Contents

ASPECTS OF THE POSTURAL ALIGNMENT AND PLANTAR STRUCTURE IN JUNIOR FEMALE TABLE TENNIS PLAYERS

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Abstract

The purpose *of the present scientific research in performance table tennis at the level of junior female athletes was to determine the postural alignment and structure of the foot sole at static level, in order to create an amelioration program specific to kinetotherapy in the future, in case of identifying deficiencies.*

Hypothesis*: It is assumed that by using modern means of assessing posture and plantar footprints at dynamic level, we can identify the correlations between them in order to facilitate effective compensation systems.*

The aim *of this research is to improve the quality of life and sports performance in junior female table tennis players.*

Methods*: The assessment of body posture and plantar footprint was performed by using images, using the freeStep software by Sensor Medica and the assessment of the static plantar pressure and surface was performed by using the FreeMedbaropodometric platform. The study was conducted on a group of 9 female table tennis athletes with ages between 10 and 12 years old. The deviations from the normal postural and plantar values were calculated with IBM SPSS Statistics software, Version 23.*

Results and Conclusions*: The values ($p < 0.001 < \alpha = 0.05$) for the left sole, respectively ($p = 0.001 < \alpha = 0.05$) for the right sole, highlight significant differences between the total plantar area and the reference value on both soles of the foot, from the postural assessment resulting a significant difference between the group values and the reference value for all measurements ($p < 0.001 < \alpha = 0.05$).*

Keywords*: kinetotherapy; female junior athletes, FreeSteps, table tennis, postural unbalances*

1. Introduction

The human body determines the information from visual, sensorial, vestibular, muscular and cerebellar systems, all in a multi-sensorial process (Neto, H. P., et. al., 2015)in order to help the body posture in a spatial and temporal environment.

The changes in body postures and lines of movement have been encountered in table tennis players, mainly due to the torsions at trunklevel and to various movement-specific muscle contributions (Wong, DWC, Lee, WCC, & Lam, WK, 2020).

It was stated in approximately 90% that the plantar disorders are the most important causes leading to lower limb injuries, an aspect mentioned by Zenovia, S., EUGEN, B., & Constantin,

R. (2016); thus, it is necessary to correct the anomalies in the sole of the foot for a better control of the postural tonus (Neto, HP, et al., 2015).

In order to identify postural deficiencies and plantar imbalances in time, an objective assessment is necessary because repetitive and unilateral movements in speed regime are found in sports competitions, which can cause stress on intervertebral discs (Muyor et al., 2013; Bańkosz, Z., &Barczyk-Pawelec, K., 2020), as well as deviations from normal posture.

According to Mocanu., M and Negulescu.I. (2018), the forehand topspin and smash are the main technical-tactical elements of the attackin table tennis, these blows being performed at high speed, involving in their execution the whole osteo-muscular-articular system, at the level of the trunk and implicitly of the spine, being performed an accelerated twist, a motor action that in some cases generates in time the appearance of postural deficiencies with implications on sports performance and on the quality of life of the female athletes.

In this age group, 10-12 years old, we can identify an intensification of growth and other related changes; the establishment of the athlete in table tennis should be at an age between 15 and 18 years old, according to Balint, G., Ganzenhuber, P., Balint, T., &Spulber, F. (2013) and failing to meet this target could be due to some osteo-muscular-articular imbalances generating pain. Table tennis is one of the fastest ball sports games (Kondrič, M., Zagatto, A. M., &Sekulić, D., 2013) requiring numerous qualities and physical overstraining in achieving the desired performance.

11 years old children present a wrong posture in a percentage of 38% of them, aspect mentioned by Kratěnová J. et al. (2007), and frequently, in table tennis, the vicious posture is accentuated because certain executions are performed by a rapid movement of the torso in flexion-extension and twisting, according to Muyor et al., (2013). This aspect is highlighted in its twin sports, tennis, where the asymmetry of the body is highlighted from the youngest age category, and the reason for occurrence of the problems in the spine (Filipcic, A., Cuk, I., &Filipcic, T. 2016).

It is necessary to include a kinetotherapist in the multidisciplinary team in order to periodically evaluate the musculoskeletal system, implicitly the introduction of some asymmetric acting systems specific to kinetotherapy, with the purpose of preventing some possible body posture deficiencies, which in time can generate pain, aspect mentioned by the authors (Folorunso, O., et al., 2010; Munivrana, G. et al., 2011), stating that vicious postures during the game cannot be avoided.

2. Material and Methods

2.1. Subjects

The study was performed between 10.08.2020 and 15.09.2020, on a group of 9 junior female athletes III,with right active (skillful) arm, players registered in the Romanian Table Tennis Federation, with ages comprised between 10 and 12 years old, from three different cities.

In order to participate in this study,the consent of parents, coaches and athletes was required; also, another requirement was to be registered at Federation level and to participate in competitions for at least 3 years. We have concluded 3 partnership agreements with the 3 medical practices, bearing the registration number RF 3686, in view of a better future collaboration.

2.2. Procedures

The measurements were performed by the specialist from the medical practice, including the diagnosis following the assessment of the postural and footsole alignment.

The body postural assessment was performed with the help of the digital camera, then the measurements were processed by the FreeSteps By Sensor Medicasoftware, having the following specifications in its composition: image calibration, objective measurements, following to a protocol for positioning markers at the level of the following landmarks: **A** - Vertex, **B** - C7Vertebra, **C** - Right shoulder, **D** - Left shoulder, **E** - Right scapula, **F** - Left scapula, **G** – The prominence of the right posterior superior iliac spine, **H**–The prominence of the left posterior superior iliac spine can be traced in Figures no 1, 2.

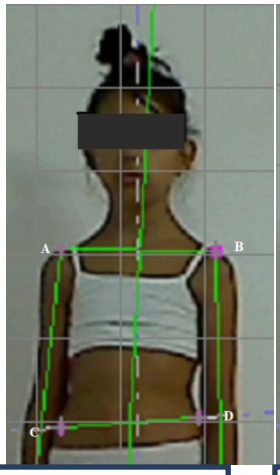


Figure no. 1. Body posture by (FreeSteps) images in frontal plan, anterior view of one of the subjects

***A –** Right shoulder, **B -** Shoulder, **C –** Right antero-superior iliac spine, **D -** Left antero-superior iliac spine

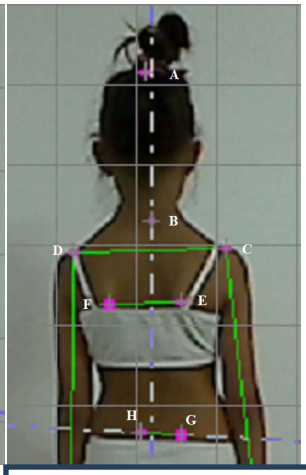


Figure no. 2. Body posture by (FreeSteps) images in frontal plan, posterior view of one of the subjects

***A –** Subject's vertex, **B –** Prominence of C7 vertebra, **C –** Right shoulder, **D –** Left shoulder, **E –** Apex of right scapula, **F -** Apex of left scapula, **G –** Prominence of posterior – superior right iliac spine, **H -** Prominence of posterior – superior left iliac spinere no. 1.

According to Munivrana, G., Paušić, J., &Kondrič, M. (2011), the values of all postural deviations should be equal to 0, for an ideal postural alignment.

The analysis of FreeMedbaropodometric platform was performed statically, through pictures and processed with FreeStep software, which shows the numerical information on foot pressure distribution, surfaces, rear / front percentage, foot axis, and automatic analysis report and comparison with normal values, according to Figure no. 2 of a junior female athlete.

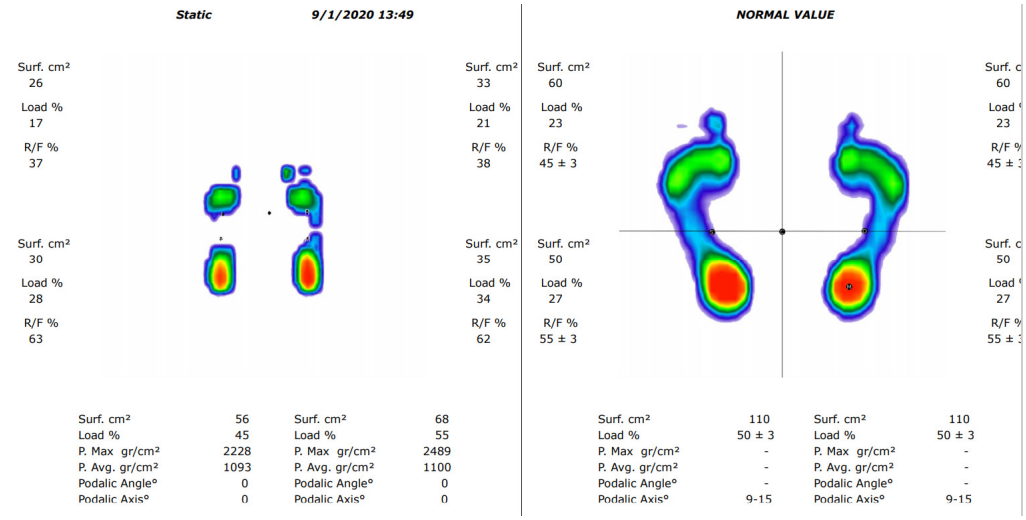


Figure no 3. The plantar analysis of one of the subjects in comparison to the reference value, in static phase, achieved with Freemed by Sensor Medicabaropodometric platform

3. Results

The present scientific research conducted among junior female performance athletes, highlighted very important aspects at body posture level, according to the figures and tables presented below. The collected data were processed with the statistical-mathematical analysis software IBM SPSS Statistics, Version 23, calculating the standard deviation, the associated probability (p) or Sig. (2-tailed) and the z test (95% Confidence Interval of the Difference).

Table no.1. Mean values achieved by the junior female athletes at the postural assessment

	N	Minimum	Maximum	Mean	Standard deviation
Shoulder inclination	9	1	4	2.22	0.833
Scapula inclination	9	1	5	2.56	1.236
SIPS inclination	9	2	7	3.56	1.590
Pelvis inclination	9	1	4	2.78	1.302
Valid N (list wise)	9				

***SIPS –**postero-superior iliac spine

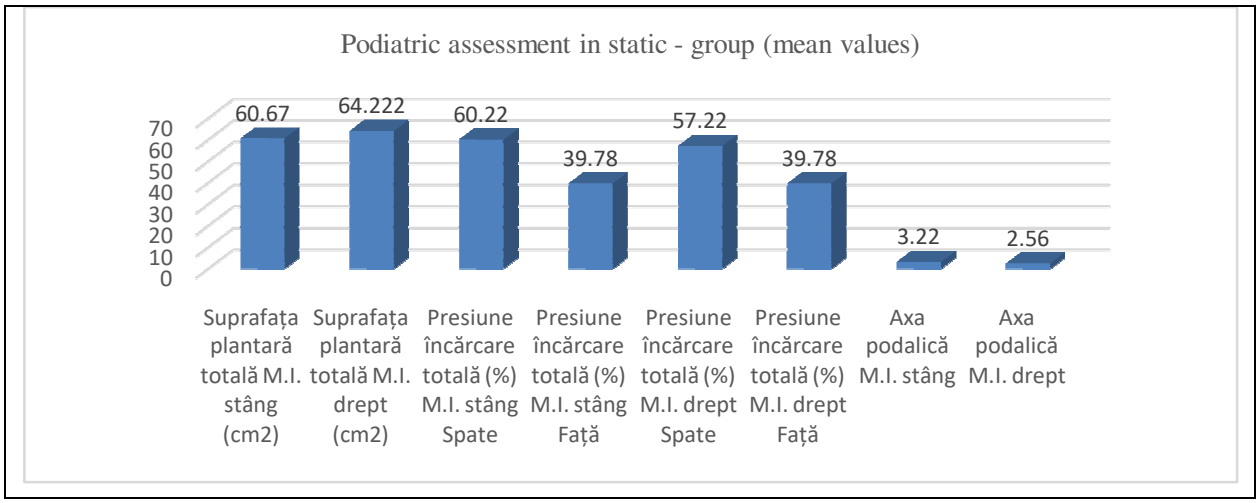
According to highest mean value, 3.56, it results that SIPS inclination is the most pronounced and the one with the farthest value from the normal one – 0.

Table no. 2. Values of the subjects on postural testing between the mean value and the reference value of the female athletes

	Test Value = 0					
	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
Shoulder inclination	8.000	8	0.000	2.222	1.58	2.86
Scapula inclination	6.203	8	0.000	2.556	1.61	3.51
SIPS inclination	6.709	8	0.000	3.556	2.33	4.78
Pelvis inclination	6.402	8	0.000	2.778	1.78	3.78

Because $p < 0.001 < \alpha = 0.05$, it shows the fact that it does not contain zero value, resulting **significant differences** between the values of the subjects and the reference value **for all measurements.**

Following the podiatric assessments statically with the help of the baropodometric platform, various values and multiple correlations resulted at the plantar level, all favoring a perspective highlighted in Figure no. 4, Tables no. 3 and no. 4.



Left L.L.total plantar area (cm^2)	Right L.L.total plantar area (cm^2)	Back leftL.L. total load pressure (%)	Front left L.L. total load pressure (%)	Back right L.L. total load pressure (%)	Front right L.L. total load pressure (%)	Left L.L. podiatric axis	Right L.L. podiatric axis

nior female athletes

***L.L.** – lower limb

According to mean values, 64.22, it results the fact that the plantar area is larger on the right sole, 60.22 –the plantar pressure is higher on the left sole foot and an internal abnormal rotation on the left foot - 8.

Table no. 4. Values of the subject on the plantar area at static level between the mean of the value of the female athletes vs. the reference value

	Test Value = 110					
	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
Left L.L.total plantar area (cm^2)	-5.627	8	.000	-49.333	-69.55	-29.12
Right L.L.total plantar area (cm^2)	-4.824	8	.001	-45.7778	-67.660	-23.895

Because $p < 0.001 < \alpha = 0.05$ for the left foot, respectively $p = 0.001 < \alpha = 0.05$ for the right foot does not contain zero value, it results that there are significant differences between the total plantar area of the female juniors from the experiment group and the reference value on both soles of the foot.

