Force Grip Dynamometer. [17] The data showed a significant difference ($p<0.05$) between the results, with Jamar recording higher than K-Force. Another comparison of the Jamar dynamometer with the MicroFET showed higher values for the latter ($p<0.05$).

Similar to our study was that of Mutalib et al. in which GripAble and Jamar PLUS+ were compared. The values between the two dynamometers were similar ($p = 0.77$).

Between Baseline (hydraulic) and Smedley a group of 87 participants (24% female, 43±12 years) generated close values if the level of handgrip strength was below 35 kg and higher for the former if the strength was above 45 kg. [1] The Camry model, similar in design to the traction model we used, was compared to the Jamar by evaluating 220 patients before undergoing elective surgery. The results resulted in a non-significant difference. [2]

The aspects highlighted by the studies mentioned above are related to the subject of our research, which reinforces the idea that measuring HGS with different dynamometers can generate variations in results and make it difficult to relate them to other existing information.

Conclusions

Consistent with other studies, HGS differs by gender, with boys having higher values compared to girls. Different settings of each dynamometer may result in varying measures of HGS, but not for each individual level. This partially confirms the first hypothesis of the study. Tightening of the dynamometer with tension gives the best results at setting levels 3 and 4, and for the one with pressure at 2. Comparison of the data series collected by the two devices used, regardless of the setting, shows a significant difference between force measurement with the tension and pressure dynamometer. The dynamometers analysed in the present study can be used to monitor muscle tone, the relevance being given by the use of the same model for a longer period of time.

There is a need to find a correspondence between the measurements of the two models, which could help practitioners to relate moment results to those obtained by other specialists in the field.

Acknowledgement

This work was supported by a grant by "Alexandru Ioan Cuza" University of Iași, within the Research Grants program, Grant UAIC no. 09/2021, "The biomotor profile of primary school students in Iași County and their potential for sports performance" (GI-UAIC-2021-09).

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Study on Correlations Between Strength, Speed and Agility in Adolescents

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Abstract

Introduction: Knowing the motor performance of high school students should be a benchmark for any physical education teacher or coach. The tendency of physical effort in youth sports is towards anaerobic effort, with muscular strength being a predominant factor in achieving competitive success. Speed, explosive power and agility have serious implications for the sports selection process.
Aim: Our attention is directed towards the analysis of the links that can be established between explosive strength, speed and agility in a group of high school students, given the biological support for the manifestation of these qualities.
Materials and Methods: A group of 49 students (30 girls–16.64±1.03 years and 19 boys–16.21±0.98 years) underwent physical tests to determine explosive force (SJ, CMJ and FJ), running speed for 5, 10, 15 and 20 m and agility (505 and Illinois). Desmotec V12 and Trac Tronix were used for measurements.
Results: Processing of results using Spearman's test revealed significant correlations between all parameters assessed in girls ($p<0.05$). In the boys group the links between the data series were limited to connections between some parameters of strength, speed and agility.
Conclusions: Anaerobic exercise parameters are interrelated during adolescence, a period of life marked by multiple physiological changes. Indicators of anaerobic physical maintenance show more links in girls' group.

Keywords: speed, strength, agility, adolescents, school

Introduction

In most sports games and beyond, speed running, agility and lower limb explosive strength are shown to be important characteristics for meeting the conditions for improved sports performance. These physical components are targeted for improvement and physical education classes. Speed running, rapid change of direction ability and explosive strength are conditioned on each other and there are common physiological and biomechanical determinants. [10]

Countermovement jump (CMJ) height has been reported to correlate with 10 m [24], 25 m and 35 m sprinting. [23] Little and Williams [12] found strong correlations between 10 m, 20 m sprinting and zig-zag movement performance in football players, whereas Salaj and Markovic

[17] found weak correlations between 5 m, 10 m and 20 m sprinting and 20 m shuttle (agility) times recorded.

Research has concluded that power and sprint speed are significantly related to agility in female students compared to male students. [19]

Sports professionals have used the vertical jump to calculate lower-body strength [18], determine the skill levels of athletes relative to their rankings [2], and make comparisons between novice and advanced athletes [6, 9]. Some authors consider the vertical jump to be a measurable coordinated action [5, 8, 15], while other specialists point to vertical jump performance as a measure of lower extremity muscle strength. [14, 16, 20] Most athletes and coaches aim to improve athletic performance, thus use jump testing to measure the effectiveness of various training programs for explosive power development, including strength training programs [13] and plyometrics. [7]

Aim

The aim of this research is to identify possible links between anaerobic strength indicators in adolescents.

Hypothesis: We assume that there are links between explosive strength, running speed and agility in adolescents, given their biological substrate of manifestation.

Materials and Methods

The present study aims to examine the links between explosive strength, speed and agility in a group of adolescents, given the favorable period of manifestation of these qualities.

Considering the age criterion, a sample of 49 high school students was selected to participate in the research, including 30 girls and 19 boys (Table 1). Each subject had parental consent signed by a legal representative person to participate in this study.

Body analysis and height: subjects had their height measured using Bosch electronic level and rangefinder and body analysis was performed with Omron BF-511 analysers. Height was measured from the subject's standing position and body composition according to the manufacturer's instructions.

Explosive force: explosive force testing was performed with Desmotec V.12 (Biella, Italy). Each subject performed the 3 jumps (Squat Jump (SJ), CMJ, Free Jump (FJ)) in turn.

Speed Run: TracTronix timing system was used to perform these events. Evaluation distances were marked at 5, 10, 15 and 20 m from the start line. The 3 TracTronix gates were positioned at the 0 (start), 5 and 15 m marks for a first measurement and then moved to 10 and 20 m. Study participants stood at the start line and performed two speed runs for each measurement, with a 5-minute break.

Agility 505: a TracTronix gate was placed 10 m from the start line and a parallel line was marked 15 m from the start line. On the evaluator's signal, the subject ran to the 15 m line, placing one foot on the ground behind it, and then returned to the line by running at the highest speed past the timing gate.

Illinois Agility: the test involves making numerous changes of direction performed in as short a time as possible. The start line and finish line consist of two TracTronix timing gates.

Statistical processing of the results was performed with GraphPad Prism 9.3.0 (GraphPad Software Inc.). After failing tests for normality of distribution, the data series were compared

with the nonparametric Mann-Whitney test for unpaired data in order to determine differences between genders at each measurement made. Interest in associations between the parameters being tracked (strength, speed and agility) led to the use of the Spearman correlation test. The values of r led to the assessment of the level of correlation as follows: 1–perfect, above 0.80–strong, above 0.50–moderate, above 0.20–weak and below 0.20. [25] The threshold value for statistical significance of the tests used was set at 0.05.

Table 1. Comparison between body composition, strength, speed and agility of girls and boys

	Girls (n=30)	Boys (n=19)
Height (cm)	163±7,08	175±6,90****
Weight (kg)	57,72±9,49	67,09±7,30***
BMI (kg/m2)	21,8±3,09	22,4±2,28
Body fat (%)	28,58±6,42	14,01±4,94****
Muscle mass (%)	30,7±2,48	42,66±2,68****
SJ (cm)	15,9±3,77	26,78±5,33****
CMJ (cm)	16,77±4,3	28,32±5,27****
FJ (cm)	18,92±4,97	31,8±6,10****
5 m (s)	1,32±0,13	1,10±0,05****
10 m (s)	2,28±0,18	1,94±0,10****
15 m (s)	3,20±0,26	2,61±0,09****
20 m (s)	4,22±0,53	3,46±0,21****
505 (s)	3,07±0,32	2,80±0,29**
Illinois (s)	20,68±1,19	18,12±1,22****

Results

Using Student's t-test to compare the two groups, as expected, the best values for the measurements made were in the boys group, similarity being in BMI ($p>0.05$).

Based on the data contained in Table 2, in the girls' group shows significant correlations between the heights of the three types of jumps (SJ - CMJ, $r=0.74$, $p<0.001$; SJ - FJ, $r=0.80$, $p<0.0001$; FJ - CMJ, $r=0.74$, $p<0.001$). In the same group, SJ results correlated with running speed over 5 m ($r=-0.45$, $p<0.05$), 10 m ($r=-0.50$, $p<0.01$), 15 m ($r=-0.56$, $p<0.01$) and 20 m ($r=-0.49$, $p<0.05$), as well as agility (505, $r=-0.51$, $p<0.01$; Illinois, $r=-0.64$, $p<0.001$). CMJ statistically established a significant level of correlation with 5 m ($r=-0.59$, $p<0.01$), 10 m ($r=-0.63$, $p<0.001$), 15 m ($r=-0.62$, $p<0.001$) and 20 m ($r=-0.60$, $p<0.01$) running speed, as well as agility for our subjects: 505 ($r=-0.44$, $p<0.05$) and Illinois ($r=-0.51$, $p<0.01$). The FJ correlation index with girls' running speed and agility followed the same trend (5 m: $r=-0.49$, $p<0.05$; 10 m: $r=-0.59$, $p<0.01$; 15 m: $r=-0.57$, $p<0.01$; 20 m: $r=-0.54$, $p<0.01$; 505: $r=-0.46$, $p<0.05$; Illinois: $r=-0.66$, $p<0.001$). In turn, running speed (over our 4 proposed distances) and agility were closely related (505 - 5 m: $r=0.42$, $p<0.05$; 10 m: $r=0.57$, $p<0.01$; 15 m: $r=0.55$, $p<0.01$; 20 m: $r=0.61$, $p<0.001$; and Illinois - 5 m: $r=0.42$, $p<0.05$; 10 m: $r=0.54$, $p<0.01$; 15 m: $r=0.70$, $p<0.001$; 20 m: $r=0.57$, $p<0.01$). To complete a picture of the interconnections of the parameters of anaerobic effort exerted by the girls, a strong correlation was also formed between the two agility tests ($r=0.67$, $p<0.001$). Table 3 reflects for the results recorded by the boys' group a

lower number of correlations between the parameters analysed compared to the girls' group. The only correlations in which explosive force was significantly involved were between CMJ and FJ ($r=0.76$, $p<0.001$), respectively FJ and 15 m running speed ($r=0.53$, $p<0.05$). Running speed showed correlations between the times obtained over the 4 distances.

Given the 505-agility test, correlations were established between this and running speed over 10 m ($r=0.60$, $p<0.01$) and 20 m ($r=0.56$, $p<0.05$) respectively.

Table 2. Correlation between strength, speed and agility of girls

	SJ (cm)	CMJ (cm)	FJ (cm)	5 m (s)	10 m (s)	15 m (s)	20 m (s)	505 (s)
CMJ (cm)	0,74***							
FJ (cm)	0,80****	0,74***						
5 m (s)	-0,45*	-0,59**	-0,49*					
10 m (s)	-0,50**	-0,63***	-0,59**	0,71***				
15 m (s)	-0,56**	-0,62***	-0,57**	0,86****	0,77****			
20 m (s)	-0,49*	-0,60**	-0,54**	0,53**	0,88****	0,71***		
505 (s)	-0,51**	-0,44*	-0,46*	0,42*	0,57**	0,55**	0,61***	
Illinois (s)	-0,64***	-0,51**	-0,66***	0,42*	0,54**	0,70***	0,57**	0,67***

Table 3. Correlation between strength, speed and agility of boys

	SJ (cm)	CMJ (cm)	FJ (cm)	5 m (s)	10 m (s)	15 m (s)	20 m (s)	505 (s)
CMJ (cm)	0,26							
FJ (cm)	0,36	0,76***						
5 m (s)	-0,43	-0,15	-0,46					
10 m (s)	0,007	-0,29	-0,25	0,33				
15 m (s)	-0,46	-0,35	-0,53*	0,84***	0,47*			
20 m (s)	-0,19	-0,36	-0,36	0,28	0,83***	0,56*		
505 (s)	0,03	-0,32	-0,28	0,05	0,60**	0,13	0,56*	
Illionois (s)	-0,03	-0,10	-0,12	0,19	0,64**	0,37	0,70**	0,79***

Discussion

The aim of this article is related to the identification of possible statistical links that can be established between strength, speed and agility. These qualities have in common the anaerobic alactacid mechanism of energy production. Over time, some studies have argued for the

existence of links between tests assessing lower limb explosive strength and running speed (5 m, 10 m, 30 m), such as Cronin and Hansen (2005), who noted links between SJ, CMJ and running speed over 5, 10 and 30 m ($p<0.05$) in rugby players (23.2±3.3 years). [4] The overall picture of correlations shows us the interconnectedness of anaerobic power parameters in both genders. The girls' group, compared to the boys' group, has an increased number of interconnections between strength, speed and agility. Most of the correlations have moderate strength. In girls there is a strong link between SJ and FJ, from which it follows that in this category explosive lower limb strength preceded by isometrics follows the same trend as elasticity. Other specialists have brought to light the significant relationship between 20 m running speed with the T agility test ($p<0.01$) and CMJ ($p<0.01$) performed by female football players aged 18.56±2.24 years. Correlation analysis determined links between the T-test and the CMJ ($p<0.05$). [11] Girls' running speed and explosive force enter into medium and weak correlations, the best being between 15 m running speed and CMJ ($r = -0.62$). Being running samples, speed and agility increase together, with medium and weak link strength. Running speed over 5 m is in a significantly weak interaction with agility. In contrast, the 15 and 20 m runs are more closely related to agility. Within the speed tests we note two strong correlations between running distances of 5 and 15 m, and 10 and 20 m, respectively, in both genders.