Table no. 5. – Correlations at the level of the structure of the foot sole (area, pressure, podiatric axis)

		Left L.L. total plantar area (cm^2)	Right L.L. total plantar area (cm^2)	Back left L.L. total load pressure (%)	Front left L.L. total load pressure (%)	Back right L.L. total load pressure (%)	Front right L.L.total load pressure (%)	Left L.L. podiatric axis	Right L.L. podiatric axis
Left L.L. total plantar area (cm^2)	Pearson Correlation	1	**.971****	-.128	.128	.070	.128	-.319	-.346
	Sig. (2-tailed)		**.000**	.742	.742	.858	.742	.402	.362
	N	9	**9**	9	9	9	9	9	9
Right L.L. total plantar area (cm^2)	Pearson Correlation	**.971****	1	-.034	.034	.242	.034	-.319	-.405
	Sig. (2-tailed)	**.000**		.931	.931	.530	.931	.402	.280
	N	**9**	9	9	9	9	9	9	9
Back left L.L. total load pressure (%)	Pearson Correlation	-.128	-.034	1	**-1.000****	**.693***	**-1.000****	-.179	.478
	Sig. (2-tailed)	.742	.931		**.000**	**.038**	**.000**	.646	.193
	N	9	9	9	**9**	**9**	**9**	9	9
Front left L.L. total load	Pearson Correlation	.128	.034	**-1.000****	1	**-.693***	**1.000****	.179	-.478

pressure (%)	Sig. (2-tailed)	.742	.931	**.000**		**.038**	**.000**	.646	.193
	N	9	9	**9**	9	**9**	**9**	9	9
Back right L.L.total load pressure (%);	Pearson Correlation	.070	.242	**.693***	**-.693***	1	**-.693***	.098	.299
	Sig. (2-tailed)	.858	.530	**.038**	**.038**		**.038**	.802	.435
	N	9	9	**9**	**9**	9	**9**	9	9
Front left L.L total load pressure (%)	Pearson Correlation	.128	.034	**-1.000****	**1.000****	**-.693***	1	.179	-.478
	Sig. (2-tailed)	.742	.931	**.000**	**.000**	**.038**		.646	.193
	N	9	9	**9**	**9**	**9**	9	9	9
Left L.L. podiatric axis;	Pearson Correlation	-.319	-.319	-.179	.179	.098	.179	1	.444
	Sig. (2-tailed)	.402	.402	.646	.646	.802	.646		.231
	N	9	9	9	9	9	9	9	9
Right L.L. Podiatric axis;	Pearson Correlation	-.346	-.405	.478	-.478	.299	-.478	.444	1
	Sig. (2-tailed)	.362	.280	.193	.193	.435	.193	.231	
	N	9	9	9	9	9	9	9	9

*. Correlation is significant at the 0.01 level (2-tailed).

**. Correlation is significant at the 0.05 level (2-tailed).

Following the results related to Table no. 5, the following resulted from Pearson correlation coefficient, which indicates a strong correlation between:

- **Left L.L. total plantar area and right L.L.total plantar area,** ($p < 0.001 < \alpha = 0.05$, $r = 0.971$);
- **Right L.L.total plantar area and left L.L.total plantar area,** ($p < 0.001 < \alpha = 0.05$, $r = 0.971$);
- **Left back L.L.total load pressure(%)and right backL.L.total load pressure (%)** ($p < 0.001 < \alpha = 0.05$, $r = 0.693$);
- **Left back L.L.total load pressure(%)and right frontL.L.total load pressure(%)** ($p < 0.001 < \alpha = 0.05$, $r = -1.000$);
- **Left back L.L.total load pressure(%)and left front L.L.total load pressure(%)**; ($p = 0.038 < \alpha = 0.05$, $r = -1.000$);
- **Left back L.L.total load pressure(%)and right backL.L.total load pressure(%)** ($p = 0.038 < \alpha = 0.05$, $r = 0.693$);
- **Left back L.L.total load pressure(%)and left frontL.L.total load pressure(%)** ($p = 0.038 < \alpha = 0.05$, $r = -1.000$);

- **Left front L.L.total load pressure(%)and right backL.L.total load pressure(%)** ($p = 0.038 < \alpha = 0.05$, $r = -0.693$);
- **Left front L.L.total load pressure(%)and right front L.L.total load pressure(%)** ($p = 0.038 < \alpha = 0.05$, $r = 1.000$);
- **Right front L.L.total load pressure(%)and right backL.L.total load pressure(%)** ($p = 0.038 < \alpha = 0.05$, $r = -0.693$);

5. Conclusions

From the correlations at the level of the structure of the sole of the left and right foot (total area, total pressure and podiatric axis), the most important conclusions addressed to specialists in order to improve the quality of life and sports performance have resulted:

- Strong correlation resulting from left front L.L. load pressure (%) assessment in relation to the right back L.L.load pressure (%) ($r = - 0.693$) means an inverse proportionality which demonstrates that a high pressure of the left forefoot implies a lower pressure in the right heel area of junior female athletes.
- In the case of the strong correlation resulting from the assessment of the right L.L.total plantar area in relation to the left L.L.total plantar area ($r = 0.971$), it means a directly proportional ratio that demonstrates that a larger total plantar area of the right lower limb implies a larger total plantar area of the left lower limb of female athletes.
- The strong correlation resulting from the assessment of the right L.L.total load pressure (%)in relation to the right back L.L.total loaded pressure (%)($r = - 0.693$) means an inverse proportionality, demonstrating that a high pressure of the right forefoot implies a lower pressure in the right heel area of junior female athletes.

The most important conclusions following the measurements processed by the Freestep software and interpreted from statistical – mathematical point of view, related to body posture, have highlighted the following problems in our subjects:

- Slight asymmetry of the shoulders and scapula resulting from specific unilateral movements, causing muscle-joint imbalances.
- The most pronounced inclination was found at the posterior superior iliac spine (SIPS) and pelvis level. This results in significant differences between the subjects' values and the reference value with a 95% probability that the difference is true.

The results obtained after the assessment with modern devices, regarding the postural deficiencies and plantar imbalances in the female players with ages between 10 and 12 years old in table tennis, favored the filtering of some conclusions and favored the improvement of sports performance and quality of life.

We recommend the following specific actions, in order to achieve the proposed objectives:

- Periodic objective assessment of junior female athletes with the help of specific software to stop the accentuation of postural deficiencies and plantar imbalances;
- Based on the assessment of the athletes, the diagnosis was Postural Dysperception Syndrome in all 9 female athletes, requiring an individualized recovery program specific to physical therapy.
- Following the podiatric assessment, the female athletes presented the following imbalances: talus valgus at the plantar level, bilateral knee in the valgus, hollow foot, 2ndgrade flat foot, mixed foot and an accentuated internal rotation of the sole which can influence the pelvic and lumbar region, the recommendation being to wear individualized plantar supports.
- A kinetotherapist is required in the multidisciplinary team in order to achieve, propose and introduce an individualized postural improvement protocol that includes joint mobilizations, asymmetric actuation systems, specific massage and implicitly kinesiologic straps.

6. Future Research Directions

In the near future, we intend to evaluate a group of 18 sportswomen with ages between 10 and 12 years old, using our own methodological strategy for assessing and improving the postural deficiencies.

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INJURIES RESULTING FROM PRACTICING PERFORMANCE SPORTS IN TABLE TENNIS AND TENNIS – REVIEW

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Abstract

Performance sport as an area of human excellence requires, besides an over-average genetic endowment of motor skills, a huge workload of high intensity, which causes the wear of the body systems of the athletes, especially the osteo-musculo-articular. The high ball movement speed for rocket and paddle sports disciplines such as table tennis and field tennis, intensively demands the performance of the body of practitioners when performing specific technical tactics, especially the technical elements of the attack, such as topspin or smash. Based on the theoretical documentation, I noticed an acute condition in the scapulo-humeral joint 21.05%, at the lumbar level 15.79% and 13.16% in the ankle joint in the table tennis and in the field tennis as percentages at scapulo-humeral joint 13.85%, lumbar 15.38% and 20.00% ankle joint, aspects that validate our desire to improve the quality of life of practicing athletes of the two disciplines through a program of amelioration of compensatory nature.

***The objective** of this theoretical research is to identify the areas subject to mechanical stress with high risk of wear or injury from the two "sister" sports disciplines.*

***Tasks**: Critical analysis of a larger volume of studies conducted on the direction of our research interest.*

***Purpose**: obtaining the information necessary which would highlight the risks the performance athletes, practitioners of the two disciplines, are subjected to, as well as gaining knowledge on tennis and table tennis.*

***Keywords**: injuries, tennis, table tennis, kinetotherapy*

1. Introduction

Today, in sport, high performance requirements have become much more with the participation and increase in training, leading to over-exercise in sports practice resulting inevitably towards a frequency of accidents. An old and confirmed finding in medicine, making it easier to prevent a disease than to treat it, is also perfectly true with regard to performance sports accidents (20). Rocket and pallet sports disciplines are a form of dynamic exercise in which we have many healthy health benefits over the years. Most tennis and table tennis players may suffer asymmetric musculoskeletal changes due to repeated and rapid movements of the trunk in

flexion and extension in the sagittal and frontal plane where twisting movements are very common in this sports and over time the risk of injury increases .(1,21,4,18).

Table Tennis is a high-quality sport that requires athletes to execute in a short period of time efficient thinking and a strong blow to the ball. Therefore, due to the results of scientific research, table tennis players have a significantly shorter reaction time than any other athlete (2) and even shorter than tennis players (19, 2, 3).This sport called table tennis is complex, requiring and involvingin the technical sphere different combinations of acceleration and deceleration, changes of direction and balance, in order to be able to hit effectively (16), in the case of tennis, these aspects being similar in a higher stress regime due to the higher weight of the playing materials, to specific stresses that induce great stress on the joints, muscles and spine, which can generate in some cases disorders in the body's mechanisms and systems that are involved in the effort.

Tennis play is characterized by overhead motions, quick starts and stops with short explosive bursts of motion, and a dynamic exchange of intricate strokes and serves, any weakness in the kinetic chain results in dysfunction that creates more reliance on other body segments, leading to injury, athletes are susceptible to a variety of injuries, upper extremity injuries are common and typically from high-velocity arm movements, the shoulder and elbow are most frequently affected followed by the wrist and hand (17).

Also, they compared the muscle activity of the lower limbs during seven typical table tennis strokes, in which they found that the forehand smash and topspin stroke techniques exhibited significantly higher emg amplitudes as compared with other strokes, situation which we consider to be similar in the case of the component technical elements from tennis's specific attack due to the substantial muscle impulse necessary for their execution (6).

The information provided by one of the most recent epidemiological studies on tennis traumas states that upper limb injuries account for 28% of all injuries for male adult players and 23% for female adult players, while the shoulder joint was reported to be the most often injured area of the upper limb. Traumas to the shoulder joint are very frequent in professional tennis players, mainly due to the repetitive mechanical overload of the shoulder joint. Shoulder pain was present in 24% of top tennis players with ages comprised between 12 and 19 years old (9).

Muscle misalignment caused by repetitive unilateral movements (15) that cause stress on fascial tissues, intervertebral discs, spinal ligaments and not only. As a symptomatology, it shows headaches, pain in the cervico-dorso-lumbar region, fatigue but also possible spinal deformities. Trauma in sports seems to increase at all athletic levels due to intense participation, where intensity and requirements are high, and training periods are long (11). Treatment should be very

effective and should start as soon as possible because most athletes want to return to training and competitions in the shortest possible time (12).

2. Characteristics

The biomechanics of the execution of some technical elements common to the two sports is made in three phases or stages, these being the preparation of the hit, the actual hit and the end of the movement, the difference being the amplitude necessary for a high performance execution that we consider to be higher in tennis, as compared to table tennis. Being characterized by explosive motor actions (performed at high speed) involving the entire osteo-musculoskeletal system, the procedures in the sphere of attack involve a greater stress than those of control or middle game (slice, backspin, counter, stop, volleys, drop-shot), reason for which they represent an important factor in the occurrence of specific injuries among others responsible elements, such as a poor recovery after training and competitions, improper dosage of effort during the training period (intensity, volume, complexity), the lack of food and relaxation rigor.

Also, a deficient posture negatively influences the efficiency of some elements specific to the attack according tothe coaches interviewed based on opinion survey, the smash, topspin and retopspin or counter-loop and service being the most important of them, as an example according to Mocanu, Negulescu, Moisescu, (2018), the forehand topspin is considered the most used attack hit in competitive table tennis with an usage percentage of 95.23%), it is omnipresent both in offensive and defensive players, which highlights both the usage level and also the wearing the athlete's body is submitted to de to their frequent usage.

According to Kondrič, M., et al., (2011) the most often impairments in the racket sports with are:

- *Pain in lumbosacral areas;*
- Tendinitis of the rotator cuff shoulder's muscles (dead hand);
- King-Kong arm (overdevelopment of the skilled arm);
- Tennis player's elbow (inflammation of the lateral epicondyle);
- Blocking of the forearm nerve;
- Lesion of the abdominal wall.

Two of the most important technical procedures common to the two sports are presented in the images below, in which the muscular, articular and spine effort is particularly high, as it can be seen from the captured details, aspect which we consider responsible as part of the factors meant to create specific disorders, due to the unilateral repetitive nature of the executions.

Fig 1. Forehand smash in table tennis- (25)

FIG 2. Forehand smash in tennis-(26)

Fig 3. Topspin forehand initial phase-(27)

Fig 4. Topspin forehand hitting phase-(28)

Fig. 5. Topspin forehand finish-(29)

Fig. 6. Topspin forhand in tennis frame by frame-(30)

Instead of doing trunk rotates(FIG.7), we make this twist of the lumbar spine(FIG.8), when we speak about twist, this is composed of 3 movements: - flexion, inclination and rotation, this is the basic mechanism of the hernia disc.

In this two sports, asymmetric changes due to the single-arm stroke.

And yes, sports activity, performance sports can cause lumbar pain, why, because all the vertebral plate is distorted. As physiotherapists, promoters of kinetotherapy and healthy life, we need to help and teach people, athletes and performance athletes, how to include new methods and techniques of relaxation, stretching, and, most importantly, the reposturing part, the balance part of the muscular system and respectively the bone system, because the muscles are the cranes that draw bones in all parts.

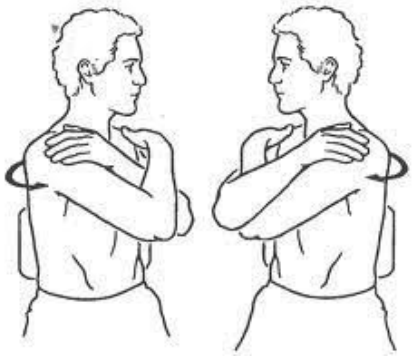

Fig.7 rotation trunk-(17)

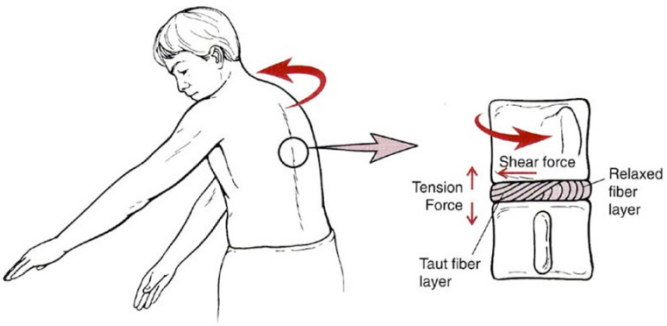

Fig.8 twisttrunk

Source: Hamill and Knutzen*K, 1995, 'Biomechanical Basis of Human Movement,' Lippincott*

Methods

In order to carry out this scientific research on the specific injuries of the two related disciplines, we mainly used the bibliographic study method, this being responsible for most of the information found in the presented material.

The logical and the hermeneutic method facilitated the search, the choice and interpretation of the selected passages regarding the information of interest, the method of registration based on survey also playing an important role in obtaining and highlighting some data that we consider valuable for designing the present scientific article.

Also, the statistical-mathematical method was a test indicator for interpreting the data collected from the interviewed specialists, the used program being SPSS vers. 23.

Results

It is also important to mention that in a study based on an opinion survey in table tennis conducted by Iordan, Mocanu&Mereuta (2020) on the 5 areas of the spine subjected to high wear and implicitly to the appearance of disorders,the area presenting the most frequent incidence rate was indicated to be the lumbar area with a percentage of 78%.

The biomechanical characteristics of these two sports are:

(a) asymmetric changes (resulting from strong, repetitive single-arm strokes);

(b) strong lumbar and hip joint rotation. (21)

In this review, 68 questionnaires were completed by top Slovenian athletes. Of which 29 are table tennis players and 39 tennis players.

The average age of questioned athletes was 19.37 years. (9)

Table 1 : *Injury occurrence in table tennis during preparation and competition period*

	TOGETHER1	During practice						During competition					
		In the beginning		In the middle		At the end		In the beginning		In the middle		At the end	
In preparation period	14	4	28,57%	4	28,57%	4	28,57%	1	7,14%	0	0,00%	1	7,14%
In competition period	25	4	16,00%	5	20,00%	4	16,00%	2	8,00%	6	24,00%	4	16,00%
Together 2		8		9		8		3		6		5	

Table 1, 1.2, 1.3 acording to Kondrič, M., Matković, B., Furjan-Mandić, G., Hadžić, V., &Dervišević, E. (2011). Injuries in racket sports among Slovenian players. Collegium antropologicum, 35(2), 413-417.

Table 1.2: *Injury location*

	Table tennis	Tennis
Head	0,00%	0,00%
Neck	0,00%	4,62%
Shoulder	21,05%	13,85%
Upper arm	0,00%	0,00%
Forearm	0,00%	1,54%
Wrist	10,53%	13,85%
Fingers	0,00%	0,00%
Trunk	2,63%	3,08%
Spine	15,79%	15,38%
Hip	15,79%	1,54%
Femur	7,89%	12,31%
Knee	2,63%	1,54%
Shank	0,00%	3,08%
Ankle	13,16%	20,00%
Foot	10,53%	9,23%

Table 1.3: *Percentage of injuries per individual sport*

	Skin	Muscles	Tendon	Bones	Joint
Table tennis	0,00%	52,63%	13,16%	13,16%	21,05%
Tennis	0,00%	49,23%	10,77%	4,62%	35,38%

Table 1.4 according to Iordan,D., Mocanu, M.,&Mereuta, C.

On a scale from 1 to 10, how much do you consider that a deficient posture of the female athlete can negatively influence the biomechanics of the topspin's execution?

		Frequency	**Percent**	**Valid Percent**	**Cumulative Percent**
Valid	7	2	7.4	7.4	7.4
	8	8	29.6	29.6	37.0
	9	9	33.3	33.3	70.4
	10	8	29.6	29.6	
	Total	27	100.0	100.0	100.0

Note: As per the highest percentage of 33.3 % corresponding to Grade 9 granted by the coaches to the deficient posture

Table 1.4 according to Iordan,D., Mocanu, M.,&Mereuta, C.

Do you consider that a program for assessing and ameliorating the incorrect positions of the body would be useful and could it bring benefits to the improvement of attacking technique?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	27	100.0	100.0	100.0

Note: The necessity of performing a postural assessing and ameliorating program is validated by all coaches questioned, considering that the kinesiotherapeutic endeavor would favor the optimization of table tennis attack

Based on the results of this review, it can be assumed which risk factors cause a particular injury, and depending on the pathology, prevention protocols are made. Significant differences have been found between table tennis players and tennis players about injuries.

Traumatisms caused by overloading can be considered as tissue injuries as a result of repeated micro-traumas due to the short time between two demanding episodes (22).

The highest number of injuries (21.05%) is found in the shoulder joint. According to the demands of the level of the shoulder joint in the two sports, it appears that the higher number of injuries in table tennis is due to short, sudden and extremely rapid movements, especially in the case of forehand strikes. When a bigger ball was introduced, these blows became even stronger

(24). During the competition period, injuries are not lacking, as the number of factors is steadily increasing (Table 1). When talking about injuries, most of them take place in the middle of the training session or during the competition. At the same time this is very interesting because it can show us inappropriate heating, the lack of stretching exercises before the game, even after, manipulations but also other causes.

The most common injuries in table tennis and tennis are the muscles tissues (Table 1.3), followed by injuries in the joints and tendons.

As a percentage, injuries to the joint of the shoulder and ankle joint are most common, which also confirms the epidemiology reports worldwide. The shoulder joint is the most flexible part of the body but at the same time it is most prone to injuries. In the two sports, the upper part, the kicks made by the players involve a lot the upper part, the trunk. Amplitude of movement and control of the muscular system at the trunk if it is reduced due to a certain factor that the efficiency and effectiveness of the strokes decreases leading to muscle imbalances resulting in a possible injury.

At present, it is difficult to estimate exact values for the nature of the pains and types of injuries in the lumbar region for table tennis and tennis players due to limited sports-specific research. Surprisingly, in table tennis, due to these sudden movements, the percentage of injuries in the hip joint rises to 15.79% and it is low for field tennis players where it is (only 1.54%), which indicates that most of the Slovenian players play on "soft" ground. Column vertebral injuries (over 15%) relate more or less to pain or injuries caused by overload in the lower spine.

3. CONCLUSIONS

As a result of the analysis of the results and information taken and presented in the present material, we want to outline some of the most important and interesting aspects of tennis and table tennis on the areas most affected by technical procedures and specific motor skills, so as to create an image clear to the specialists from the two sports disciplines, but also to the enthusiasts who practice the two sports regularly, in order to inform them about the risks to which they or the athletes they train may be subjected so as to be able to prevent such specific pathologies.

While in tennis the areas with a higher percentage incidence of injuries as compared to table tennis are represented by the wrist, femur, ankle and neck muscles, in the sister discipline the shoulder, spine, hip and sole are the most important aspects which highlights the fact that despite the fact that they are racket sports, the game materials and the amplitude of the movements along with the play spaces that must be covered by the movement of athletes create pathologies in different areas of their body,the tendons and bones having a higher percentage of injuries, while in tennis the joints are most prone to create problems for practicing athletes.

Kinetoteraphy and everything that comes with it is an excellent way to improve skills and all the movements in both sports. Effective management of table tennis and tennis injuries is therefore prevention, based on an understanding of the factors involved in overweight injuries. Frequent repetition of the activity required to develop and improve table tennis and tennis skills can result in chronic injury caused by overloading. Maybe poor technique, muscle training, and inappropriate equipment lead to execution errors that may cause increased stress on muscular-muscular tissues and cause pain due to micro-trauma or overload. In order to minimize the painful response, the body adopts compensatory mechanisms, which eventually add to the execution errors and thus establishes the endless cycle of overloading. Database records contribute to the planning and organization of medical care for performance athletes, which inevitably require better medical supervision and higher quality;

From this perspective, it is therefore very important for a table tennis or tennis coach to work in close collaboration and under the supervision of the physical trainer, team physician and physiotherapist. This review of the literature could be of some use to all technicians involved in table tennis.

A specific postural program and the implementation of orthopedic heel cushions could be recommended to improve the postures, compensatory work through carefully directed actuation systems for a balanced development of the body muscles opposite to the active execution part, as well as the systematic evaluation regarding the bone and muscular composition, the possible existence of inflammations, the posture and the plantar surface in static and dynamic, represent actions meant to prevent the appearance or development of specific pathologies of the osteo-muscular-articular system and of the spine.

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STUDY ON THE INFLUENCE OF USING CIRCUIT TRAINING FOR THE EDUCATION AND DEVELOPMENT OF COORDINATION SKILLS OF U16 HANDBALL PLAYERS

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Abstract

This study seeks to use complex means (circuit training), which will lead to technical improvements in U16 male handball, along with the development of conditional and coordinating skills.

The sample of the study consisted of two groups of subjects (experimental and control) consisting of 21 and 17 athletes respectively. The selected subjects were handball players from Bucharest Municipal Sports Club - the experimental group, and athletes of the handball team from School Sports Club No. 2 Bucharest – the control group.

The results obtained have shown that the specific means and materials used by us during the application stages of the training of the male handball players, led to the optimization of the technical training by enriching the motor repertoire, the development of conditional and coordinating skills, the consolidation and improvement general and specific motor skills.

***Keywords**: handball, circuit training, coordinating skills, technique.*

Introduction

Today, handball has become an extremely demanding and complex game, which requires players to have high-intensity movements, frequent body contacts, as well as high intensity stamina and strength.

The ingame creativity, coupled with high-speed moves, sudden turns, rapid changes of pace, throwing the ball at high speed while making body contact makes this game very attractive but difficult to play. Thus, players are required to have superior physical, technical and tactical capabilities to overcome all adversities imposed by competitive environments. For these reasons it is recommended that coaches be concerned with developing motor, perceptual and cognitive skills using various means during the process of training.

Thus, a player withwelldeveloped motor skills increases the probability of success in physically challenging situations. This is because players will be better able to analyze, predict or anticipate environmental conditions, and ultimately react more effectively and appropriately (Higgs, 2010).

The maximum intensity of development of motor skills, especially coordination skills, takes place between the ages of 7-11 and 14-18 years. Performing certain exercises develops the efficiency of the central nervous system, and indirectly increases the level of coordination, which in turn allows for a better movement execution (Cojocari, D., 2014, pp.14-29;Starosta,W., 2006, pp.9-23).

Coordinating capacities serve to form a global movement from partial movements in a consistent and coordinated manner. If these movements are coordinated, we can achieve the highest level of overall coordination (Esfahankalati, A., et.al., 2013, pp. 42-46).

Blumenstein, B., et.al., (2007, pp. 62-67) thinks that these are important during the game of handball since they need to progress from an early age. Especially, coaches working with young players will need to include the development of coordination in their daily workout program.

Thus, a high degree of "handball specific coordination skills" allows the player to execute complex actions at higher and higher speed, and can be applied, for example, when movements are restricted by the actions of the defenders (Starosta,W., 2006, pp. 9-23).

The development of coordination, sensory and perceptual skills has a positive impact on technical abilities, contributing to their development (Dumitru,G., 2011, p. 8).

It is believed that the high level of basic, situational, cognitive and functional motor skills is an important condition for efficient learning, perfecting and successful implementation of new motor structures (Hirtz, P., et.al., 2002, pp. 19-28).

At the basis of a workable execution of the model of the established motor program, there is good coordination, which in turn depends on the correctness of information from analysts (whose role and integrity are decisive).

Matherialsand methods

We have assumed that the use structures of means for enriching the motor repertoire as well as to strengthen and improve handball skills, can positively influence the specific indicators, for the purpose of learning and developing coordination skills.

The research was carried out over a period of six months, comprising two groups of subjects (experimental and control) consisting of 21 and 17 athletes respectively, members of the male youth teams of Bucharest Municipal Sports Club – the experimental group, and those of School No. 2 Sports Club Bucharest - the control group. During the research we used a set of specific technical training methods of circuit training, which were applied to the experimental group 3 times per week, 15 minutes each, at the beginning of each training session.

Circuit training 1: 4 alternate jumps on vaulting box, arms swinging upwards; winding run among 4 marking cones, repeat after changing side; 4 lateral jumps over bench with legs apart; 3 pushups with medicine ball touching the chest; running round a cone; lateral movement with side steps among 4 cones; two leg jumping over 4 hurdles; catching a handball with two hands down; forward dribbling among 4 cones with dominant hand; jump shot at goal from the 9-metre area; recovering the ball and returning it to original place by running 4/4; returning to the end of queue by running backward.

Circuit training 2: 5 jumps from beside the bench with legs apart onto the bench; winding run sideways among 4 cones, repeating on other side; throwing 3-kilogram medicinal ball 4 meters away from the chest, recovering the ball and placing it at the throwing point; 4 toe touch crunches on gym mat; catching handball with two hands; dribbling through conesrunning sideways, then repeating with opposing side; dribbling forward among the cones; jump shot at goal from the 9-metre area; recovering the ball and returning to formation.

Circuit training 3: winding run around 2 cones placed in the way;cushioned dive on arms; two leg jumps over 4 succesive cones; turning around a cone;jumps from beside the bench with legs apart onto the bench; winding run around 2 cones placed transversely in the way,repeating on opposite side; catching a handball with two hands; dribbling around 2 cones placed transversely in the way, repeating on opposite side; dribbling with jump shot from the 9-metre area; recovering the ball and running back to formation.

The set of tests was selected from the work of Reiman, M., P., et.al., (2009, p.193) with the aim of evaluating speed, agility, multidirectional body control, explosive upper limb force (armspan).

"Pro agility" test (5-10-5)

- *Aim*: testing speed in different directions, agility and body control.
- *Equipment*: 4 cones, stopwatch, adhesive surface, tape measure.
- *Working procedure (after Harman, 2000):*Players proceed on Go command from the starting line, with both feet in the same position. Running at full speed to the sideline on the right, touching it with the right hand. The he runs to the left sideline, 9.1 m away, touching it with the left hand. Afterwards he runs to the starting point where the stopwatch is stopped.Not touching the sidelinesispenalized.