We attribute this result to the paired measurement of the 4 times. Research by Vescovi J. D. and Mcguigan M. R. (2008) reported correlations between Illinois and CMJ ($p<0.0001$), 9.1 m running speed ($p<0.0001$) and 18.3 m running speed ($p<0.0001$) among adolescent female soccer players (n=83, 15.1±1.6 years) [23]. Boys have fewer correlations than girls that they keep at the same power level. Thus, we identify links between explosive force starting from isometric stance and running speed over 15 m, respectively both agility trials and running speed over 10 and 20 m. Explosive force and agility show a lack of significance in the trend of change in values. Among handball players aged 21.62±1.90 years, 30 m sprint performance correlated with agility ($p=0.002$) and explosive force ($p=0.009$), the same relationship being between T-test and vertical jump ($p=0.003$). [3] Köklü et al. (2014), based on the results of young football players (16.0±0.8 years old), demonstrated significant relationships between the 30 m sprint with CMJ ($p=0.02$) and the Zig-Zag agility test without ball ($p=0.01$). The relationship between the explosive force, rendered by CMJ, and the Zigzag test p-value was recorded as 0.01. [10]

These data show that girls show closely related strength, speed and agility, while boys do it less, but keep correlative values. Both adolescent girls and boys increase 15 m running speed in parallel with elastic explosive force and 10 and 20 m running speed with agility.

Conclusions

Our study reconfirms gender differences in strength, speed and agility in adolescents, with boys being stronger. The analysis of the results of the two research groups leads to highlight the links that exist between the three parameters followed through significant correlations. This confirms our hypothesis that strength, speed and agility correlate in adolescents. Research on development during adolescence benefits our understanding of how the body behaves physically during a period of biological change.

Acknowledgement

This work was supported by a grant by "Alexandru Ioan Cuza" University of Iași, within the Research Grants program, Grant UAIC no. 09/2021, "The biomotor profile of primary school students in Iași County and their potential for sports performance" (GI-UAIC-2021-09).

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The Relationship Between Body Composition Parameters in Female Teenagers with and Without Intellectual Disability

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Abstract

Introduction: In general, adolescents with intellectual disabilities have a different body composition than adolescents without intellectual disabilities. The results of some studies have shown that adolescents with intellectual disability had a higher percentage of body fat and less muscle mass than adolescents without intellectual disability, suggesting that they may be more at risk of obesity.
Aim: This study aims to assess several morphofunctional parameters in female teenagers with and without intellectual disability.
Materials and Methods: To evaluate the morphofunctional parameters, we used a professional Tanita MC 580 device relying on bioelectrical impedance analysis technology (BIA), most commonly used in studies concerning body composition because it is non-invasive, quick, with high data fidelity; it can be easily moved to various locations and applied straightforwardly among populations with diverse types of intellectual disability.
Results: The data obtained upon using statistical and mathematical indicators can be analysed in relation to the literature. This study included 88 subjects (females) divided into three groups. Our findings show significant positive or negative correlations between body mass and muscle mass (Kg) $r = 0.914$ ($p < 0.001$) and between body mass and body fat (Kg) for $r = 0.857$ ($p < 0.001$), as well as between other parameters of body composition by the type of intellectual disability.
Conclusions: Our study focused on examining the relationship between body mass and muscle mass in adolescent girls with and without intellectual disabilities, and the results provide valuable information on factors that may influence body composition in this population.

Keywords: body composition, intellectual disability

Introduction

Compared to the astounding volume of studies focusing on children and adolescents without disabilities, research regarding various body composition parameters in young populations with intellectual disabilities is relatively scarce. Their number further decreases when we refer to specific age groups with intellectual deficiencies, i.e., teenagers younger than 18. As in teenagers without intellectual disabilities, diverse health benefits have been associated with physical activity, psychosocial included [1], balance, muscle strength, quality of life [2], neurocognitive function, inhibitory control and motor performance [3]. Excess weight in teenagers and obesity is one of the most severe public health problems in our times. After the 1980s, excess weight rates

among children and adolescents increased suddenly. Worldwide, in the four decades between 1975 and 2016, the number of children and adolescents aged between five and nineteen with a body mass index (BMI) categorised as obese increased over ten years from 11 to 124 million (CD-RISC 2017).

Outdoor physical activity – accounting for the primary activity of adolescents – has been replaced, in recent decades, by computer or video console games, Internet and school activities with increasing requirements. These lifestyle modifications promoting inactivity have social and psychological consequences, contributing to the onset of chronic disease even since childhood. A strong correlation was found between physical activity and health; children who spend more time outdoors are much more active and healthier. Physical activity is known to reduce the risk of premature death caused by cardiovascular disease, diabetes mellitus, osteoporosis, colon cancer, depression, and anxiety [4]. The progress of technique and the emergence of various electronic devices (i.e., computers, Pods, mp3-players, video consoles for games, mobile phones, and laptops) decrease the time children and teenagers allocate for physical activity. Concerning persons with intellectual disabilities, clinical data analysis has shown that teenagers with intellectual disabilities record higher obesity prevalence.

Aim

This study aimed to evaluate a series of morphofunctional parameters in teenagers with and without intellectual disability to characterise normality and its disturbances.

Materials and Methods

This investigation included 88 subjects (females) distributed into three groups, as follows: Without intellectual disabilities (WID) – 55 girls (17.2 ± 0.7 years old), Moderate intellectual disability (MID) – 22 girls (16.6 ± 0.8 years old), and Severe intellectual disability (SID) – 11 girls (17.1 ± 0.8 years old). The activities took place in the gymnasiums of educational units and the physical therapy practices of the "Sf. Andrei" School Centre Gura Humorului (Suceava County), The "Constantin Păunescu" School Centre Iaşi, "Elisabeta Polihroniade" Inclusive Education School Centre Vaslui, "Emil Gârleanu" Special School No. 1 Galați.

We used the TANITA MC 580 professional device to determine the body composition and a dedicated analysis software (version 3.4.5). The TANITA multi-frequency monitors can measure bioelectrical impedance analysis on three or six different frequencies. The additional frequencies provide an exceptional precision level compared to one-frequency and dual-frequency monitors. TANITA PRO SOFTWARE – 3.4.5 version – the Tanita PRO software pack was developed in partnership with the most significant medical software developer (Medizin & Service GmbH). The software can store and analyse the data from the Tanita MC 580 monitor. The use of TANITA MC580 and TANITA PRO SOFTWARE generates 11 measurements: Body mass – Kg; BMI (Kg/h^2); Body fat %; Muscle mass %; BMR (kcal); Body fat – Kg; Muscle mass – Kg; SMM – skeletal muscle mass; Total water; Bone mineral mass; Segmental analysis on upper/lower limbs, left/right. According to EU Regulations, both the device for body composition and the software are medically approved, and they observe the Regulations in force (Council Directive 93/42/EEC of 14 June 1993 concerning medical devices). We analysed the data collected using graphical and numerical syntheses in SPSS 20.0.

All the procedures carried out in this study were in conformity with the 1964 Declaration of Helsinki and its subsequent amendments.

Hypothesis

The type of intellectual disability influences body composition parameters.

Results and Discussions

We used Pearson's correlation to determine the power and direction of a linear relationship between two continuous variables within the study.

Concerning the relationships between variables for the group of girls without intellectual disabilities, we note in Table I that a significantly positive correlation was found for r = 0.785 ($p < 0.05$) between body mass index and percentage body fat. In contrast, a significantly negative correlation was recorded between body mass index and muscle mass percentage for r = -0.785 ($p < 0.05$).

Table I. Synthetic table with the value of Person's coefficient (r) for the group of girls WID

Variable		H (cm)	MC (Kg)	BMI (Kg/m2)	GC (%)	MM (%)	BMR (kcal)	GC (Kg)	MM (Kg)	SMM
H (cm)	CP	1	.378**	-.048	.093	-.094	.465**	.213	.482**	.479**
MC (Kg)	CP	.378**	1	.904**	.765**	-.765**	.948**	.857**	.914**	.913**
BMI Kg/m2)	CP	-.048	.904**	1	.785**	-.785**	.806**	.829**	.762**	.762**
GC (%)	CP	.093	.765**	.785**	1	-1.000**	.567**	.890**	.450**	.447**
MM (%)	CP	-.094	-.765**	-.785**	-1.000**	1	-.566**	-.891**	-.449**	-.447**
BMR (kcal)	CP	.465**	.948**	.806**	.567**	-.566**	1	.691**	.973**	.972**
GC (Kg)	CP	.213	.857**	.829**	.890**	-.891**	.691**	1	.624**	.623**
MM (Kg)	CP	.482**	.914**	.762**	.450**	-.449**	.973**	.624**	1	1.000**
SMM	CP	.479**	.913**	.762**	.447**	-.447**	.972**	.623**	1.000**	1

** The correlation is significant for $p<0.01$ *The correlation is significant for $p<0.05$, CP – Pearson's Correlation, H – height (cm); MC – body mass Kg); BMI – body mass index (Kg/m2); GC% - body fat in %; MM% - muscle mass in %; BMR – basal metabolic rate (Kcal); GC (Kg) – body fat in Kg; MM (Kg) – muscle mass in Kg; SMM – skeletal muscle mass

Significantly positive correlations are recorded between body mass and muscle mass (Kg) r = 0.914 ($p < 0.001$) (Fig. 1) and between body mass and body fat (Kg) for r = 0.857 ($p < 0.001$) (Fig. 2).

Studies show that, in girls, there is a positive correlation between body mass and muscle mass, but this correlation can be lower than in boys. In addition, a positive correlation exists between body mass and body fat, which can be stronger than in boys [5,6]. It is relevant to mention that, in general, body fat has a more substantial influence on body mass in girls than in boys. Consequently, when examining the relationship between these factors, one must also consider gender and specific factors that can affect these relationships.

Other significantly positive correlations are recorded between body mass variable (Kg) and the variables: body mass index r = 0.904 ($p < 0.001$), basal metabolic rate r = 0.948 ($p < 0.001$), muscle mass (Kg) r = 0.914 ($p < 0.001$) and skeletal muscle mass r = 0.913 ($p < 0.001$).