Armspan test

- *Aim*: testing explosive force of upper limbs.
- *Equipment*: smooth surface, tape measure.

- *Working procedure:* the athlete rests face down on the arms and toes behind a line, executing three successive bends and stretches of the arms (pushups) with explosion and forward movement. Three successive explosive pushups are carried out only by means of the arms (three successive pushups). Testing is carried out twice. The distance from the starting line to the last landing of the arms is measured.

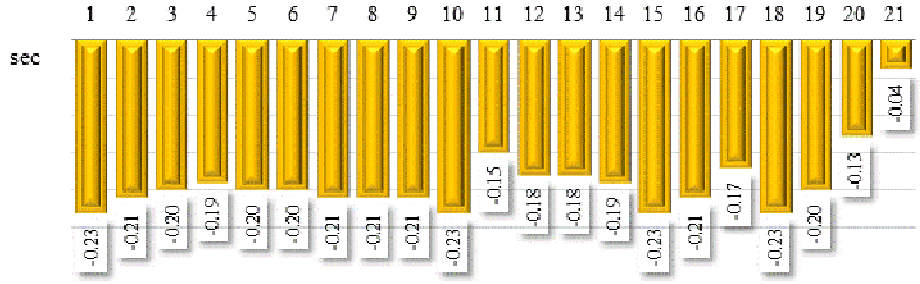
Results and discussions

"Pro agility" test (5-10-5)

Table1. Experimental group-Analysis of statistical-mathematical indices before and after applying the training programme-"Pro agility" test (5-10-5)

Statistical indices	T_i	T_f		Statistical indices	T_f -T_i differences	
Average	4.56	4.37		Average		-0.19
Median	4.51	4.36		Progress		4.2%
Std. deviation.	0.23	0.26		95% C.I.	(-0.21; -0.17)	
Minimum	4.3	4.0		Standard deviation		0.04
Maximum	5.1	5.0		Paired samples T-test	t	p
Amplitude	1	1			20.27	<0.001
Coeff. of variation	5.1%	6.0%		Effect size		4.42

In the Pro agility test (5-10-5) for speed in different directions, agility and body control, the elapsed time dropped at the final test, by 0.19 sec on average. Progress was 4.2%. The difference between averages is within the range (-0.21; -0.17), with a confidence level of 95%. Data dispersion in both tests is homogeneous. The difference between averages is very high and statistically significant, p<0.001, for t=20.27 and df=20. The average values and the differences between final and initial results are shown in graph1.

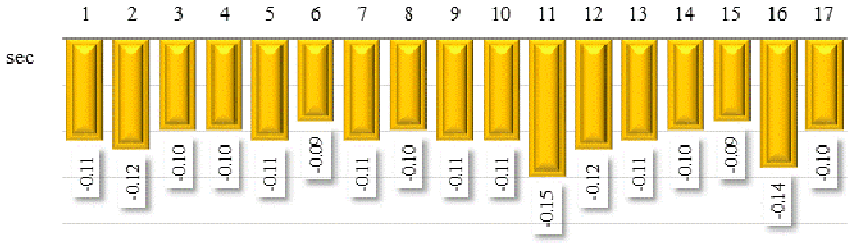


Graph1. Experimental group - Initial and final test - Diferrencesbetween individual final and initial results - "Pro agility"test (5-10-5)

Table2. Control group–Analysis of statistical-mathematical indices before and after applying the training programme - "Pro agility" test (5-10-5)

Statistical indices	T_i	T_f		Statistical indices	T_f -T_i differences	
Average	4.98	4.87		Average		-0.11
Median	4.97	4.86		Progress		2.2%
Std. deviation.	0.33	0.33		95% C.I.	(-0.12; -0.10)	
Minimum	4.5	4.4		Standard deviation		0.02
Maximum	5.6	5.5		Paired samples T-test	t	p
Amplitude	1	1			28.68	0.000
Coeff. of variation	6.6%	6.7%		Effect size		6.96

In the Pro agility test (5-10-5) for speed in different directions, agility and body control, the elapsed time dropped at the final test, by 0.11 sec on average. Progress was 2.2%. With a confidence level of 95%, the difference between averages is within the range (-0.12; -0.10). Data dispersion in both tests is homogeneous. The difference between averages is high to very high and statistically significant, $p<0.000$, for $t=28.68$ and $df=16$. The average values and the differences between final and initial results are shown in graph 2.



Graph2. Control group -- Initial and final test - Diferrences between individual final and initial results - "Pro agility" test (5-10-5)

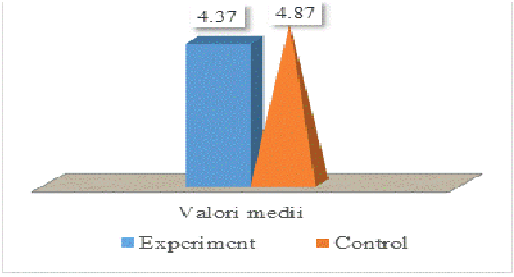
Table3. Experimental vs control group–Comparative analysis of the averages of statistical-mathematical indices obtained after the application of the training program - "Pro agility" (5-10-5) test

GROUP	Average	Avg diff.	Med-ian	Std. dev.	Min.	Max.	Ampl-itude	Coeff. of var
Experi-mental	4.37	-0.50	4.4	0.26	4.0	5.0	1.0	6.0%
Control	4.87		4.9	0.33	4.4	5.5	1.1	6.7%

Table4. Independent T-test - "Pro agility"(5-10-5) test

Levene's test for equality of variances		Equal dispersions?	T-test for equality of averages				Effect size
F	Sig.		Difference of avgs	t	df	p	
1.317	0.259	YES	-0.50	5.265	36	0.000	1.72

The independent T-test for equal dispersions, with p=0.000<0.05 and df=36, indicate a statistically significant difference between the averages of the results obtained by the subjects of the two groups in the "Pro agility" (5-10-5) test for testing speed in different directions, agility and body control. The average is 4.37 for the experimental group and 4.87 sec for the control group. It follows that the average is lower in the experimental group by 0.50 sec (10.32%). The effect size (1.72) shows a high to very high difference between the averages of the two groups. The data dispersion in both tests was homogeneous. The average values of the results of subjects fromboth groups at the final tests are presented in graph 3.



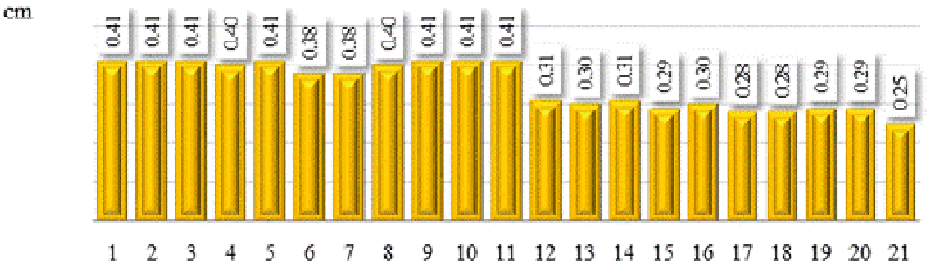
Graph3. Experimental vs control group - Average test values - "Pro agility" (5-10-5) test

Armspan test

Table5. Experimental group - Analysis of statistical-mathematical indices before and after applying the training programme –Armspan test

Statistical indices	T_i	T_f		Statistical indices	T_f -T_i differences	
Average	2.19	2.54		Average		0.35
Median	2.14	2.55		Progress		15.9%
Std. deviation.	0.15	0.20		95% C.I.	(0.32; 0.38)	
Minimum	2.0	2.2		Standard deviation		0.06
Maximum	2.6	3.0		Paired samples T-test	t	p
Amplitude	1	1			26.89	<0.001
Coeff. of variation	6.9%	7.9%		Effect size		5.87

The armspan test is used to evaluate explosive force. Armspan increased at the final testing, on average, by 0.35 cm. Progress was 15.9%. With a confidence level of 95%, the difference of averages is within the range (0.32; 0.38). For both tests the data dispersion is homogeneous. The difference between averages is very high and statistically significant, p<0.001, with t=26.89 and df=20. The average values and the differences between the final and initial results are shown in graph 4.

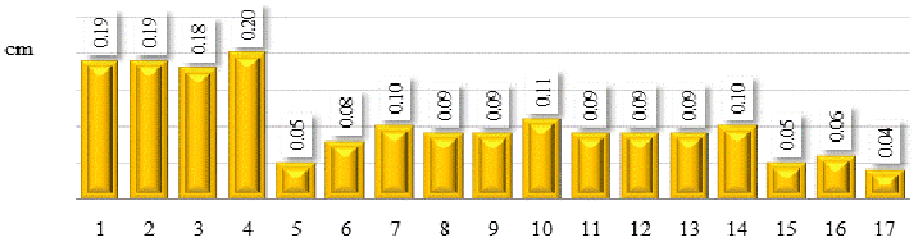


Graph4. Experimental group - Initial and final testing–Difference between individual final and initial results– Armspan test

Table6. Control group- Analysis of statistical-mathematical indices before and after applying the training programme – Armspan test

Statistical indices	T_i	T_f		Statistical indices	T_f -T_i differences	
Average	2.14	2.24		Average		0.11
Median	2.15	2.24		Progress		5.0%
Std. deviation.	0.16	0.20		95% C.I.	(0.08; 0.13)	
Minimum	1.8	1.9		Standard deviation		0.05
Maximum	2.3	2.5		Paired samples T-test	t	p
Amplitude	1	1			8.40	0.000
Coeff. of variation	7.3%	8.8%		Effect size		2.04

The armspan test for evaluating explosive force shows an increase at the final testing, on average, by 0.11 cm. Progress was 5.0%. With a confidence level of 95%, the difference of averages is within the range (0.08; 0.13). For both tests the data dispersion is homogeneous. The difference between averages is high to very high and statistically significant, $p<0.000$, with $t=8.40$ and $df=16$. Graph 5 shows the average values and the differences between the final and initial results.



Graph5. Control group - Initial and final testing – Difference between individual final and initial results – Armspan test

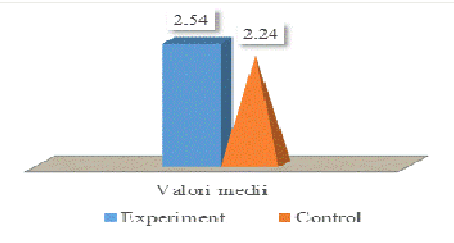
Table7. Experimental vs control group - Comparative analysis of the averages of statistical-mathematical indices obtained after the application of the training program - Armspan test

GROUP	Average	Avg diff.	Median	Std. dev.	Min.	Max.	Amplitude	Coeff. of var
Experimental	2.54	0.30	2.55	0.20	2.24	2.96	0.72	7.9%
Control	2.24		2.24	0.20	1.85	2.53	0.68	8.8%

Table8. Independent T-test– Armspan test

Levene's test for equality ofvariances		Equal dispersions?	T-test for equality of averages				Effect size
F	Sig.		Difference of avgs	t	df	p	
0.305	0.584	YES	0.30	4.620	36	0.000	1.51

At the independent T-test for equal dispersions, with p=0.000<0.05 and df=36, we notice a statistically significant difference between the averages of the results obtained by the subjects of the two groups in the Armspan test for evaluating explosive force. The average is 2.54 cm for the experimental group and 2.24 cm for the control group. It follows that the average is higher with the experimental group by 0.30 cm (13.41%). The effect size (1.51) shows a high to very high difference between the averages of the two groups. The data dispersion in both tests was homogeneous. The average values of the results of subjects from both groups at the final tests are presented in graph 6.



Graph6. Experimental vs control group–Average test values–Armspan test

Conclusion

Due to the variety of specific methods, means and materials used by us during circuit training during training sessions for male U16 handball players, it is noticeable that they lead to the optimization of technical training by enriching the motor repertoire, the development the coordination skills, strengthening and improving general and specific motor skills, as well as the development of creativity of male U16 handball players.

Appropriate circuit training methods can lead to more active participation among handball players, as the varied means of action and high attractiveness stimulate their attention, awareness and involvement in the training process. The technical elements of handball such as court movement, holding the ball, passing it, driving or dribbling the ball, shooting on goal through various handball specific technical procedures are combined in circuit training with methods of development of lower and upper limb span, speed, repetition and execution, the main objective being increasing agility, coordination, multidirectional control and the stimulation of creativity, the improvement of individual technique with or without the ball of male U16 handball players.

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DEVELOPMENT OF STATIC-ACTIVE FLEXIBILITY SPECIFIC TO SHOTOKAN KARATE FOOT TECHNIQUES

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Abstract

Flexibility is an essential quality for an athlete, which is why a high level of flexibility is required to increase efficiency and economy of movement, which interests all sports disciplines.

The purpose of this scientific approach is to show that the development of static flexibility specific to foot techniques in karate, for practitioners between the ages of 14 and 18, is not done at random. The drive systems, applied within the programme proposed in this study for the development of flexibility, are subject to anatomically determined laws of motion, are functional and succeed in a methodical sequence.

The experiment performed on karate practitioners - shotokan emphasizes the importance of developing specific mobility which will allow them to execute foot techniques at a higher level and achieve outstanding performance. The application of the tests and the implementation of carefully selected drive systems that contribute to the development of mobility specific to karate techniques substantiates the working hypothesis and validates through its results the correctness of the experimental operation.

Keywords*: flexibility, development, technique, karate.*

1.Introduction

Researchers Felix, J.M. R., &Ashwin, P. (2014) argued that martial arts are coded combat systems and traditions, which are practiced for several reasons: self-defense, competition, physical health and fitness, entertainment, as well as mental, physical and spiritual.

"Martial arts, as the core of all combat styles, have tradition, principles and special philosophies (zen, Buddhism, Daoism, etc.) through which they differ clearly from other forms of combat".[*]

Master Deshimaru Taisen said that "The true kinship between martial arts and Zen lies in the fact that both can lead us to the spirit of the path: because any conflict, whether it takes place inside the body and mind or outside them, is always a battle against the self." [†]

According to the theory of the Belarusian group of authors, Petrov, L, et al., (2018), Karate is one of the most popular sports martial arts, practiced all over the world and its best known styles

[*] Deliu, D. (2008). Method of combat sportsdisciplines. BrenPublishing. Bucharest .p. 12

[†] Deshimaru, T. (1982). Zenandmartialarts. Herald Publishing. Bucharest. p.5

are Shotokan, Shitoryu, Goju-ryu, Wado-ryu and Kyokushin. Karate includes two competitive disciplines: kumite and kata.