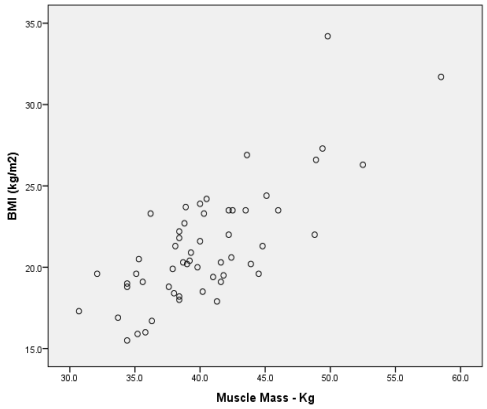

Figure 1. Correlation between BMI and muscle mass (Kg) for the group of girls WID

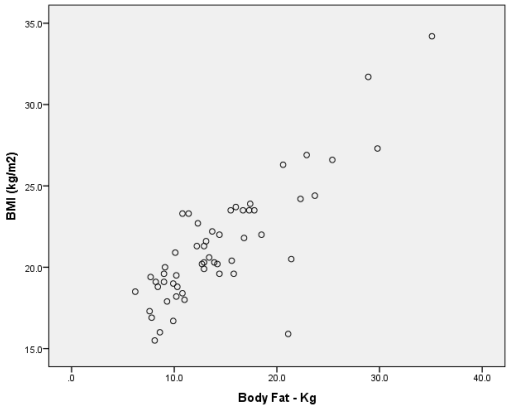

Figure 2. Correlation between BMI and body fat (Kg) for the group of girls WID

A perfectly positive correlation can be noted between skeletal muscle mass (SMM) and muscle mass (Kg) for r = 1.00 ($p < 0.001$) (Fig. 3). It is important to note that skeletal muscle mass (SMM) and muscle mass (Kg) differ, though both refer to the amount of muscle tissue in the human body. SMM refers to the number of muscles acting as an engine for motion (striated muscles); it is more relevant in the context of physical activity. Muscle mass (Kg), on the other hand, refers to the body's total amount of muscle tissue, including the skeletal and smooth and cardiac muscle tissue.

The relationship between SMM and muscle mass (Kg) can be positive but imperfect. In general, higher SMM leads to an increase in muscle mass, but other factors, such as the level of hydration or fat tissue in the body, can also affect total muscle mass.

A study assessed the relationship between SMM and muscle mass (Kg) in a group of teenagers. Findings have shown a significant positive correlation between SMM and muscle mass (Kg), but Pearson's correlation coefficient was 0.93, indicating a strong but imperfect correlation [7]. Consequently, there is no perfect correlation between SMM and muscle mass (Kg). Understanding the difference between SMM and muscle mass (Kg) and other factors susceptible to impairing these measurements is essential in interpreting the correlations between these factors. In addition, the same variable also correlates highly positively with body mass (Kg), for r = 0.913 ($p < 0.001$).

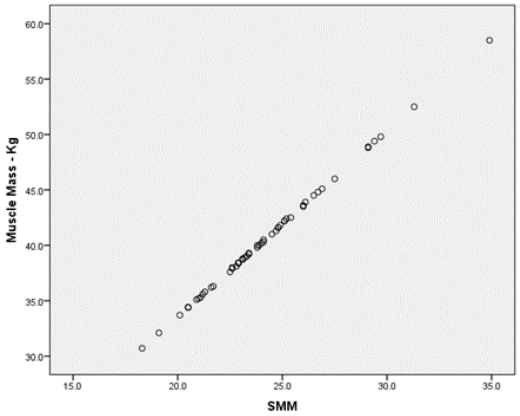

Figure 3. Correlation between SMM and muscle mass (Kg) for the group of girls WID

In the group of girls with MID, we note (Table II) that body mass index correlates highly positively with body mass (Kg) r = 0.804 ($p < 0.001$), percentage body fat r = 0.838 ($p < 0.001$), basal metabolic rate r = 0.858 ($p < 0.001$) and with body fat (Kg) for r = 0.882 ($p < 0.001$) (Fig. 4).

Table II. Synthetic table with the value of Person's coefficient (r) for the group of girls with MID

Variable		H (cm)	MC (Kg)	BMI (Kg/ m2)	GC (%)	MM (%)	BMR (kcal)	GC (Kg)	MM (Kg)	SMM
H – cm	CP	1	.390	.165	.159	-.326	.523*	.401	.493*	.426*
MC-Kg	CP	.390	1	.804**	.741**	-.552**	.781**	.834**	.630**	.658**
BMI (Kg/m2)	CP	.165	.804**	1	.838**	-.545**	.858**	.882**	.707**	.774**
GC %	CP	.159	.741**	.838**	1	-.742**	.626**	.855**	.416	.457*
MM %	CP	-.326	-.552**	-.545**	-.742**	1	-.470*	-.610**	-.273	-.318
BMR (kcal)	CP	.523*	.781**	.858**	.626**	-.470*	1	.811**	.902**	.936**
GC-Kg	CP	.401	.834**	.882**	.855**	-.610**	.811**	1	.644**	.617**
MM-Kg	CP	.493*	.630**	.707**	.416	-.273	.902**	.644**	1	.961**
SMM	CP	.426*	.658**	.774**	.457*	-.318	.936**	.617**	.961**	1

**The correlation is significant for $p < 0.01$ *The correlation is significant for $p < 0.05$ CP – Pearson's Correlation
H – height (cm); MC – body mass (Kg); BMI – body mass index (Kg/m^2); GC% - body fat in %; MM% - muscle mass in %; BMR – basal metabolic rate (Kcal); GC (Kg) – body fat in Kg; MM (Kg) – muscle mass in Kg; SMM – skeletal muscle mass

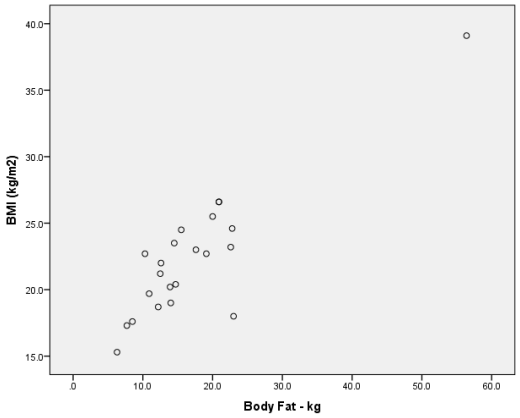

Figure 4. Correlation between BMI and body fat (Kg) for the group of girls with MID

For the group of girls with SID, we note in Table III that, concerning body mass index, we found highly positive correlations, with body fat in Kg r = 0.953 ($p < 0.001$), muscle mass in Kg r = 0.841 ($p < 0.05$) and skeletal muscle mass for r = 0.846 ($p < 0.05$). At the same time, body mass index correlates highly positively with percentage body fat r = 0.838 ($p < 0.05$).

Table III. Synthetic table with the value of Person's coefficient (r) for the group of girls with SID

Variable		H (cm)	MC (Kg)	BMI (Kg/m^2)	GC (%)	MM (%)	BMR (kcal)	GC (Kg)	MM (Kg)	SMM
H – cm	CP	1	.500	.328	.208	-.206	.484	.400	.527	.530
MC-Kg	CP	.500	1	.979**	.818**	-.817**	.957**	.964**	.858**	.863**
BMI (Kg/m^2)	CP	.328	.979**	1	.838**	-.839**	.952**	.953**	.841**	.846**
GC %	CP	.208	.818**	.838**	1	-1.000**	.665*	.932**	.442	.455
MM %	CP	-.206	-.817**	-.839**	-1.000**	1	-.665*	-.931**	-.443	-.455
BMR (kcal)	CP	.484	.957**	.952**	.665*	-.665*	1	.857**	.960**	.963**
GC-Kg	CP	.400	.964**	.953**	.932**	-.931**	.857**	1	.693*	.701*
MM-Kg	CP	.527	.858**	.841**	.442	-.443	.960**	.693*	1	1.000**
SMM	CP	.530	.863**	.846**	.455	-.455	.963**	.701*	1.000**	1

**The correlation is significant for $p < 0.01$ *The correlation is significant for $p < 0.05$ CP – Pearson's correlation
H – height (cm); MC – body mass (Kg); BMI – body mass index (Kg/m^2); GC% - body fat in %; MM% - muscle mass in %; BMR – basal metabolic rate (Kcal); GC (Kg) – body fat in Kg; MM (Kg) – muscle mass in Kg; SMM – skeletal muscle mass

Concerning body mass variable, we highlight several highly positive correlations with body mass index $r = 0.979$ ($p < 0.001$), percentage body fat $r = 0.818$ ($p < 0.05$), basal metabolic rate $r = 0.957$ ($p < 0.001$), muscle mass in Kg $r = 0.858$ ($p < 0.05$) and skeletal muscle mass $r = 0.863$ ($p < 0.05$). The relationship between body mass and muscle mass in teenagers with intellectual has been explored in recent studies. The study's conclusions underlined a significantly positive and robust correlation between this population's body mass and muscle mass [8,9].

Conclusions

In girls, the relationship between body mass, muscle mass and body fat can vary by age, physical activity level, diet, and other factors. However, girls are generally prone to having a higher body fat percentage than boys, which can affect the relationship between body mass, muscle mass, and body fat.

Our study focused on examining the relationship between body mass and muscle mass in female teenagers with and without intellectual disabilities, and findings provide valuable information on the factors that can influence body composition in this population. Further research is necessary to explore the underlying mechanisms of this correlation and determine the potential implications. Nonetheless, conclusions have significant implications in understanding the unique health needs of adolescents with moderate and severe intellectual disabilities and highlight the relevance of regular physical activity and proper diet among this population.

Acknowledgements

This work was co-funded by the European Social Fund, through Operational Programme Human Capital 2014 – 2020, project number POCU/993/6/13/153322, project title "Educational and training support for PhD students and young researchers in preparation for insertion in the labor market".

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Body Weight Distribution on Plantar Support and Body Oscillations Using the Static Baropodemotric Test and the Posturographic Romberg Test in Children

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Abstract

Maintaining balance and postural control is one of the essential tasks of the human locomotor system. From a biomechanical point of view, the foot is a functional unit that aims to maintain body weight and provide leverage to move forward when walking and running [1,2]. Biomechanical' changes in the base of support and disruption of different information of any joint or structure located along the lower extremity motor chain can affect postural control strategy. Despite their small surface area, the soles play an important role in maintaining the body's balance. The anatomical structure of transverse, internal longitudinal, and external longitudinal arches cause the formation of stable operations and the production of force to move the body forward in all human activities. Musculoskeletal abnormalities affect posture and stability [3]. The postural tonic system is working well only if all the receptors are in balance. The aim of the study was checking the number of patients who have an incorrect distribution of body weight in the four main points of support at the foot level and the oscillations of patients with open and closed eyes (posturographic test) [4].
95 children between the ages of 7 and 11 were included, without any previous pathology. The evaluation was performed with baropodometric plate. Through the static baropodometric instrumental examination, we tested the distribution of weight between the left and right leg of each patient and the load on forefoot and hindfoot. The second examination analyzes body oscillations in the Romberg test [5]. Of the 95 patients examined, we found 42 patients with 50-53% load on left/right, 46 with 53-57% load and 7 with load above 57%. In all three categories we found that children load more on the left hindfoot. In Romberg Test we found that in only 34 out of 95 patients the visual system does not send wrong signals to the brain and have both parameters (sway length and ellipse surface) [6, 7] with open eyes smaller values than closed eyes [8]. Correct load distribution, allows us to make all our systems work in harmony, with the rules of efficiency and economy. An incorrect distribution of the load makes us suspect that our postural tonic system has incorrect information from its receptors. Therefore, we need to investigate the cause that prevents correct balance of the body. For example, an alteration of the visual system creates enormous compensations by the postural tonic system, changing the tension of the muscle/myofascial chains, fatigue and stressing every part of our body (as seen in the posturographic test results).

Keywords: weight distribution, plantar support, myofascial chains, baropodometry.

Introduction

Posture can be defined as the state of balance of the body [8]. It expresses the fusion of the body's ability to acquire and maintain all positions, maintaining balance.