Karate, which means "empty hand", was developed in Okinawa in the early 17th century (modern karate) after the Japanese conquered the island and banned the use of all weapons. Today, millions of people practice karate all over the world (Felix, J.M. R., &Ashwin, P-2014).

"Karate do is a martial art in which the ultimate goal is not to seek to win a battle, but to work to improve character, personality, through accumulation of experience, through specific training." [‡]

"Karate begins and ends with courtesy!" - Gigin Funakoshi (1868-1957) the father of karate. [§]

With the popularization of Karate, methods to develop body mobility have evolved. In this evolution a decisive role was played by the training of European, American and Canadian specialists, who adopted the Japanese methods of working with the body and deciphered the mechanisms of carrying out these exercises.

"Mobility is the ability of man to make the most of the anatomical potential of locomotion in a particular joint or in all the joints of the body, concreted by performing movements with high amplitude"[**] therefore a high level of flexibility is required to increase the efficiency, effectiveness and economy of movement, which is generally true in all sports. The practice of Martial Arts requires a special development of mobility, primarily for the correct execution of basic techniques.

"Flexibility is defined by stretching experts as "the absolute degree of movement in a joint reached by a short-term effort, with the help of a partner or using specific equipment"[††]

This definition emphasizes that flexibility is not general in nature, it is specific to a joint or a set of joints. For example, a person who has flexible upper body is not necessarily flexible in the lower body.

In this study we focused on the development of static-active flexibility, which the researcher Neculai Acalinia defines, in his work Practical Course of Karate Do-2006, as the ability to execute and maintain body positions in extension, using only the tension of agonists and synergists muscles while antagonistic muscles are more stretched. Lifting a leg and keeping it without support is an example of this (Neculai Amalina 2006).

[‡] Deliu, D. (2008). Method of combat sportsdisciplines. BrenPublishing. Bucharest .p. 122

[§] GighinFunakoshi. (1998). Karate-do Myway in life. GarellPublishingHouse. p. 144

[**] Nicu, A., et al. (1993). Modern sports training. EditisPublishing. Bucharest

[††] Tony Gummerson, *Mobility Trening for the Martial Arts*, A&C Black Publishers. 1990

Through this research we want to contribute to the development of the flexibility of the body of Shotokan karate practitioners, who are between 14-18 years old, by applying the STRETCHING method and methodically staggered drive systems, carefully selected against the background of a basic training in gymnastics.

Since the concept of flexibility is not applied methodically in martial arts, and the principles of scientific stretching are virtually unknown, we presented in this approach a compendium of exercises (action systems), which contribute to the development of mobility and a stretching program applicable in Karate Do.

Using the stretching method, it can improve muscle flexibility and elasticity for Karate Do practitioners, who are between 14 and 18 years old, which will allow them to perform the techniques specific to this discipline at a higher level and achieve outstanding sports performance.

2. Materials and methods

The experimental research took place over a period of eight months at the gymnasium of the Theoretical High School "Ioan Slavici"-Panciu, jud. Vrancea.

The subjects of the research are fifteen practitioners of Shotokan Karate Do and are between the ages of 14 and 18. They are the students of the "Theoretical High School - Ioan Slavici" Panciu, jud. Vrancea and members of the "Kazumi Sports Club" -Focsani-Vrancea Association (Shotokan karate section).

The first stage of the research consisted of the initial testing of the subjects, which took place in the gymnasium where the Kazumi-Focsani Sports Club Association is training.

This first stage was aimed at detecting the individual level of development of the mobility of the body of the students participating in the extracurricular activities entitled "KARATE-DISCIPLINA AND EDUCATION".

The following devices and materials were used in the research: NIKON camera, metric tape (roller), goniometer, trellis.

Control samples

A. For active static flexibility

 **Figure 1. Technique by Mae Geri**	P.I. – sitting (Hachiji – Dachi) goes the outstretched leg forward executing the Mae Geri technique (direct kick forward) and keeps the leg stretched as far as possible (the torso is straight). It runs the technique with the other leg.
 **Figure 2. Technique by Yoko Geri**	P.I. – sitting (Hachiji – Dachi) goes the foot to the side performing the Yoko Geri Keromi technique (kick to the side after a direct trajectory) and keeps the leg extended as far as possible.It runs the technique with the other leg.

 **Figure 3. Technique by Mawashi Geri**	P.I. – sitting (Hachiji – Dachi) goes semicircular leg executing the Technique Mawashi Geri (kick after a circular trajectory) and keep the leg extended as much as possible (the torso is straight, arms bent at chest level). It runs the technique with the other leg.

Figure 4. Technique by Ushiro Geri

P.I. – sitting (Hachiji – Dachi) goes back foot
performing the technique with Ushiro Geri (direct kick
back) and keep the leg stretched as far as possible.

It runs the technique with the other leg.

Note: for figures 5-8, the time to maintain the techniques was timed.

B.Actuating systems applied in the experiment

I. Exercises for the development of flexibility

1. Examples of exercises for the development of dynamic flexibility

2. Examples of exercises for the development of static flexibility

II. Stretching

1. Exercises to develop the degree of mobility in the joint coxo-femoral

III. Execution of side string

1. Preparatory exercises for lateral rope

2. Exercises for the execution of lateral string

3.Preparatory exercises for lateral rope executed with toes facing upwards

IV. Execution of the string before

1. Preparatory exercises for the rope before

2. Exercises for the execution of the string before

V. Mobility exercises specific to karate techniques

1. Specific flexibility exercises for Mae Geri

2. Specific flexibility exercises for Yoko Geri

3. Specific flexibility exercises for Ushiro Geri

4. Specific flexibility exercises for Mawashi Geri.

The second phase of the research took place in the same gym over a longer period of time, i.e. eight months (September – April inclusive).

Exercises to develop body flexibility were performed at the end of each extracurricular activity, after the muscles were well warmed. During this period, four activities were carried out per week, and the duration of the session for the development of body flexibility was between 20 and 30 minutes. During this time the subjects were subjected to the training method that I proposed in this paper.

At the end of the preparation period, i.e. at the end of the eight months, the experimental group was subjected to final testing.

This last stage of the research was to evaluate the final progress reached after observing the training method that we proposed for the development of the flexibility of the body of the practitioners of the Shotokan Karate Do discipline.

The same control samples used in the initial testing framework were used.
Measurements carried out at this last stage of the research have been entered in the registration sheets.

3.Results

In order to assess the success of the experiment, we statistically processed the collected data, the values obtained being presented in Table 1.

Table 1. Statistical processing of the collected data and the values obtained

Statistical indices	Flexibility statical-active							
	Bringing the foot forward mae geri (s)		Carrying the lateral leg yoko geri kekomi		Leading the foot forward after a circular trajectory mawashi geri (s)		Bringing the leg back ushiro geri (s)	
	T0	**T1**	**T0**	**Tf**	**T0**	**T1**	**T0**	**Tf**
x	35,6	70,88	34,6	66,88	37,6	68,88	31,6	62,88
S ±	11,49	5,06	11,49	5,06	11,49	5,06	11,49	5,06
CV (%)	32,28	7,14	33,21	7,56	30,56	7,34	36,37	8,04
t	10,88		9,95		9,64		9,64	

In research we used the following statistical indices: arithmetic mean, standard deviation, variability coefficient and STUDENT test. Following the initial test, a lack of homogeneity of the experimental group could be found, the scattering of the results being large. The lack of homogeneity is caused by the different level of development of the mobility of the practitioners' body.

After observing the training method that we proposed during the eight months of training, at the end of this period, the final testing was carried out, thus evaluating the final progress in the development of the mobility (flexibility) of the body.

In order to conduct a comparative analysis between the initial and final testing, we made a parallel between the initial and final arithmetic averages corresponding to each sample.

These parallels are accompanied by the graphic:

Chart No.2 Arithmetic Mean
Mae Geri and Yoko Geri

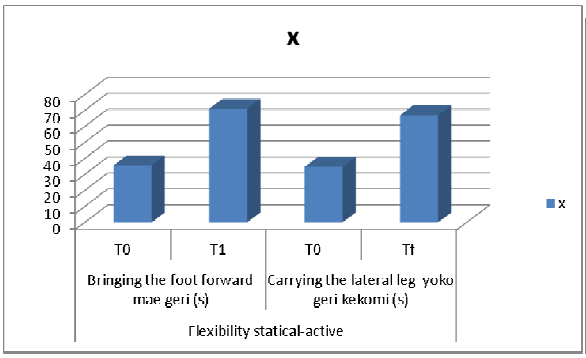
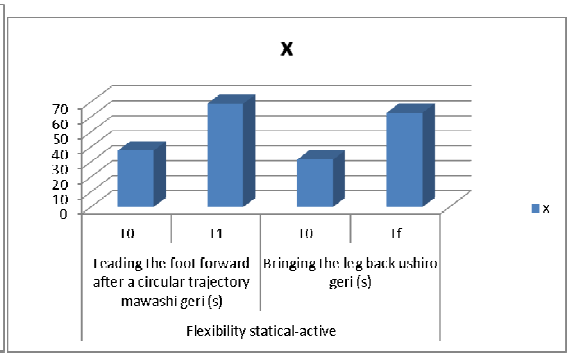


Chart No.3 Arithmetic Mean
Mawashi Geri and Ushiro Geri



From the study of these graphs it can be found that the experimental group has a higher level of development of body flexibility compared to that originally found.

To find out if the progress made by the experimental group is significant, trustworthy and that it is not due to chance, but to our intentional action, we calculated the statistical index "t" (student test).

The risk we take in our assessment is given by the threshold of significance, which in our field of activity, the most permissive is 95% (p=0.05). The values of the test "t" (calculated) are compared with the values of "t" corresponding (theoretical) to the number of cases processed in column f=n-1 (degrees of freedom) contained in the special tables (FISCHER'S TABLA).

Thus, in our case, the value of "t" in the table at 95% accuracy is as follows:

F = 15 – 1 = 14 (degrees of freedom); t = 2,145

Chart No. 4 Student Test Value (t)

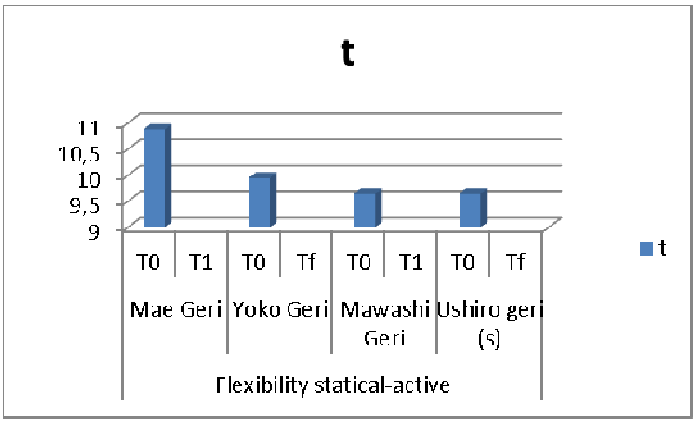
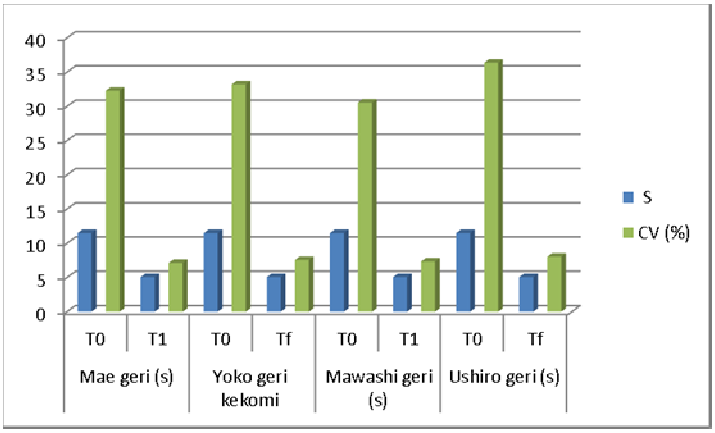


Chart No. 5 Standard deviation and variance coefficient S (±),CV (%)



The calculated value of the "t" test for each sample is greater than its theoretical value in the table.

Finally, the differences in the value of the results obtained between the averages of the two To (initial testing) and Tf (final testing) are significant, certainly 95%.

Conclusions

Given that the final test can show a good homogeneity of the collective as well as a significant increase in the statistical indices we can conclude that the actuators applied in the experiment were well selected

Increasing the amplitude of movements can be achieved with the help of flexibility exercises that will be performed with (or without) helpful objects. Choosing inappropriate exercises, an unfavourable time of stretching during training, and choosing the wrong method of performing can considerably hinder the development of mobility. Therefore, these exercises must be well selected and structured methodically to avoid injury, mistakes and lack of results.

Recommendations

In assessing the flexibility of the body we recommend the transition from classical measurement methods, which do not have a very high degree of precision, to emerging technologies (state-of-the-art measuring and evaluation devices, software, etc.) that are more accurate and with a much lower degree of error.

We propose that in the KARATE DOJOs (training rooms), ensure through a logical and well thought-out training, the development of all the elements that contribute to a sporty form of a KARATE-KA including flexibility.

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IMPACT OF QUARANTINE, DUE TO COVID-19, ON PHYSICAL ACTIVITY, MONITORED WITH EEG (CASE STUDY)

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Abstract

Due to the situation created by the emergence of Covid-19, we found that the restrictions and quarantine had a significant effect on normal activities and especially on physical activities. Physical education teachers, coaches, sports instructors, etc., were forced to change the approach of this segment of activity, from all points of view. As the promotion of physical activity has become a global priority, leading to a drastic review of this field, we used the most advanced study methods to establish the effects of quarantine and motor activities at home on brain activity. Electroencephalogram (EEG) is a method that records electrical activity on the scalp and measures voltage changes resulting from ionic current flows in brain neurons. In this case study, we monitored the EEG activity of a Pilates instructor also the manifestation of brain waves (Delta, Theta, Alpha, Beta and Gamma) during specific activities during quarantine. We assumed that this forced adaptation to indoor activity will lead to certain manifestations of the brain waves depending on the specifics of the activities (theoretical training, physical training and online teaching Pilates sessions) and will be influenced by the extension of the quarantine period.

Keywords: *Physical activities during COVID-19, EEG monitoring, online Pilates sessions*

Introduction

In the current context, the new coronavirus disease (COVID-19) has a globally strong impact on all activities, and especially on physical activities. Thus, the WHO recommends 60 min / day of moderate physical activity for children 6 to 17 years old and 75 min / week of intense physical activity for adults. (Amri et al., 2020). The physical activity is an important factor with a beneficial effect on the health of the population, especially in the context of the arising anxiety associated with the new coronavirus: devastating effects of alcohol and drugs, extreme religious confrontations, depression and suicidal ideation, etc. (Sherman A. Lee, 2020). For this reason, we studied the way in which the specialists in motor activities faced these special requirements and how they managed to solve problems. We noticed that physical education teachers, coaches, sports instructors, etc., had major problems, especially emotional ones, due to the loss of physical contact with those they coordinated. The lack of physical body, touch, direct physical

contact led to problems of lack of identity of the subject in question. (Valeria Varea & Gustavo González-Calvo, 2020).

The effects of the pandemic also decisively influenced the activity of performance athletes as well as professionals in this field. (Schinke et al., 2020) For this reason, it is recommended that in the future, new ways be found to support these categories whose activity has a very important social impact (Papaioannou G. et al, 2020). The promotion of the physical activity has become a worldwide priority leading to a drastic review of physical activity and exercise during the COVID-19 pandemic (Chathuranga Ranasinghe et al, 2020). The results of recent studies have highlighted the close link between the effects of COVID-19 on people who have reduced physical activity and the weakening of the immune system. Thus, physical activity has become an important factor in reducing the risk of disease and immune system improvement (Barbara E. Ainsworth, Fuzhong Li, 2020). The most advanced study methods use the Electroencephalogram (EEG). This method represents the recording of electrical activity on the scalp and measures voltage changes resulting from ionic current flows in brain neurons (Noppadon Jatupaiboon et al., 2013).

It is already known that the physical exercise causes changes in brain's activity expressed by EEG models. The results of these studies show that due to these electrophysiological changes, all physiological, biochemical, cognitive, emotional, etc. mechanisms can be rearranged and restructured for the benefit of the person who practices physical activity (Moraes, 2007).

Because during this period, physical activity at home is recommended, with an emphasis on those simple exercises that can be performed in confined spaces and do not require complex equipment (Peijie Chen et al., 2020), in this case study we monitored the EEG of a Pilates instructor.

We aim to study the brain waves (Delta, Theta, Alpha, Beta and Gamma) during specific activities during quarantine. We assumed that this forced adaptation will lead to certain manifestations of the brain waves depending on the specifics of the activities (theoretical training, physical training and online teaching Pilates sessions) and will be influenced by the extension of the quarantine period.

Methods

Between April and June 2020, we monitored the EEG activity of a Pilates instructor obliged to carry out his activity in quarantine, on three activities performed at home: indoors physical activity (PACS), online physical activity - Pilates (OPAP) and theoretical training activity

(TTA).We monitored 12 sessions from each activity by selecting those with an approximately equal duration (60 minutes).

We used MindWave Mobile 2 device (fig. 1) with recording on an eSense counter in the Meditation Journal - Microsoft Silverlight (fig. 2). The domains pursued by the EEG were the specific eSense (attention and relaxation) each with values in all frequencies of brain waves. For each different type of eSense, we reported the value of the meter on a relative scale from 1 to 100 (fig. 3).

MindWave Mobile 2 securely measures and transmits EEG power spectra (Alpha waves, Beta waves, etc.), NeuroSky eSense meters (attention and relaxation) and eye blinking. The device consists of a headset, an ear clip and a sensor arm. The reference and grounding electrodes of the headphones are on the ear clip, and the EEG electrode is on the sensor arm, placed on the forehead above the eye.

Figure 1. MindWave Mobile 2

Figure 2. Counter NeuroSky eSense

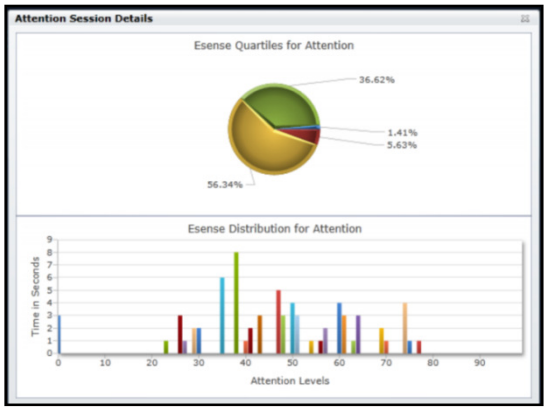


Figure 3. Attention Session Details

The electroencephalogram (EEG) is a recording of the electrical activity of the brain in the scalp. The recorded waveforms reflect cortical electrical activity which is quite small and has certain frequencies: Delta, has a frequency of 3 Hz.; Theta, has a frequency between 3.5 -7.5 Hz and is classified as "slow" activity; Alpha, has a frequency between 7.5 -13 Hz.; Beta is a "fast" activity; it has a frequency between 14-30Hz.; Low range: with frequencies between 30-200 Hz.

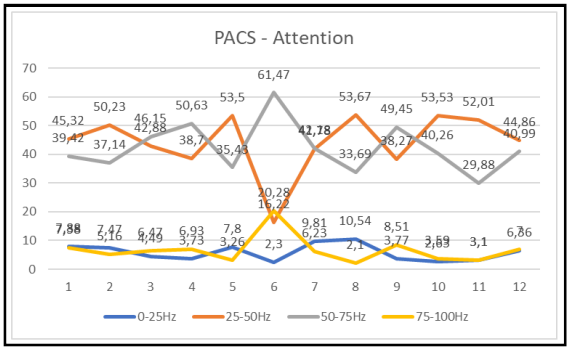
Results and Discussions

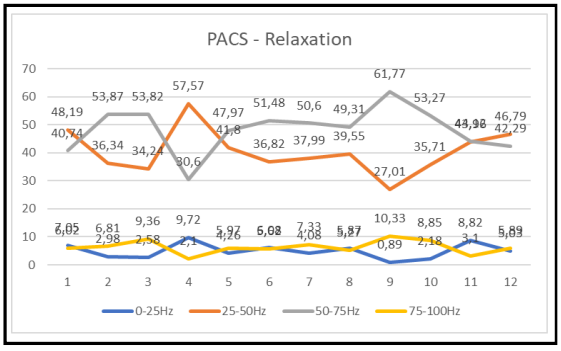
The data we extracted from the eSense graphical representation (fig. 3) was entered in the tables, separately for attention and relaxation, depending on each monitored activity.

In the Table 1 we showed the EEG values during indoors physical activity (PACS). We noticed in the Graphs 1 and 2, small percentages at frequencies of 0-25Hz and 75-100Hz. They are the extremes of the mental work field: low frequencies (Delta, Theta, Alpha and Beta low - 0-25Hz) and high frequency oscillations (high Gamma with values over 60Hz showing ultrafast EEG activity). EEG frequencies are mostly in the 25-75Hz range. The efficiency is between 70 and 88.3% of the measured time.

Table 1. EEG values recorded during indoors physical activity (PACS)

PHYSICAL ACTIVITY IN A CLOSED SPACE (PACS)												
Attention %												
Hz / Nr.	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
0-25Hz	7,88	7,47	4,49	3,73	7,8	2,3	9,81	10,54	3,77	2,63	3,1	6,36
25-50Hz	45,32	50,23	42,88	38,7	53,5	16,22	41,78	53,67	38,27	53,53	52,01	44,86
50-75Hz	39,42	37,14	46,15	50,63	35,43	61,47	42,18	33,69	49,45	40,26	29,88	40,99
75-100Hz	7,38	5,16	6,47	6,93	3,26	20,28	6,23	2,1	8,51	3,59	3,1	7
Relaxation %												
Hz / Nr.	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
0-25Hz	7,05	2,98	2,58	9,72	4,26	6,08	4,08	5,87	0,89	2,18	8,82	5,03
25-50Hz	48,19	36,34	34,24	57,57	41,8	36,82	37,99	39,55	27,01	35,71	43,96	46,79
50-75Hz	40,74	53,87	53,82	30,6	47,97	51,48	50,6	49,31	61,77	53,27	44,12	42,29
75-100Hz	6,02	6,81	9,36	2,1	5,97	5,62	7,33	5,27	10,33	8,85	3,1	5,89
Efic. %	80,00	84,70	88,30	83,30	70,00	78,50	86,20	84,10	83,30	74,20	72,00	83,41





Graph 1. Evolution of EEG for attention (PACS) **Graph 2.** Evolution of EEG for relaxation (PACS)

In session 6 (chart 1) we noticed a clear decrease in frequencies of 0-5 Hz and a significant increase in those of 50-100Hz. In this session we elaborated a new structure of a Pilates session (more elaborate and structured exercises on another framework) requiring fast EEG activity – the

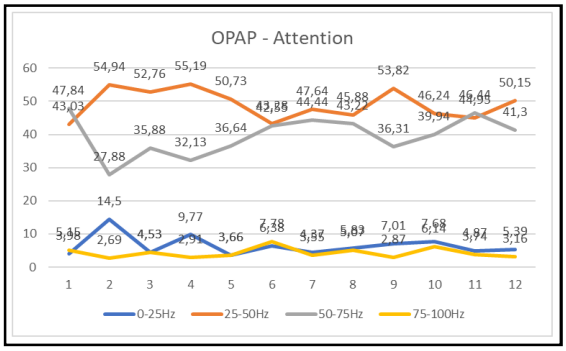
highest percentage of extreme frequencies – 22.28%. At the basic frequencies 25-75Hz, we noticed that they alternated depending on the specifics of the physical training. While in session 4 and 9 for attention, the frequencies do not fluctuate, for relaxation we noticed a peak inside the range of 50-75Hz and a decrease for the range of 25-50Hz. In Table 2 we showed the EEG values recorded for the physical activity during online Pilates sessions (OPAP).

Table 2. EEG values recorded during physical activity during online Pilates sessions

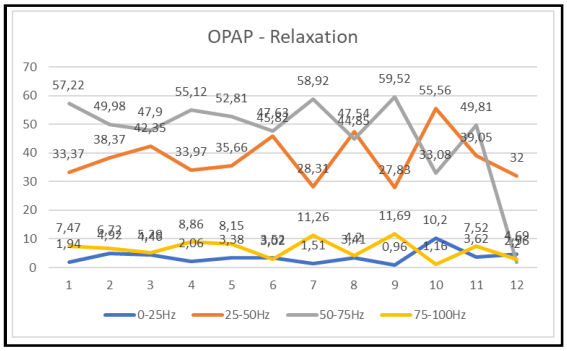
ONLINE PHYSICAL ACTIVITY – Pilates (OPAP)												
Attention %												
Hz / Nr.	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
0-25Hz	3,98	14,5	4,53	9,77	3,66	6,38	4,37	5,83	7,01	7,68	4,87	5,39
25-50Hz	43,03	54,94	52,76	55,19	50,73	43,28	47,64	45,88	53,82	46,24	44,95	50,15
50-75Hz	47,84	27,88	35,88	32,13	36,64	42,55	44,44	43,22	36,31	39,94	46,44	41,3
75-100Hz	5,15	2,69	4,53	2,91	3,66	7,78	3,55	5,07	2,87	6,14	3,74	3,16
Relaxation %												
Hz / Nr.	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
0-25Hz	1,94	4,92	4,46	2,06	3,38	3,52	1,51	3,41	0,96	10,2	3,62	4,69
25-50Hz	33,37	38,37	42,35	33,97	35,66	45,82	28,31	47,54	27,83	55,56	39,05	32
50-75Hz	57,22	49,98	47,9	55,12	52,81	47,63	58,92	44,85	59,52	33,08	49,81	2
75-100Hz	7,47	6,72	5,29	8,86	8,15	3,02	11,26	4,2	11,69	1,16	7,52	2,96
Efic. %	85,90	84,68	50,45	52,70	52,70	52,50	56,40	85,00	83,00	84,00	86,00	84,88

We noticed in the Graphs 3 and 4 small percentages for frequencies between 0-25Hz and 75-100Hz. There are extremes of the mental field of work: low frequencies (Delta, Theta, Alpha and Beta low - 0-25Hz) and high frequency oscillations (high Gamma with values over 60Hz that show ultrafast EEG activity, in this case with a higher percentage for relaxation). The activity is pleasantly and safely performed. EEG frequencies are mostly in the 25-75Hz range.

The efficiency is between 50.45% and 86% of the measured time. We noticed that after 2 sessions the efficiency decreases drastically and then increases progressively towards the end of the period. Starting with session 3 there were several people so it was necessary to make certain adaptations to the activity. We noticed a predominance on 25-50Hz and 0-25Hz at the beginning of the period and approximately equal values between the low frequencies 0-25Hz and the maximum ones of 75-100Hz. For the relaxation component we noticed a compensation of the activity on attention and a predominance at the frequencies 75-100Hz.



Graph 3. Evolution of EEG for attention (OPAP)

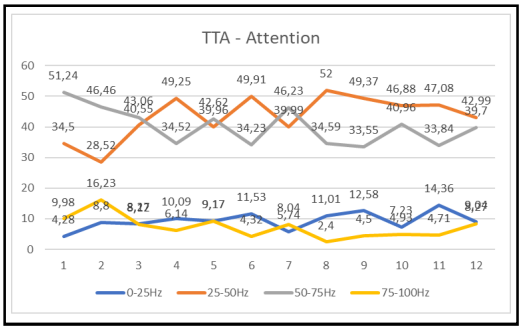


Graph 4. Graph 4. Evolution of EEG for relaxation (OPAP)

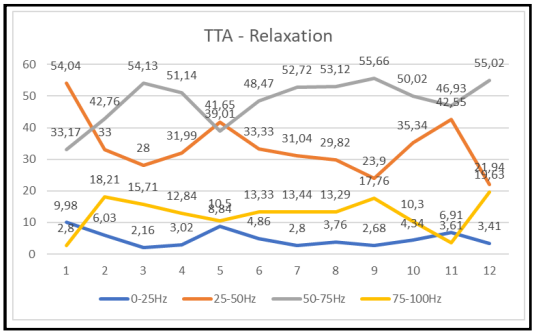
In the Table 3 we showed the EEG values recorded during the theoretical training activities (TTA).