Correct posture is nothing more than the ideal position of the body in relation to space [9]. A correct posture is necessary to achieve the connection of antigravity with minimal energy resources both in walking and in dynamics [10], and several factors work for this: neurophysiological, biomechanical, emotional, psychological [11].

People maintain their upright position autonomously, by means of a muscle-controlled system called the postural tonic system [12]. The postural tonic system is a set of communicating structures and processes whose function is:

- fight against gravity,
- resistance to external forces,
- placement in space-time,
- allows balanced movement, guiding and strengthening it [13].

Postural control is a term used to describe the way our central nervous system (CNS) regulates sensory information from other systems in order to produce adequate motor output to maintain a controlled, upright posture. The visual, vestibular, and somatosensory systems are the main sensory systems involved in postural control and balance [14].

The visual system is the primary receiver of sensory information to maintain postural balance, and as such our postural stability increases with the improvement of the visual environment [15].

The upright posture control is based on the idea of the inverted pendulum and the presence of center of pressure (CoP) oscillations, as important measure of postural stability [16]. In the simplified inverted pendulum model of the upright human posture, the center of body mass (CoM) is the single controlled variable. In quiet standing, CoP oscillates either side of CoM to keep it in a fairly constant position between the two feet [17]. Since the center of body mass (CoM) is located relatively high (in the trunk, ~1 m above the ankles that determines the length of the inverted pendulum) and the base of support is relatively small, the posture is inherently unstable. Accordingly, one might conclude that the higher the CoM location, the larger the CoP oscillations [18].

The human foot acts as a base for support and propulsion in gait, ensuring effectiveness in load transfer during the entire gait cycle. Proper biomechanics of the foot is responsible for maintaining the posture and symmetrical distribution of the plantar pressure. With its two modalities, static or dynamic, baropodometry is the main tool for the study of plantar pressures distribution [19].

The baropodometer is an advanced force platform, used for the analysis of plantar pressure areas applied by the body in both motion and static position. It uses appropriate software to produce images similar to a podoscope. This technique provides data with a high diagnostic value, which are printed in graphs. It provides direct and indirect information about the position of the patient in the standing position, dynamic gait analysis, distribution of loads during walking, peak pressure and contact time with the ground, and detection of areas in risk on foot and helps in the production of orthotic insoles, on the detection of biomechanical abnormalities of the foot, pelvis, and spine [20].

Baropodometric analysis assesses dysfunctions of the feet. The principle is to map the pressure of the plantar surface, which, indirectly, indicates important postural abnormalities Computerized baropodometric analysis records plantar imprints and ground reaction forces

during upright quiet standing. This is divided into the right and left feet and subdivided into the forefoot, midfoot and hindfoot. This allows the determination of the percentage of weight supported by each foot and the symmetry ratio between them. Moreover, it can also calculate an arch index informing the type of foot: normal; cavus or flat. It also provides the stabilometric parameters derived from the spatial and temporal behavior of the center of pressure, similar to a force plate [21].

Material and Methods

95 healthy children aged between 7 and 11, without other pathologies, participated in this study.

Through the static baropodometric instrumental examination, the weight distribution between the left and right legs of each patient was monitored, as well as the type of antero-posterior loading.

For the evaluation, the children were placed barefoot on the baropodometric scale and did the static test while maintaining their gaze on a fixed point in front of them at eye level. The static test lasted 20 seconds during which they were not allowed to change their position or move their gaze from the dot.

The same test was used to check the weight distribution between the forefoot and rear foot.

To check the oscillations during the Romberg test, the same baropodometric scale was used. The Romberg test consists of a 52-second test with the eyes open fixed on a fixed point at eye level and then another 52-second test, this time with the eyes closed.

The Romberg test is a neurological exam that is used to test balance and coordination. The patient's ability to stand with legs parallel and close together with eyes open and then eyes closed for 30 seconds is assessed. This test was described in the 19th century by Mortiz Romberg, a European neurologist.

In the Romberg test results we are interested in two parameters, namely: the sway length and ellipse surface.

- sway length: the length of the trajectory followed by the cop normalized to the acquisition duration
- ellipse: It is the surface area that encloses the sway length in both directions

Results

The weight distribution between the left leg and the right leg was divided into three categories:

1. 51%-53% (acceptable/tolerable limit but to be kept under control) – 41 children
2. 53- 57% (severe imbalance) – 46 children
3. Over 57% (severe imbalance) – 7 children

We divided the number of patients from those who had support up to 53% to those who load more on the left or on the right.

- the distribution with the maximum up to 53% has an acceptable tolerance but must be kept under control.

From the 50-53% category as can be seen in Table 1, only 2% have a correct distribution (50-50%), and 69% lean more on the left leg, 29% on the right leg, as can be seen in Figure 1.

Table 1. Load distribution between right/left foot

Category	Total	Left foot load	Right foot load
50 % - 50%	1		
51% - 53%	41	29	12
53% - 57%	46	34	12
>57%	7	6	1

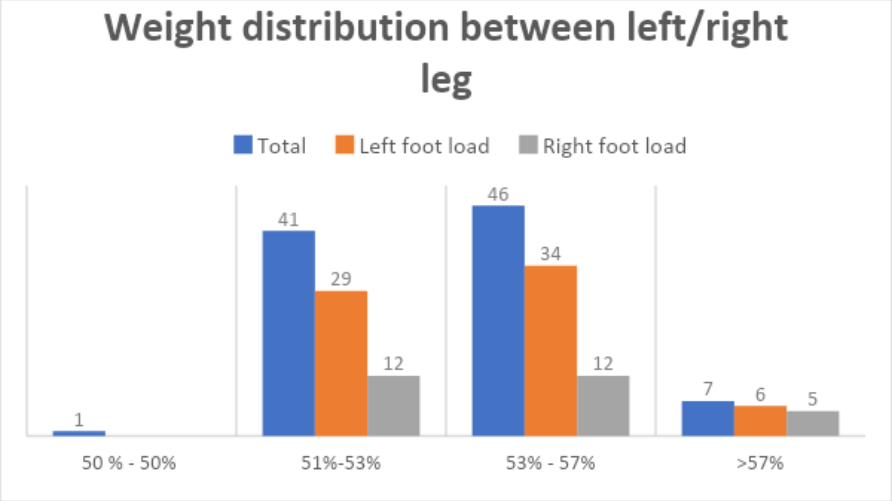

Fig 1. Weight distribution between left/right leg

Anterior/posterior load distribution

From the 50-53% left/right category, there are 42 children with imbalance in the anterior-posterior plane as well. 16 have a load on the forefoot, 24 on the hind foot, and two others of these have a peculiarity because they load diagonally, which means a pelvis in torsion (Table 2 and Figure 2). This leads us to assume that one of the main receptors of posture is sending incorrect signals to the body, so this torsion occurs as compensation.

Table 2. Load distribution on the four main points on right/left leg.

Category	Anterior left leg load	Posterior left leg	Anterior right	Posterior left	Both legs anterior	Both legs posterior	Diagonal
50-53%	7	12	7	8	2	4	2
53-57%	2	23	8	9	0	4	0
>57%	2	3	2	0	0	0	0

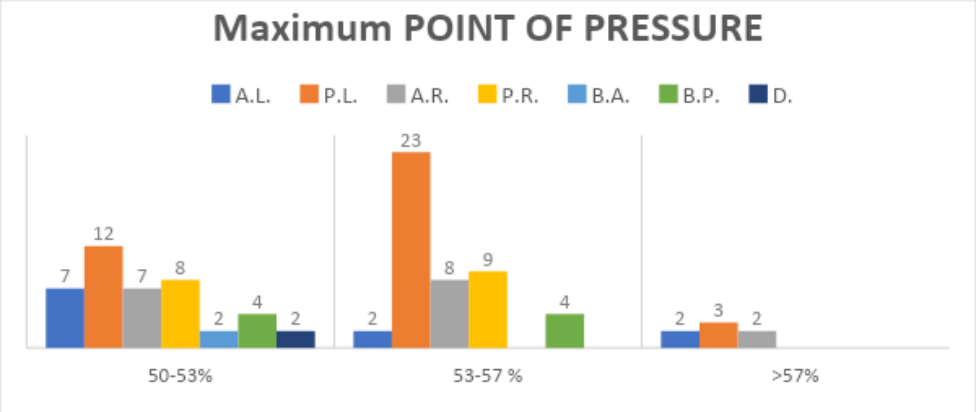

Fig. 2. Load distribution on the four main points on right/leg left.

The second exam was the Romberg Test. The patients were placed in the correct position on the stabilometric platform. Postural adjustment movements were analyzed first with eyes open and after with eyes closed, in the absence of intense lights and external noises.

Normal values for sway length: 307 – 599 mm; ellipse surface: 39- 250 mm2.

In total 61 patients have better oscillatory balance with their eyes closed as seen in Table 3 and Figure 3.

Table 3. Romberg Test results with closed eyes and open eyes.

Romberg test 7-11 years	
Better open eyes	34
Better closed eyes	29
Elipse CE < elipse OE	26
Sway C.E. < Sway OE	6
Total	95

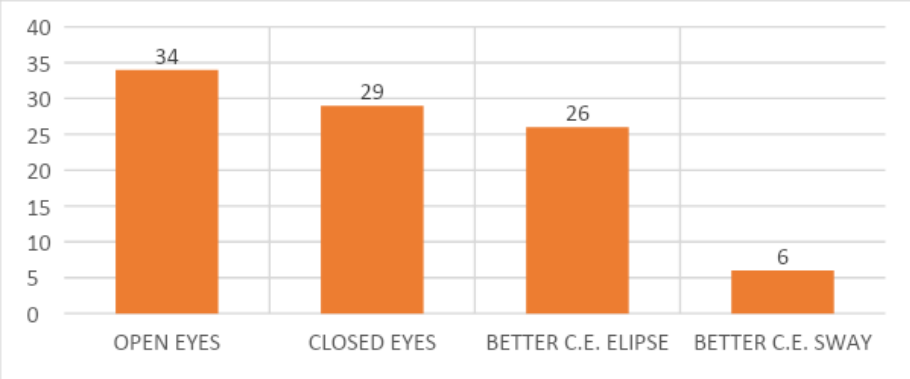

Fig 3. Romberg test results with closed eyes and open eyes.

75 patients with their eyes open have at least one of the two parameters, out of the average balance.

- If the sway length is smaller than the normal values, it means low muscle stiffness
- If the sway length is bigger than the normal values, it means an inability in step, TMJ problems, or rotation induced by scoliosis.

Discussion and Conclusions

Correct load distribution allows us to make all our systems/equipment work in harmony, with the rules of efficiency and economy. An incorrect distribution of the load makes us suspect that our postural tonic system has incorrect information from its receptors. Therefore, we need to investigate the cause that prevents correct balance of the body.

In the literature we couldn't find similar studies on healthy children, only on children that have other pathologies. Considering the results of the tests and the problems we discovered in these healthy children, they might or might not develop some kind of pathology in the future.

If this imbalance lasts over time, we will have wear on the most affected structures. For example, the joints of the lower limbs, such as the hip, knee, ankle and also fascial organs tissue [22]. In addition to it weighing on the foot itself, especially the metatarsus and heel. Also, it would also leave us to compensations along the column.

Also, an alteration of the visual system creates enormous compensations by the postural tonic system, changing the tension of the muscle/myofascial chains, fatigue and stressing every part of our body.

This data allows us to discover poor visual-postural function and it will be interesting to find out more into the problem with an eye specialist and optometric visits.

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The Influence of Pilates Exercises in Improving Spine Mobility

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Abstract

Introduction: This article aims to provide information on the influence of Pilates exercises in improving spine mobility among 18-22 year olds. Involvement in this research can contribute to the development of new knowledge, in the prevention of possible back pain, as well as for the well-being that everyone possesses after performing Pilates exercises.
Materials and Methods: To gather important data, each subject had their spinal mobility measured before and after completing the Pilates exercises. 50 young women between the ages of 18-22 participated in the study. The study group have followed a Pilates exercise program for 7 weeks, one hour/week. We assessed the spine mobility of each subject, using Schöber method, measuring the finger-floor distance (FFD) at the beginning as test - T1 and after as test -T2.
Results: After 7 weeks of performing Pilates exercises, the subjects involved in this study showed a better mobility of the spine. The results show that the difference between the means measured during the two test rounds is 7.76 cm.
Conclusions: The results obtained show a positive effect even after the first Pilates session, a fact that encourages us in promoting this method, in which the body is subjected to a pleasant, relaxing and at the same time effective effort.

Keywords: Pilates, mobility, exercises

Introduction

Today's lifestyle takes its toll on the health of the spine, starting at younger and younger ages. People spend a large part of their time sitting, at the office, school or in the car, and they exercise less and less.

In recent decades, there has been a significant increase in the incidence of degenerative spine diseases at young ages with clinical manifestations ranging from back pain and pain associated with compression of the sciatic nerve. One of the causes incriminated in the occurrence of these diseases is represented by the adoption of faulty postures, due to a sedentary life.

Physical exercises are an important factor that can help improve spinal mobility. In the modern world, more and more people are facing various spinal conditions, among them, back pain is the most common. These pains can be mostly caused by the lack of mobility of the spine.

In the specialized literature, there are studies that have highlighted the beneficial effect of different physical therapy programs in improving the quality of life in patients with back pain [1,

2]. An exercise program that is often used to increase muscle strength and improve mobility is the Pilates method [3].

Pilates exercises combine mental and physical training for correct body posture. This aims to improve the quality of movements, correct posture, joint mobility, control of fine movements and mental relaxation [4].

The Pilates method of body conditioning is not a rough and difficult technique that is tiring or painful. On the contrary, through the simultaneous movements of straining and stretching the muscles, the body is subjected to a pleasant, relaxing and at the same time effective effort [5,6].

Objective

The objective of this study is to evaluate the mobility of the spine, in healthy young women between 18-22 years old and to improve it, through the Pilates method.

Materials and Methods

50 young women, students, aged between 18-22, who were not familiar with this method, were included in this research. All the subjects involved in the research presented a good general health condition (fit for sports).

The group participating in the research followed a physical activity program, using Pilates-type exercises, once a week for 60 minutes, for 7 weeks. The persons involved gave their verbal consent for the proposed evaluations and data processing. The evaluations were made at the beginning (FFD_T1) and end (FFD_T2) of the research, after 49 days.

The assessment included the measurement of the finger-floor distance (FFD): from the standing position, the subjects leaned forward with their arms extended in trunk extension. To perform the mobility test, an aerobic step was used, on which a 50 cm ruler was fixed, with the number 25 at the upper edge of the step. Subjects sat with their lower limbs outstretched, without shoes. The trunk is bent forward in a slow motion, with the arms extended forward and close together, so that the fingertips slide as far as possible on the graduation of the ruler. At maximum stretch, the position was held for 3 seconds and the number of cm was measured.

The Pilates program practiced by the subjects lasted 60 minutes. The structure of the training sessions used during this research consists of 3 parts.

Part 1 (preparatory): The warm-up, lasting 15-20 minutes, includes exercises to prepare the body for the effort.

Part 2 (fundamental): Having a duration between 30-35 minutes. In this part, exercises for the whole body were included, but joint mobility and muscle elasticity exercises predominated. The exercises were performed exclusively on the mat (Pilates) from the upright position, sitting and lying down.

Part 3 (conclusion): In this last step some relaxation exercises have been considered. The duration of this part was 10-12 minutes.

At the end of each Pilates session, a favorite exercise was chosen and performed daily by the research subjects until the next session.

The statistical analysis was performed using the SPSS program. The ”t” test was used to compare the data between the two tests, T1 and T2, and see the progress.

Results

The date and results were analyzed using statistical analysis and are presented in Table 1 and Figure 1 (Mobility assessment).

Table 1. Mobility assessment

	N	Mean	Std. Deviation	Std. Error Mean
Age	50	19.90	1.359	.192
FFD_T1	50	6.58	7.629	1.079
FFD_T2	50	-1.16	7.490	1.059
FFD_diff	50	7.76	2.767	.391

Fig 1. Mobility assessment

The comparison of the means of the two tests are presented in table 2.

Table 2. Mobility assessment – comparison of the means

	Test Value = 0					
	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
age	103.541	49	.000	19.900	19.51	20.29
FFD_T1	6.098	49	.000	6.580	4.41	8.75
FFD_T2	-1.095	49	.279	-1.160	-3.29	.97
FFD_diff	19.832	49	.000	7.760	6.97	8.55

For a better visualization of the differences between test1 (T1) and test2 (T2), the two means are graphically represented in Fig. 2.

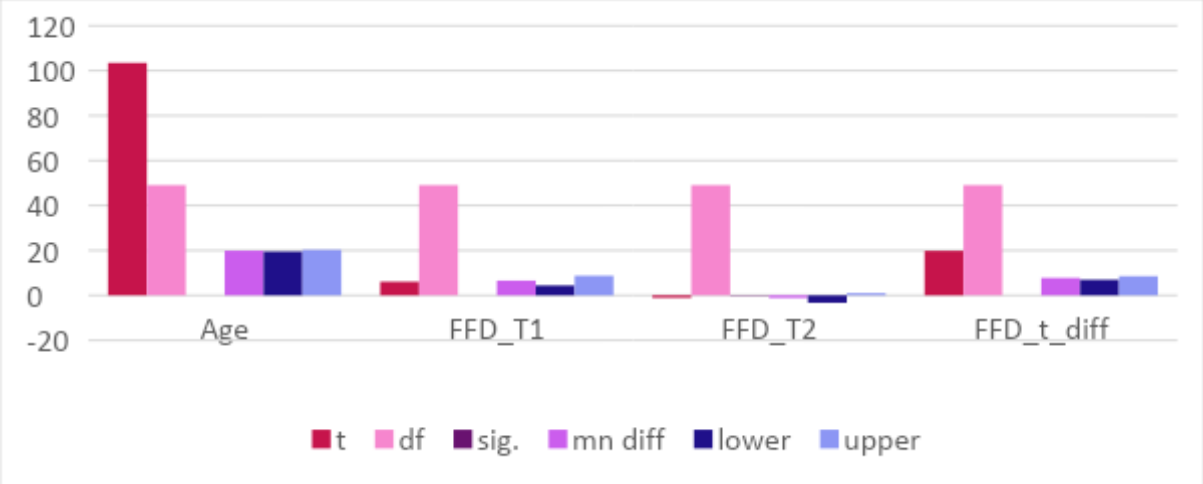

Fig. 2. Mobility assessment – comparison of the means

We observed that there are significant differences between T1 and T2, regarding the improvement of spine mobility, after the Pilates exercise program. We can conlude that the Pilates method used was effective in this research.

Discussions

The results obtained in this study show that physical activity using Pilates exercises influences the mobility of the spine.

Also called "the art of control" or "chronology of muscles", the Pilates method focuses on training the body and mind to improve physical, mental and spiritual conditions, with multiple results.

The specialized literature shows that the purpose of Pilates training, regardless of the training level of the practitioners, is to create a natural flow of movements, which then gradually increase the energy, dynamics of the execution of the movements, without neglecting the control and correctness of the execution.

Through the Pilates method, the weak become strong, the stiff become flexible, and those with muscle and joint problems will no longer complain of pain, thus a state of well-being and self-confidence appear [7, 8]. After 7 weeks of training all our subjects included in this study showed a better mobility of the spine right from the first session.

Moreover, our results are also confirmed by other studies that have shown that practicing Pilates physical activity can lead to improved breathing, after 8 weeks, in people with a history of Covid-19 [9].

Recent studies have shown the effectiveness of Pilates exercises, performed over 10 weeks, by improving heart rate and lung function in healthy young women [9].

Conclusions

These results show us that practicing Pilates exercises regularly, once a week for 60 minutes each, has positive effects on the mobility of the spine, preventing its stiffness.

Daily practice of a single favorite exercise can contribute to maintaining mobility as well as a sense of well-being.

Initiation in Pilates should be done with a person specialized in such physical exercises, as the correctness of the movements is very important.

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The Impact of Heat Training in Endurance Running - Case Study

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Abstract

Introduction: In endurance sports, environmental factors have a significant impact on body performance. Heat training is increasingly popular among athletes, and their trapped exposure to high temperatures will trigger the physiological process of acclimatization.
Aim: The objective of the study is to identify differences in athlete parameters following heat training versus training at optimal temperature.
Materials and Method: The subject A 27-year-old subject underwent 4 weeks of standardized training, 2 weeks of which in high-temperature conditions (31º-36ºC) and another 2 weeks of standardized training in low-temperature conditions (16º-19ºC). The following parameters were monitored: heart rate, running power, body temperature, and running speed. The data was collected using Garmin devices and the Core sensor.
Results: The results reveal that exposure to high temperature during training brings significant improvements in somatic-functional and physiological parameters, showing an optimization of heart rate in relation to running speed, running power in relation to heart rate and body temperature during running.
Conclusions: In conclusion, training at elevated temperatures can bring significant improvements in athletic performance, reflecting increases in endurance and muscle power, both at elevated and optimal temperatures.

Keywords: heat training, Core, temperature

Introduction

In 1997, researchers Levine and Stray-Gundersen confirmed the hypothesis that altitude training leads to improvements in athletic performance by introducing hypoxic exercise [1]. This assumption began to be investigated in the 1940s, invoking the idea of a possible physiological improvement following altitude training, performance analyzed at low altitude (sea level) [2],[3],[4]. Gradual exposure of the body to environmental stressors, such as altitude and heat, brings about different physiological adaptations [5].

The hot climate of the latest major sporting events, the World Athletics Championships (Doha 2019) and the Olympic Games (Rio 2016 and Tokyo 2020/2021) has led to an increase in interest among researchers in the benefits of training in the heat [6]. This method of training, known among athletes as "poor man's altitude training", is misunderstood, as the physiological adaptations are different from hypoxic training. Compared to altitude training, where the benefits of the stimulus are well known (increase in hemoglobin mass), heat training has recently gained

interest among researchers, so the recommendations with respect to the stimulus (temperature, exposure duration, humidity) are not clearly established [5]. Physiological adaptations following heat stress being ergogenic include hematological (plasma volume expansion), vascular and cardiac, and skeletal muscle as well as thermoregulatory adaptations (lower body temperature) [7],[8].

Objective

Based on these premises, this study aimed to determine the differences in heat training compared to optimal temperature training, performance analyzed in a cold environment. Astfle hypothesized that heat acclimatization brings improvements in functional parameters (running power, body temperature, heart rate).

Material and Methods

Data were taken from a 27-year-old subject with a height of 172 cm and 72 kg. Clinically healthy, with an average of 7-9 hours of sleep per night and a daily activity of 6-10 hours, with no drug, tobacco or alcohol dependence. Amateur athlete in the half marathon event, with a volume of 50-70km per week, introduced in 5/6 training sessions per week. Having a 3-year history in this discipline, the subject was positively matched to the requirements of participation in the study. Before enrolling in the study, the athlete was informed about the possible risks that the training program may bring to the heat as well as the discomfort of a new training stimulus. Following information, written consent for participation was obtained by the ethical standards set out in the 1975 Declaration of Helsinki.

The working protocol was spread over a period of 5 weeks and divided into 3 blocks. In the first 2 weeks, the subject followed a training program consisting of 4 weekly runs. The training sessions took place from 6:00-7:00 AM in the morning in optimal conditions for competition, with a temperature ranging between (16o-19oC) and a normal humidity of 40-60%. At the end of the first block consisting of runs at optimal temperatures (workout number 8), the subject performed a 10km test run under optimal thermal stress of 15oC. In part 2 of the protocol, carried out over a one-week interval, the athlete performed 2 running workouts at a low intensity. The last part of the program was spread over a period of 2 weeks, during which time the subject performed workouts at 1:00-3:00 PM in a heat-stress environment with temperatures ranging from (31oC-36oC). At the end of that block, the athlete repeated the 10km test in a 15 oC optimal heat stress environment.