Table 3. EEG values recorded during theoretical training activities

THEORETICAL TRAINING ACTIVITY (TTA)												
Attention %												
Hz / Nr.	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
0-25Hz	4,28	8,8	8,27	10,09	9,17	11,53	5,74	11,01	12,58	7,23	14,36	9,04
25-50Hz	34,5	28,52	40,55	49,25	39,96	49,91	39,99	52	49,37	46,88	47,08	42,99
50-75Hz	51,24	46,46	43,06	34,52	42,62	34,23	46,23	34,59	33,55	40,96	33,84	39,7
75-100Hz	9,98	16,23	8,12	6,14	9,17	4,32	8,04	2,4	4,5	4,93	4,71	8,27
Relaxation %												
Hz / Nr.	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
0-25Hz	9,98	6,03	2,16	3,02	8,84	4,86	2,8	3,76	2,68	4,34	6,91	3,41
25-50Hz	54,04	33	28	31,99	41,65	33,33	31,04	29,82	23,9	35,34	42,55	21,94
50-75Hz	33,17	42,76	54,13	51,14	39,01	48,47	52,72	53,12	55,66	50,02	46,93	55,02
75-100Hz	2,8	18,21	15,71	12,84	10,5	13,33	13,44	13,29	17,76	10,3	3,61	19,63
Efic. %	83,02	82,51	85,86	83,69	81,33	77,08	85,08	84,59	83,3	83,41	86,35	84,91

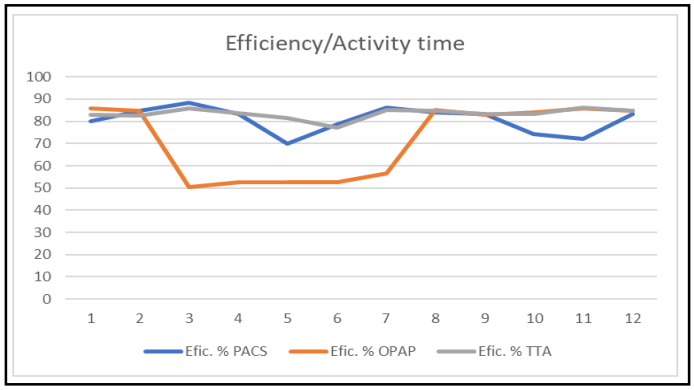


Graph 5. Evolution of EEG for attention (TTA)



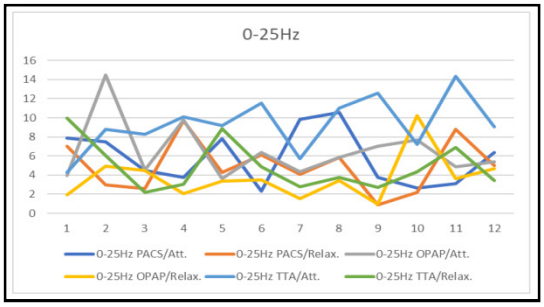
Graph 6. Evolution of EEG for relaxation (TTA)

We noticed high values at the efficiency of 77.08% - 86.35% . the lowest value is also found at the session 6. In the Graphs 5 and 6 we noticed a predominance of frequencies - 25-50Hz and 0-25Hz and a compensation of the predominance of the attention frequencies - 50-75Hz and 75-100Hz. In the Graph 7 we showed the efficiency values for all three activities. We noticed the highest efficiency at TTA and the lowest at online teaching (OPAP), and a small value at the first session with more subjects and then, a slow progressive growth. After session 6 in which the sessions were changed, we noticed a jump to values of 80%. The values for PACS and TTA were fairly linear.

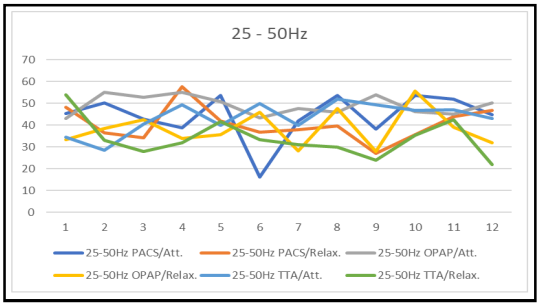


Graph 7. EEG evolution for efficiency

In the Graphs 8, 9, 10 and 11 we showed the values of the frequency categories (0-100Hz) on both data categories (attention and relaxation). In the Graph 8 (0-25Hz) we showed the most significant line at TTA for attention and the lowest at OPAP for relaxation. In the Graph 9 (25-50Hz) we showed the most significant line at OPAP for attention and the lowest at TTA for relaxation.

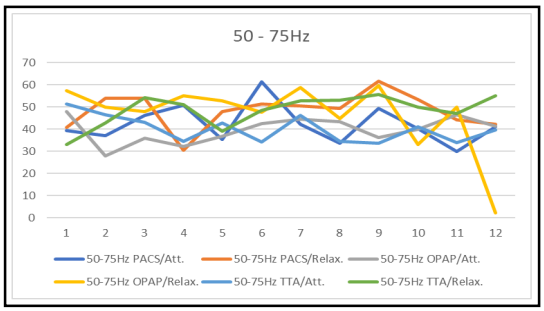


Graph 8. EEG evolution for 0-25Hz frequencies

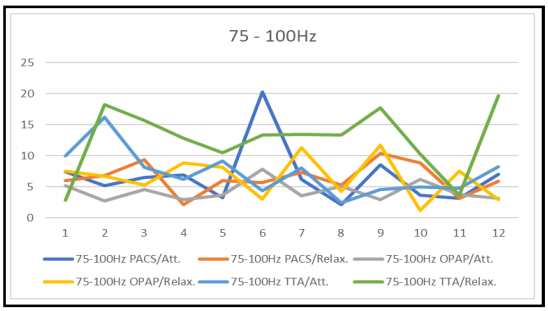


Graph 9. EEG evolution for 25-50Hz frequencies

In the Graph 10 (50-75Hz) we showed the most significant line at PACS for relaxation and the lowest at OPAP for attention. In the Graph 11 (75-100Hz) we showed the most significant line at TTA for relaxation and the lowest at OPAP for attention.



Graph 10. EEG evolution for 50-75Hz frequencies



Graph 11. EEG evolution for 75-100Hz frequencies

We noticed in people who perform physical activity, a strong correlation between participants' perception of exercise intensity and fatigue due to hyperthermia (Nielsen B, Nybo L., 2003). The effects are much more visible when physical activity takes place indoors. Strictly referring to physical activity and EEG, we know that Delta waves in excess can cause brain damage, learning problems and inability to think while an optimal level improves the immune system and ensures deep sleep. Excess Theta waves induce hyperactivity, impulsivity and lack of attention and if they are at a low level, anxiety and stress appear. If Theta waves are at an optimal level, creativity, intuition and relaxation are induced.

Alpha waves in excess induce an inability to concentrate and too low level give a state of anxiety and strong stress. In the case of Beta waves, high level induces high excitement and inability to relax and too low level induces depression.

If the level is optimal, there is a conscious focus and a good memory. The waves with the highest frequency – Gamma will induce stress and anxiety if their level is high. If the level is optimal, cognition, learning, perception and information processing occur. Low values for Gamma showed a depressed state or even ADHD (Preeti Gupta Vishal Aditya, 2020). According to other studies, Theta waves ensure the storage of new memories and the coordination of memory (Wolfgang Klimesch, 1990). High Gamma waves(50-70Hz) are associated with cognitive tasks (hearing, reading and speaking) and when it rises to 100Hz it is suitable for emotions (M. Li and B. Lu, 2009).

Conclusions

Based on the data recorded after EEG monitoring, we confirmed our research hypothesis. Brain waves had different values on the two characteristics (attention and relaxation) in all three activities performed at home during the quarantine period due to COVID-19. The monitored subject was relaxed in the case of theoretical training (TTA) and had a good level of Theta waves (creativity and intuition). For the physical training sessions (PACS), in session 6 we clearly observed a decrease of the frequencies of 0-25 Hz and the significant increase of those of 50-100Hz. In this session, we elaborated a new structure of a Pilates session (more elaborate and structured exercises on another framework) requiring fast EEG activity - the highest percentage of frequencies at extremes - 22.28%.

The Pilates sessions conducted online, due to the fact that they represented an absolutely new activity, showed an intense brain activity of the subject and was demonstrated by an ultra-fast EEG activity. We noticed the highest efficiency is at TTA and the lowest at online teaching (OPAP). We noticed a small value, a lack of distributive attention at the first session with several

subjects and then, a slow progressive growth. After the sixth session, in which the subject changed the structure of the sessions and adapted the activity as necessary, there was a jump to 80% for the efficiency. The subject quickly adapted to the special requirements due to the fact that he changed his working conditions, adapted his physical effort and progressed over time.

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STUDY ON THE APPRECIATION OF THE LEVEL OF PHYSICAL CONDITION IN ADULTS

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Summary: *The research hypothesis is based on the assumption that the factors of the physical condition under evaluation are in accordance with the level of growth and development of the tested subjects. The object of the research is the model of physical condition of the students from the final year of FPEMS. The purpose of the research is the continuous improvement and guidance of the content of the preparatory lessons in order to maintain an optimal level of physical condition, necessary to fulfil the requirements of the school program. The practical value of the research consists in the possibility to elaborate training models, by allowing the specialists to select the most effective factors that influence the level of physical condition.*

Keywords: *tests, physical condition, Eurofit*

Introduction

The physical condition is the capacity to withstand, to successfully cope, both with the possible challenges and with those present in daily life [10].

A translation of the Anglo-Saxon word "physical fitness", the physical condition can be considered as the acquisition by an individual of a level of physical ability that gives them the possibility to perform an exercise, some sport or a constant daily activity.

Fleisman defines physical condition as the individual's ability to succeed in certain classes of activities that require muscle activity [5, 6].

Bouchard defines physical condition as the optimal combination of the physical, biological, biochemical, biomechanical characteristics meant to function in a satisfactory way in a muscular activity [2].

Legido considers physical condition as being "an ensemble of organic, anatomical and physiological qualities or conditions that an individual must have in order to be able to perform a certain amount of physical effort in both sporting and daily activities [8].

From the enumeration and analysis of the points of view referring to the physical condition it is considered that while, for the coaches, physical condition is synonymous with the performance, they always want to have as many means and methods as possible to allow a certain level of physical effort, without any negative effect on their health. The teachers select the most suitable

methods and means for the physical education class, the objective being the physical training of the students in order to achieve competences and abilities and to maintain an optimal state of health.

For Alvarez del Vilar physical condition represents a general concept, being defined as the success of the human body to oppose the unilateral muscular activity that unites the professional activity with other ordinary movements or positions [3].

Merhatova and Macek consider that physical condition results from "the totality of personal conditions that allow an optimal reaction when performing a difficult physical activity, taking into account the influence of external factors" [9].

The Committee of Experts of the Council of Europe considers physical condition to be the ability of the body to carry out daily activities with vigour, without accentuated tiredness, by conserving enough energy to perform free time activities and to deal with unusual situations and emergencies [11].

The identification and description of the components of the physical condition (fitness) is an important topic for specialists in the field. E. Fleishman (1964) quoted by M. Epuran (2005) identifies 9 factors, the tests being performed on the field, without complex equipment: flexibility in extension, dynamic flexibility, explosive force, static force, dynamic force, trunk force, general body balance, general coordination, stamina (cardiovascular endurance) [7].

APPENDIX TO RECOMMENDATION No. R(87)9 of the Committee of Ministers on Eurofit physical aptitude test, May 19, 1987.

EUROFIT physical fitness tests

Identification data	NAME SURNAME	Age (years, months)	
		Gender (m / f)	
Anthropometric measures		Waist (cm)	
		Weight (kg)	
		Body fat, five skin folds: biceps, triceps, sub-scapular, supra-iliac, maleolar (mm).	
Dimension Evaluated skills / competencies,	***Factor***	***EUROFIT test Evaluation tools***	
Cardio-respiratory resistance	Cardio-respiratory resistance	Endurance shuttle race (min / sec), Ergometric bike test (min / sec),	9
Force	Static force	Manual dynamometry (kg),	5
	Explosive force	Long jump without momentum (cm),	4
Muscular endurance	Functional force	Suspended bent arm (sec),	7
	Strength of the trunk	Lifting from the sitting position (no / 30sec),	6
Speed	Speed of coordination	Race 10 X 5m (sec),	8
	Member speed	Hitting the plates (sec),	2
Flexibility	Flexibility	Torso flexion forward, in the sitting position (cm),	3
balance	General balance	Flamingo balance test (sec).	1

Table 1. Factors that influence the level of physical condition related to the Eurofit test battery [Adam et al., 1992, Eurofit].

Material and method

The program includes percentile masses on the Eurofit test battery, for both sexes, as well as the introduction of new tests and test batteries, and the modification of the existing ones.

The test battery contains 10 tests for the evaluation of 9 (nine) factors that influence the level of the physical condition, all of them measure the level of the physical condition related to the motor range (coordination, power, skill, speed, balance), 5 (five) of them being directly related to the health status [Adam et al., 1992, Eurofit].

Along with the motor tests, the battery of tests includes measurements of anthropometric indicators and data for the identification of those tested.

The statistical-mathematical indicators that were used in the analysis of the data obtained by measurement were: $\bar{X}$- arithmetic average, σ-standard deviation, W-amplitude.

The measurement was performed throughout the research to determine the level of capabilities, factors and evaluation tools as follows:

General balance = FLAMINGO balance test

Speed of repetition in the upper limbs = reaching the circles,

Flexibility/ mobility = while sitting, outstretching hands,

Lower limb explosive force = long jump without momentum,

Static force upper limb = dynamometry of upper limb,

Abdominal muscle strength and resistance = repeated returning lifting of the trunk

Strength and muscular strength in the arms and hands = keeping the arms bent from hanging to a fixed bar,

Travel speed, speed = RACE 10X5m

Cardio-respiratory endurance = RACE 12X40m.

Research results

By applying the specific balance assessment tools, when testing Eurofit, it results in an arithmetic average of 3.40 sec, a number of 5 subjects have values above average and 15 subjects have values below average and the amplitude has the value of 10 sec (Table 2, Graph 1).

When testing the speed of repetition of the upper limbs, touching the circles, the value is 8.07 sec, due to the values of 0 sec of two subjects (7 and 10), (Table 2, Graph 2).

When testing the sitting mobility, outstretching hands, the arithmetic average of 5.60 cm has lower values in 8 subjects while 12 subjects have higher values, at an amplitude level of 47cm. which is influenced by negative values (4, 9, 12, 17, 19) (Table 2, Graph 3).

Testing to determine the level of explosive force at the level of the lower limbs, the long jump without momentum has an average value of 2.27m, the amplitude being 50cm (Table 2, Graph 4).