The data was collected using Garmin's sports and fitness devices as well as the Core sensor. The Forerunner 955 watch, Garmin HRM-PRO chest strap, and platform (https://connect.garmin.com/) helped in collecting data related to heart rate, power while running, distance, and speed while testing. The Core sensor attached to the HRM-PRO belt gave us data related to body temperature as well as skin temperature at the subaxillary level.

Results

Analyzing Figure 1, the difference in heart rate from the first and second tests can be seen. Test number 1, which took place after the training program under optimal conditions revealed that the athlete, had an average heart rate of 169bpm reaching a maximum score of this

parameter of 178bpm. Test number 2, on the other hand, yielded superior results, the subject, having a lower average heart rate of 162bpm, reaching a maximum heart rate of 170bpm.

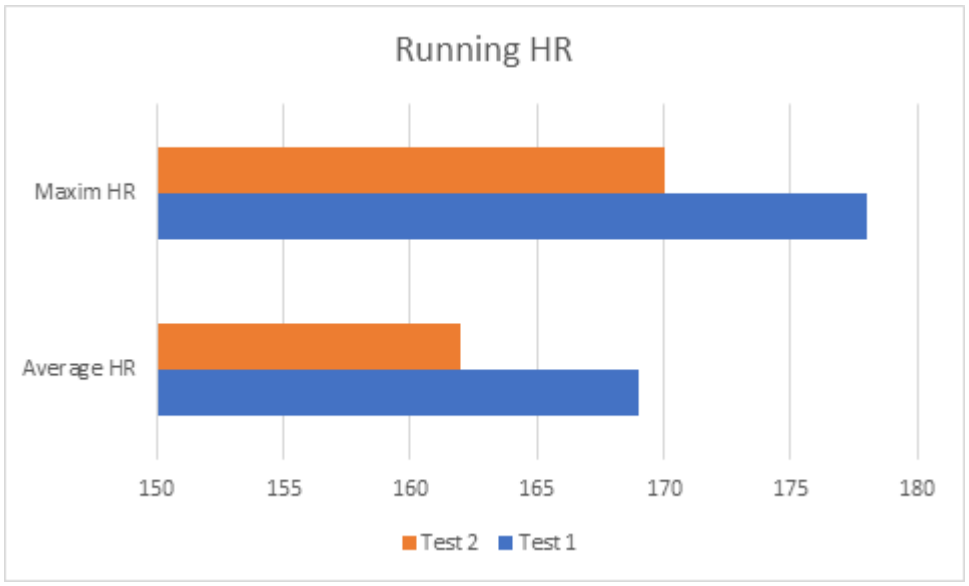

Fig. 1. Running Heart Rate

Turning to the parameter related to power exerted during running, Figure 2 reveals that the differences between the two tests are minor. In the first assessment, the subject managed to achieve an average power of 376W, reaching a maximum value of 440W. The second test, yielded similar results, with the athlete achieving an average power of 373W and a maximum power during running of 438W.

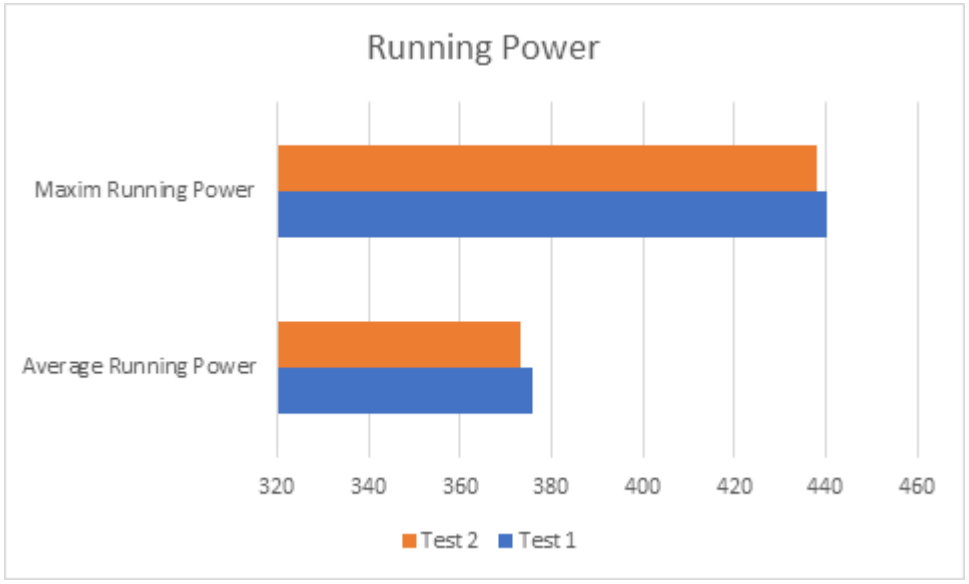

Fig. 2. Running Power

The data revealing the body temperature during the tests are shown in Figure 3. Analyzing the adjacent figure, we can see notable differences between the 2 tests. At the time of the first

evaluation, the subject had an average body temperature of 38.18°C reaching a maximum temperature of 38.84°C. Analyzing the data from the 2nd assessment, the subject had an average body temperature of 37.95°C reaching a maximum temperature of 38.52°C.

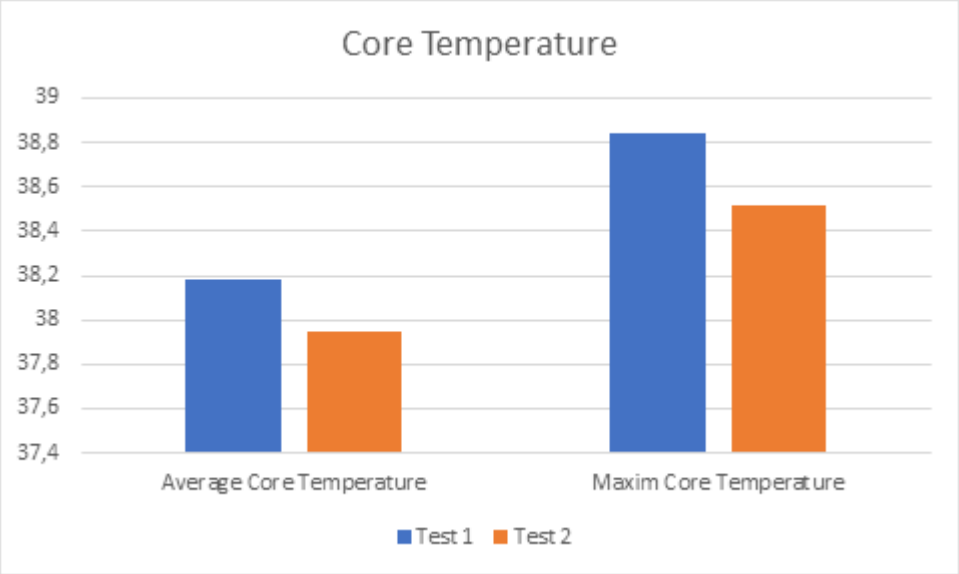

Fig. 3. Core temperature

Discuss

Following the conduct of the study, the data revealed above demonstrate that subjecting the body to heat stress during running, over a period of 14 days with a total of 8 training sessions, provides considerable ergogenic benefits in cool conditions. However, the acclimatization provided by training in the heat also brings improvements in performance in hot conditions.

The effects of heat acclimatization on athletic performance have received high attention [9],[10],[11], although little is known about the mechanisms responsible for the adaptations that occur after heat exposure. Studies such as [12],[13],[14],[15], confirm that heat training meditation is of high multidisciplinary interest, being present as a means of training for sports such as rugby, cross-country skiing, rowing, and cycling.

An improved cardiac performance (having a reduced heart rate) following a period of training under heat stress is supported by several studies [12],[13],[16]. Other studies [18],[19], have reported several mechanical and metabolic adaptations in animals. For example, heat acclimation increases left ventricular compliance and pressure generation and decreases myocardial oxygen consumption. Finally, heat acclimation accompanied by physical training has been shown to have beneficial effects on the mechanical and metabolic properties of the rat heart.

The increase in strength during running in the present study shows us that there are no significant differences brought about by heat training, these data are also confirmed by other studies [13],[15]. The latter supports that an increase in hemoglobin mass did not lead to better maximal power performance in a 1RM (W) leg press examination in elite cyclists.

Conclusions

These results revealed above, confirm the hypothesis that heat training benefits sports performance under optimal testing conditions. Both heart rate and body temperature showed notable improvements following the protocol.

Being a case study, the lack of a large number of subjects as well as a control group may put these data under the influence of the training effect.

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Assessment of VO_2MAX, $T_{LIM}VO_2MAX$ and Correlations of Physiological Indicators among Soccer Players

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Abstract

Introduction: The investigation of acute or tardive physiological modifications induced by physical effort has interested the scientific world of soccer, especially given the need to provide coaches with answers to questions or solutions to the problems and challenges specific to the field. Developing the soccer players' body capability to make increasingly complex efforts while maintaining competitive intensity and volume represents an acute requirement in performance soccer.
Aim: This study comparatively investigates VO_2max and $TlimVO_2max$ among soccer players using field and laboratory testing. The aim is to determine potential differences or correlations between specific physiological indicators.
Materials and Methods: This study included 19 young soccer players (M=19±0.7 years old) who underwent tests to evaluate VO_2max and $TlimVO_2max$ via a field trial and ergospirometry. Heart rate was also monitored during every trial.
Results: Upon calculating Pearson's correlation, we found a significantly positive correlation ($r = 0.958$ and $p < 0.001$) between VO_2max_field and VO_2max_lab. Our study indicates a statistically significant difference ($t=9.100$, $p<0.001$) between the value of VO_2max recorded via field trial (58.756 $ml^{-1}kg^{-1}$; SD = 2.803) versus the value of VO_2max recorded via lab test (56.962 $ml^{-1}kg^{-1}$; SD = 2.648). In addition, data analysis shows a statistically significant difference ($t=3.807$, $p=0.001$) between the value of $TlimVO_2max$ recorded via field trial (219.22 s; SD = 47.65) versus the value of $TlimVO_2max$ recorded via lab test (201.94 s; SD = 36.14). Concerning data analysis for Hr_{max}, we found a significant difference, too ($t=3.361$, $p=0.003$) between Hr_{max}_MAS (201.73 b/min; SD = 16.78) and Hr_{max}_lab (187.27 b/min; SD = 3.75).
Conclusions: Pearson's correlation index shows a strong positive correlation between VO_2max_field and VO_2max_lab. Data analysis indicates a statistically significant difference between VO_2max and TlimVO2max recorded via the field trial versus the value recorded via the laboratory test.

Keywords: VO_2max, $T_{LIM}VO_2max$, soccer.

Introduction

Soccer effort involves, throughout the game, the aerobic path of energy production necessary for muscle contractions. Assessing and identifying maximal oxygen uptake (VO_2max) or maximal aerobic speed (MAS) is essential to determining the exercise capacity level of soccer players [1;2]. Oxygen uptake (VO_2) represents the amount of oxygen a subject uses for basal metabolism in a minute. At rest, VO_2 records 3.5 $ml.min^{-1}kg^{-1}$, accounting for one metabolic equivalent (1 MET) – a measurement unit used by specialists to assess energy uptake during physical effort. In practice, 1 MET can vary from one subject to another by age, sex, body composition, or training level. A recent study has shown a mean value of 3.37 $ml^{-1}kg^{-1}$ in a sample of 272 subjects [3]. During the effort, VO_2 increase directly proportionally with the intensity of physical effort until it reaches a plateau (VO_2max), which it does not exceed regardless of whether other physiological parameters further increase [4, 5, 6].

VO_2max can be considered a significant indicator of cardiorespiratory capacity during resistance effort or, in other words, aerobic exercise capacity [7]. The testing protocol for VO_2max can influence to a certain extent the level of running intensity reached during the trial, not its level measured in $ml.min^{-1}kg^{-1}$ [8]. $TlimVO_2max$ can be defined as an athlete's physiological, biochemical, and metabolic capacity to maintain the intensity specific to maximal oxygen uptake (VO_2max) as long as possible. It is already known that $TlimVO_2max$ ranges from 3 to 8 minutes [9, 10].

The methodical scheduling and planning of the training process entails acute and tardive alterations of the athletes' bodies, directly affecting maximal oxygen uptake (to which our study refers directly). For flawless planning of the training effort's volume, intensity, and complexity to increase aerobic resistance, we need the status of the player's potential. Based on the results obtained, we can calculate the exact running times and determine the specific methods and means within the training process [11]. The literature includes many investigations researching the acute and/or tardive modifications of physiological or biochemical indicators specific to effort at maximal oxygen uptake. By analysing the existing data and sometimes correlations, standardised effort thresholds were determined, representing the reification of science into practice. Thus, they have become valuable, straightforward tools for practitioners in the field.

For instance, it is well-known that heart rate percentage (%Hr) is associated with oxygen uptake percentage ($\%VO_2$) [12] until reaching maximal oxygen uptake (VO_2max), when Hr can still increase, unlike oxygen uptake, which attains the so-called VO_2max plateau [13]. According to the same logic of applying the scientific outcomes analysed via laboratory studies to the current practice of coaches, the specialists conducted field surveys assessing maximal oxygen uptake; these tests are highly reliable [14, 15, 16]. In addition, it is known that an Hr value of 180 b/min can correlate with effort intensity targeting the development of aerobic resistance and, thus, maximal oxygen uptake [17].

Aim

This study comparatively investigates VO_2max and $TlimVO_2max$ among soccer players using field and laboratory testing. The aim is to determine potential differences or correlations between specific physiological indicators.

Material and Methods

The research assesses VO_2max and TlimVO_2max by comparatively measuring physiological indicators in a group of young soccer players using ergospirometry and a field trial.

The general testing and evaluation protocol includes the VAMEVAL trial to assess maximal aerobic speed (MAS) and, by extrapolation, maximal oxygen uptake (VO_2max) via a field trial, the CPET (Cardiopulmonary exercise testing) to assess maximal oxygen uptake in the laboratory. In addition, we evaluated the effort intensity time limit with maximal oxygen uptake (TlimVO_2max) in the field and the laboratory.

Based on recording and analysing the results of the VAMEVAL test, thus knowing the maximum running speed with maximal oxygen uptake, we calculated the corresponding running intensity at VO_2max for each player. The trial consists of maintaining this effort intensity for as long as possible; in the end, we noted the time and the heart rate recorded using PolarTeam Pro.

Cardiopulmonary exercise testing (CPET) is an advanced, specialised investigation, with progressive effort, providing complex data on the athlete's exercise capacity [18].

The research subjects were 19 performance athletes (soccer players) aged between 18 and 21, practising this sport for at least eight years. All our subjects are legitimated at ACSM Politehnica Iași, a professional soccer club, and they attended the study voluntarily. All the tests performed were part of the annual evaluations included in the mandatory medical check-ups or the regular physical tests. All the participants filled in a consent form for voluntary participation in the project and the scientific analysis and/or publication of the data collected in scientific works. All the players underwent the tests according to the same protocol featured above.

Results and Discussions

The Table below features the statistics of the results obtained in anthropometric measurement.

Table 1. Statistics of the results obtained in anthropometric measurement, testing of lower limb strength, speed, and spine mobility

	Mean	**Standard deviation**	**Skewness**	**Kurtosis**	**Minimum**	**Maximum**
Height (cm)	178.125	5.328	0.129	-0.885	170	188
Weight (kg)	71.244	8.899	-0.922	0.612	50.10	83.70
BMI (m^2/kg^{-1})	22.446	2.582	-1.058	1.310	16.359	26.128
Muscle_Mass (%)	41.888	2.082	-0.492	0.233	37.70	45.60
Body_Fat (%)	15.725	4.224	0.187	0.579	7.60	23.90

The following Table includes the statistics of the results recorded for evaluating VO_2max, TlimVO_2max and HrTlimVO2max:

Table 2. Statistics of the results for VO_2max, $TlimVO_2max$, and $HrTlimVO_2max$, field and laboratory

	Mean	Standard deviation	Skewness	Kurtosis	Minimum	Maximum
VO_2max ($ml^{-1}kg^{-1}$)	58.522	2.758	0.824	-0.360	55.30	64.30
MAS_track (km/h)	16.406	0.773	0.813	-0.379	15.50	18.0
Hr_max_MAS (b/min)	201.733	16.786	1.153	0.186	185.0	238.0
$TlimVO_2max$ (sec)	219.222	47.656	1.418	2.026	154.0	340.0
$HrTlimVO_2max$ (b/min)	195.563	16.793	0.058	-0.778	166.0	223.0
VO_2max_lab ($ml^{-1}kg^{-1}$)	56.822	2.549	0.392	-0.505	52.30	61.7
HR_VO_2max_lab (b/min)	187.278	3.754	0.634	-0.357	182.0	195.0
$TlimVO_2max$_lab (sec)	201.944	36.143	1.859	3.098	160.0	300.0
$HrTlimVO_2max$_lab (b/min)	196.667	7.806	0.390	-0.788	185.0	211.0

The study findings concerning VO_2max show a mean of 58.522 $ml.min^{-1}kg^{-1}$ (DS = 2.758), with a minimum value of 55.30 $ml.min^{-1}kg^{-1}$ and a maximum of 64.30 $ml^{-1}kg^{-1}$. Our findings pinpoint a generally good aerobic exercise capacity level in our sample of athletes. Other studies that assessed maximal oxygen uptake among soccer players [19; 20] reported similar findings.

Our results regarding the evaluation of MAS_track show a mean of 16.406 km/h (DS = 0.773), with a minimum value of 15.50 km/h and a maximum of 18 km/h. Results indicate at what running speed the athletes attain maximal oxygen uptake, and the recorded data range within the average limits of average results reported by other studies [21;22].

The results concerning Hr_{max}_MAS_track show a mean of 201.733 b/min (DS = 16.786), with a minimum value of 185 b/min and a maximum of 238 b/min.

Our findings for $TlimVO_2max$ show a mean of 219.222 seconds (DS = 47.656), with a minimum value of 154 seconds and a maximum of 340 seconds. The mean and maximum results are consistent with the data reported by another research measuring $TlimVO_2max$ [23]. The ampliation level outlines the difference between athletes regarding the capacity to maintain effort intensity at maximal oxygen uptake.

Our findings on the assessment of $HrTlimVO_2max$ show a mean of 195.563 b/min (DS = 16.793), with a minimum value of 166 b/min and a maximum of 223 b/min. Data show that the mean of results does not exceed the typical values for this effort intensity. However, we found two results exceeding the value of 220 b/min, which shows that, from an energy standpoint, athletes perform lactacid anaerobic effort. It can be due to increased motivation and is worth dedicating an interesting future study.

Our results regarding the evaluation of VO_2max_lab show a mean of 56.822 $ml.min^{-1}kg^{-1}$ (DS = 2.549), with a minimum value of 52.30 $ml.min^{-1}kg^{-1}$ and a maximum of 61.70 $ml.min^{-1}kg^{-1}$. We found a difference between the mean value of VO_2max recorded via a field trial (58.756 $ml.min^{-1}kg^{-1}$) versus the mean value of VO_2max recorded via a laboratory test (56.962 $ml.min^{-1}kg^{-1}$).

Our findings on the assessment of Hr_VO_2max_lab show a mean of 187.278 b/min (DS = 3.754), with a minimum value of 182 b/min and a maximum of 195 b/min. Unlike the data recorded for field tests, the HR_VO_2max laboratory results do not indicate that the threshold of

200 b/min was exceeded. The mean of the Hr_VO_2max_lab results is significantly lower than Hr_VO_2max_field.

The study findings concerning the evaluation of TlimVO_2max_lab show a mean of 201.944 seconds (DS = 36.143), with a minimum value of 160 seconds and a maximum of 300 seconds. Upon comparing the data between the two tests, we found a significant difference between the TlimVO_2max recorded via the field trial (219.22 sec) versus the TlimVO_2max value recorded via the laboratory test (201.94 s).

Our results regarding the evaluation of HrTlimVO_2max_lab show a mean of 196.667 b/min (DS = 7.806), with a minimum value of 185 b/min and a maximum of 211 b/min. These values are not significantly different from those recorded for HrTlimVO_2max via the field trial.

Table 3. T-test analysis for VO_2max. TlimVO_2max and HrTlimVO_2max

Measurement 1	Measurement 2	t	Df	p	Cohen's d
VO_2max(ml.min^{-1}kg^{-1})	VO_2max_lab (ml.min^{-1}kg^{-1})	9.100	17	< .001	2.145
TlimVO_2max (sec)	TlimVO_2max_lab (sec)	3.807	17	0.001	0.897
Hr_max_MAS (b/min)	Hr_VO_2max_lab (b/min)	3.631	14	0.003	0.938
HrTlimVO_2max (sec)	HrTlimVO_2max_lab(sec)	-0.204	15	0.841	-0.051

Hence, data analysis shows a statistically significant difference (*t=9.100, p<0.001*) between the value of VO_2max recorded via the field trial (58.756 ml.min^{-1}kg^{-1}; SD = 2.803, and SE = 0.701) versus the value of VO_2max recorded via the laboratory test (56.962 ml.min^{-1}kg^{-1}; SD = 2.648, and SE = 0.662). Other authors have reported similar findings, suggesting that the testing protocol can modify the values and parameters of VO_2max and vVO_2max in athletes [8]. The calculation of Pearson's correlation indicates a very strong correlation between VO_2max_field and VO_2max_lab (r = 0.958. p < 0.001).

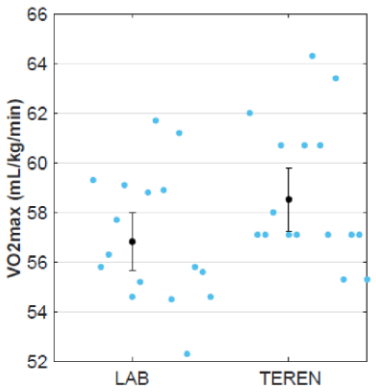

Fig. 1. VO_2max_field & VO_2max_lab

In addition, data analysis shows a statistically significant difference (*t=3.807. p=0.001*) between the value of TlimVO_2max recorded via the field trial (219.22 s; SD = 47.65, and SE = 11.23) versus the value of TlimVO_2max recorded via the laboratory test (201.94 s; SD = 36.14, and SE = 0.662).

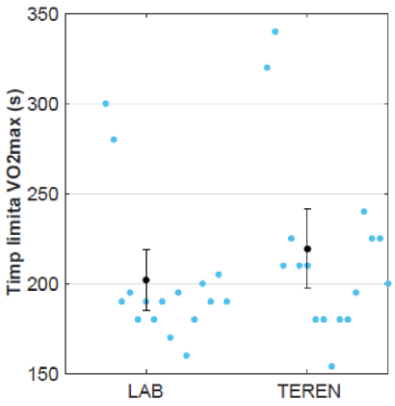

Fig. 2. TlimVO$_2$max_field & TlimVO$_2$max_lab

Concerning data analysis for Hr$_{max}$, we also found a significant difference (*t=3.361. p=0.003*) between Hr$_{max}$_MAS (201.73 b/min; SD = 16.78, and SE = 4.33) and Hr$_{max}$_lab (187.27 b/min; SD = 3.75, and SE = 0.88). This difference shows that the cardiac work represented by heart rate is higher during the field trial.

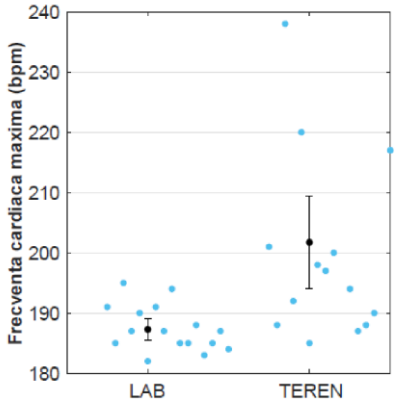

Fig. 3. Hrmax_vam & Hrmax_lab

Concerning HrTlimVO$_2$max, we found no significant differences (*t=-0,204, p = 0,841*) between HrTlimVO$_2$max in the field (195.56 b/min) and HrTlimVO$_2$max_lab (196.66 b/min).

Conclusions

Pearson's correlation index shows a strong positive correlation between VO$_2$max_field and VO$_2$max_lab. In both cases, identifying VO$_2$max reveals the effort intensity correlated with the heart rate at which athletes reach maximal oxygen uptake.

Furthermore, data analysis indicates a statistically significant difference between VO$_2$max and TlimVO$_2$max recorded via the field trial versus the value recorded via the laboratory test.

In the case of HrTlimVO$_2$max, no significant differences were found between HrTlimVO$_2$max in the field and HrTlimVO$_2$max_lab.

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This work was co-funded by the European Social Fund, through Operational Programme Human Capital 2014-2020, project number POCU/993/6/13/153322, project title << ***Educational and training support for PhD students and young researchers in preparation for insertion into the labor market*** >>.

Study on the Development of Motor Skills, Dexterity, through Logic Games

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Abstract

Introduction: Researchers are trying to find new ways to improve the motor qualities of athletes and not only. One of these methods that is discussed and results are sought among performance sports but also in leisure sport is the use of logic games before training and competitions.
Methodology: The research was based on applying crosswords and Sudoku games about 45 minutes before the start of workouts.
Subjects: A number of 30 performance athletes from the rugby team and a number of 20 students who do not practice performance sports participated in this research.
Results: From the results obtained we noticed that a number of 20 athletes and 13 students achieved improvements in skill.
Conclusions: We can say that logic games improve skill and create a state of calm among performance athletes and provide better concentration to people who practice leisure sports.

Keywords: games of logic, motor qualities, skill, development.

Introduction

In performance sports and leisure sports, methods are sought to improve skill. In performance sports, this motor quality is necessary in order to be able to carry out the actions specific to each sports branch as qualitatively as possible. In leisure sport, it aims to improve skill to avoid certain inconveniences or even injuries.

These motor qualities are innate characteristics of the body materialized in its ability to perform movements with a certain speed and power, under conditions of coordination and amplitude, for as long as possible, but with the same efficiency.

Skill represents "the ability of the human body to perform motor acts and actions, especially in varied and unusual conditions with maximum efficiency and minimum energy consumption on the part of the executant" [3].

Another definition of skill "complex form of expression of new movements and rapid adaptation to various situations, according to the specifics of each branch of sport or other basic and applicative motor experiences" [5].

Objectives

a) Improving the skills of athletes and people practicing leisure sports.
b) Introducing simple methods that do not require a large number of hours of training to improve skill.

Methodology

The research was based on applying crosswords and Sudoku games about 45 minutes before the start of workouts.

These logic games have been applied both to performance athletes and to people who practice leisure sports. Each topic had a choice between solving a crossword puzzle or a Sudoku game that would fit into a solving time between 30-45 minutes.

The subjects chose these logic games because they knew their ability to solve these puzzles. All crosswords have been selected in such a way as to encompass all levels of experience in such a way that they are available to all subjects. They were informed of the importance of solving these riddles and the potential help they received from solving them.

During the development of this small experiment that lasted 60 calendar days, of which the method was applied 8 times before each specific training of consolidation or improvement.

All subjects were subjected before the start of the study through a series of tests to show their level of skill specific to a branch of sport, rugby, and subjects practicing leisure sport were subjected to the same test but with a different object (ball). The test consisted of making 12 passes with the rugby ball from 4 different distances. Subjects who did not practice professional sports executed the same passes but with the junior rugby ball (2 smaller sizes) to make their movement more comfortable.

Subjects

A number of 30 performance athletes from the rugby team of the “Universitatea” Cluj club and a number of 20 students who do not practice performance sports attended this research.

Results

The tests performed were used to measure various criteria needed in the sport of Rugby, but in this study, we only considered the number of passes that correctly hit their target. To send an effective and correct pass requires a certain level of skill, it requires a higher level of concentration. Noting that passing the ball is a procedure that must enter into the athletes' automaticity. This automation still requires a certain level of skill. During the test, the number of effective and correct passes was tracked for each subject out of a number of 3 for each established distance. The initial testing took place before starting the application of the program, and the final testing took place after 8 meetings in which the logic games were applied.

At the first test, the results obtained were:

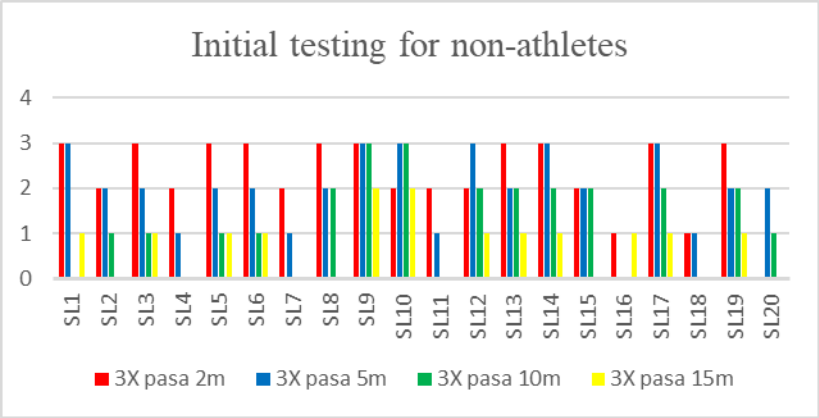

Fig 1. Initial testing for non-athletes

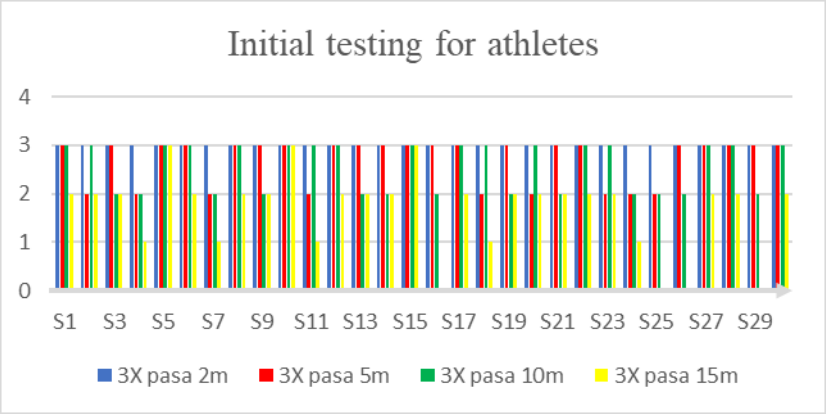

Fig 2. Initial testing for athletes

During the initial testing, the subjects fulfilled the assigned task, some of them managing to complete the number of passes that would reach the target, but their efficiency was also monitored, i.e., the moment of the pass and the trajectory of the ball, therefore some passes were not scored. The same criteria were followed for the non-sporting subjects, even though they were not used to the way of passing a ball specific to the game of rugby.

The results obtained at the final test were:

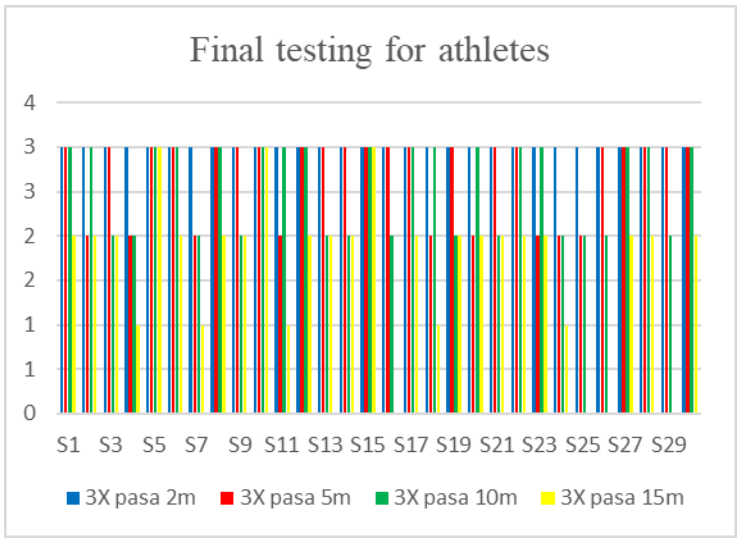

Fig 3. Final testing for athletes

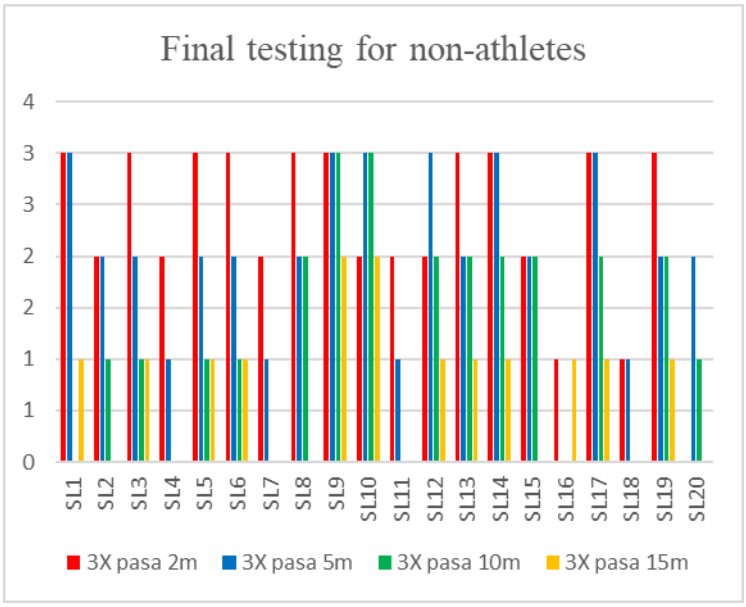

Fig 4. Final testing for non-athletes

At the final test, improvements can be seen in both groups of subjects, although the non-athletes can say that the improvements were much more significant, but I considered that the number of repetitions and the learning method was more efficient, forming their skills only in that period. For subjects who come from performance sports, it is almost impossible to change their passing technique by applying their "own signature" instead of the correct technique of passing the ball.

Conclusions

In conclusion, we can observe that logic games help the development of skill, and after the study, we can say that these games prepare the individual to be able to concentrate and exhibit movements that need skill.

As the training method, it is simple and does not require a long-term training with many repetitions, and the advantage is that this training can be done daily on the way to training or even before entering the playing surface. Another advantage is the improvement of the intellectual level, and the level of logic games will gradually increase depending on each individual.

As negative points can be seen in the subjects who were not subjective in terms of their level of training in terms of logic games. Another negative point is the ironic way in which athletes look at this way of training, and non-athletes consider that the time dedicated to movement exercises is too short and not appropriate for this level of training.

It was also observed the improvement of other qualities and other actors that improve the performance of an individual who performs sports activities, both performance and mass sports. All these improvements facilitate the mortician qualities of the individuals who practice sports activities. If the subjects improve their skill, the reaction speed also increases directly proportionally, and in contact sports, if the skill level increases directly proportionally, the reaction speed also increases, so the sportsman is much more efficient during the official games.

We believe that the improvement of a mortal quality, such as skill, facilitates the development of other qualities of an individual, who practices sports activities, be they performance or mass.

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FEFS

FEFSTIM 2023

filo diritto editore DAL 2008

ISBN 979-12-80225-75-7
Euro 20,00