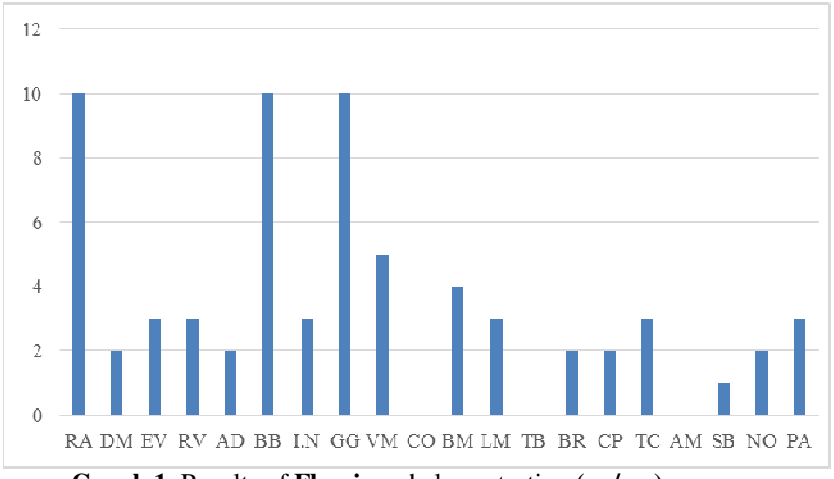
The strength of the palm flexors tested by means of the dynamometer has average values of 49.85 kg / f, 9 subjects above average values, and 11 subjects have values above average, the amplitude being 36 kg / f. (Table 2, Graph 5).

The lifting of the trunk from dorsal lying in 30 seconds has average values of 30.55 repetitions, of which 9 subjects have values above the average, while 11 subjects have values below the arithmetic mean, the amplitude being 18 (Table 2, Graph 6).

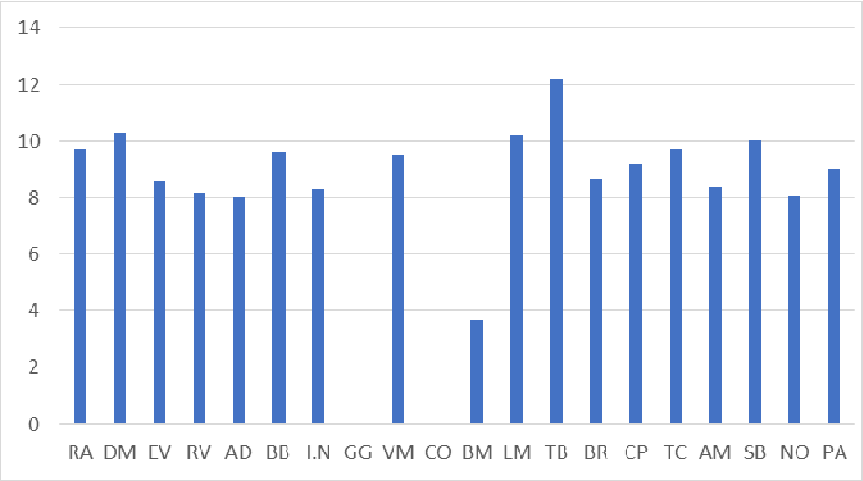
For testing the determination of the strength and resistance at the level of arms and shoulders the hanging test with the arms bent was used, the arithmetic mean is 52.80 min/ sec, 7 subjects have values above the mean, while 13 subjects have values below the arithmetic mean value of the amplitude being 82 sec (Table 2, Graph 7).

TABLE 2 TEST RESULTS

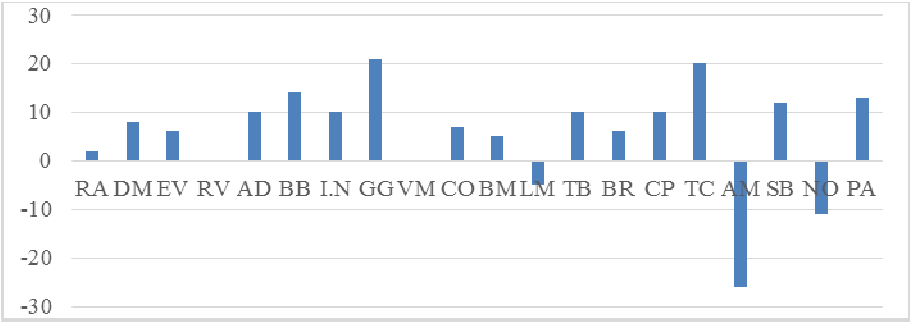
	N.P.	FLA-MINGO BALANCE (no. of points)		TOUCH CIRCLES (sec/25cycles)		STRETCH HANDS (cm+,-)		LONG JUMP WITHOUT MOMENTUM (cm.)		STRENGTH OF PALM FLEXORS (kg/f)		TRUNK LIFTING FROM DORSAL LYING (nr/30sec.)		BENT ARM HANGING (min/sec)		RACE 10X5m (sec.)		RACE 24X20m (min/sec.)		TO-TAL
		R	P	R	P	R	P	R	P	R	P	R	P	R	P	R	P	R	P	
1	RA	10	10	9.7	40	+2	20	2.30	80	60	100	33	80	40	60	12.2	50	2.35	50	480
2	DM	2	90	10.3	20	+8	50	2.30	80	54	90	22	0	70	100	12.2	50	2.25	70	550
3	EV	3	80	8.6	70	+6	40	2.10	40	38	60	32	70	111	100	12.0	60	2,14	90	590
4	RV	3	80	8.2	80	0	0	2.10	40	40	60	33	80	50	80	12.2	50	2.24	70	540
5	AD	2	90	8.0	90	+10	60	2.30	80	52	90	30	50	48	80	12.9	30	2.27	70	640
6	BB	10	10	9.6	10	+14	80	2.30	80	50	80	30	40	49	80	12.9	30	2.42	40	450
7	I.N	3	10	8.3	80	+10	60	2.30	80	56	90	29	50	33	50	12.9	30	2.25	70	540
8	GG	10	60	0	10	+21	100	2.20	60	64	100	30	60	54	90	12.0	60	2.25	70	610
9	VM	5	100	9.5	40	0	0	2.20	60	48	70	31	80	43	70	12.0	60	2.25	70	550
10	CO	0	70	0	10	+7	50	2.50	100	65	100	33	80	56	90	11.8	70	2.11	100	670
11	BM	4	80	3.7	60	+5	30	2.40	90	60	100	40	50	78	100	11.4	70	2.12	100	660
12	LM	3	100	10.2	30	-5	0	2.30	80	30	40	30	60	68	100	12.3	40	2.29	60	510
13	TB	0	90	12.2	0	+10	60	2.30	80	31	40	31	40	67	10	12.2	50	2.06	100	470
14	BR	2	90	8.7	60	+6	40	2.00	20	29	40	29	30	29	40	12.6	40	2.25	70	430
15	CP	2	80	9.2	50	+10	60	2.50	100	60	100	28	50	45	70	13.6	20	2.32	60	590
16	TC	3	80	9.7	40	+20	100	2.40	90	58	100	30	40	33	50	12.5	40	2.10	100	640
17	AM	0	10	8.4	80	-26	0	2.10	40	58	100	29	40	48	80	13.1	20	2.27	70	440
18	SB	1	100	10.0	30	+12	70	2.10	40	44	70	30	50	46	70	12.5	40	2.50	20	490
19	NO	2	90	8.1	90	-11	0	2.30	80	45	70	31	60	40	60	12.9	30	2.55	10	490
20	PA	3	80	9.0	40	+13	80	2.35	90	55	90	30	50	48	80	12.5	40	2.45	30	580
	X	3.40	70.00	8.07	46.50	5.60	45.00	2.27	70.5	49.85	79.5	30.55	53.0	52.80	73.00	12.37	44.0	2.28	66.0	546.0
	σ	3.04	31.46	3.10	27.98	10.3	32.48	0.13	22.4	11.05	21.3	3.15	19.2	18.35	22.61	0.43	14.6	0.13	25.3	73.10
	w	10	90	12.2	90	47	100	0.5	80	36	60	18	80	82	90	1.7	50	0.49	90	240



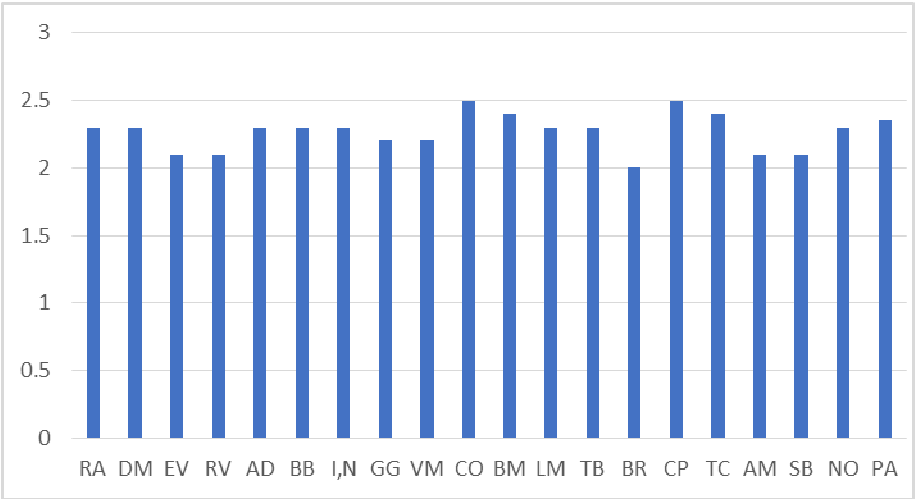
Graph 1. Results of **Flamingo** balance testing **(no/sec)**



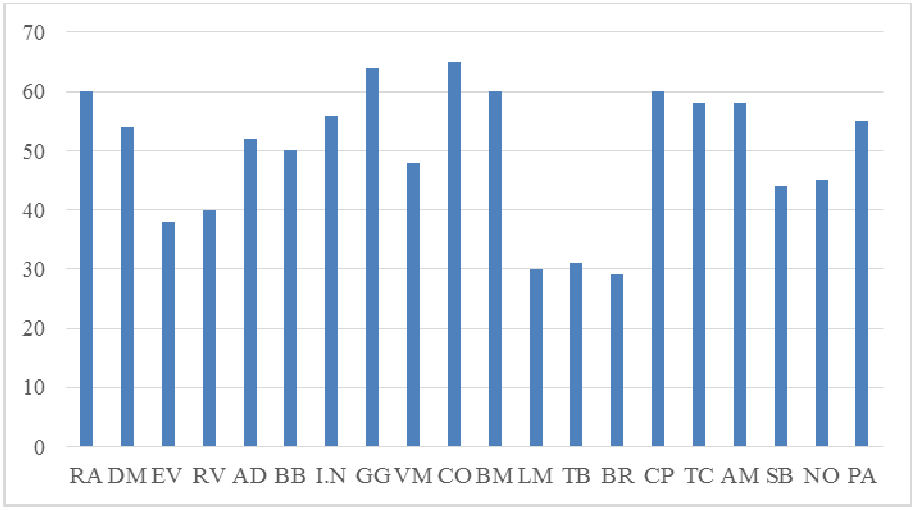
Graph 2. Results when testing **touch the circles (sec/25 cycles)**



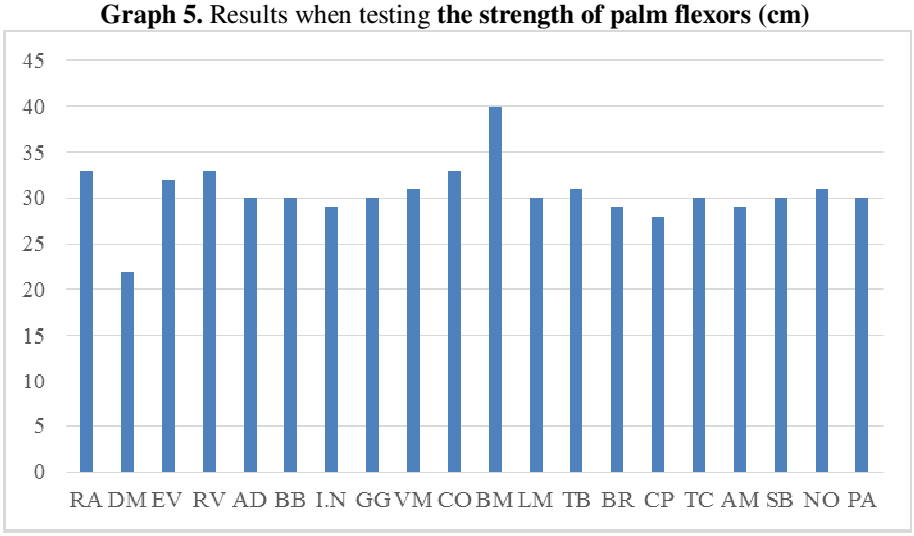
Graph 3. Results when testing **stretch the arms (+,-)**



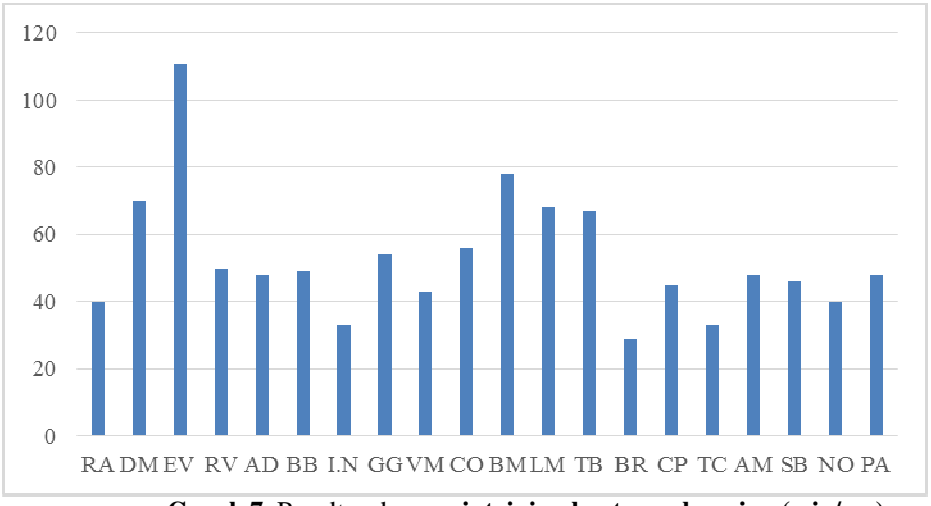
Graph 4. Results when testing **long jump without momentum (cm)**



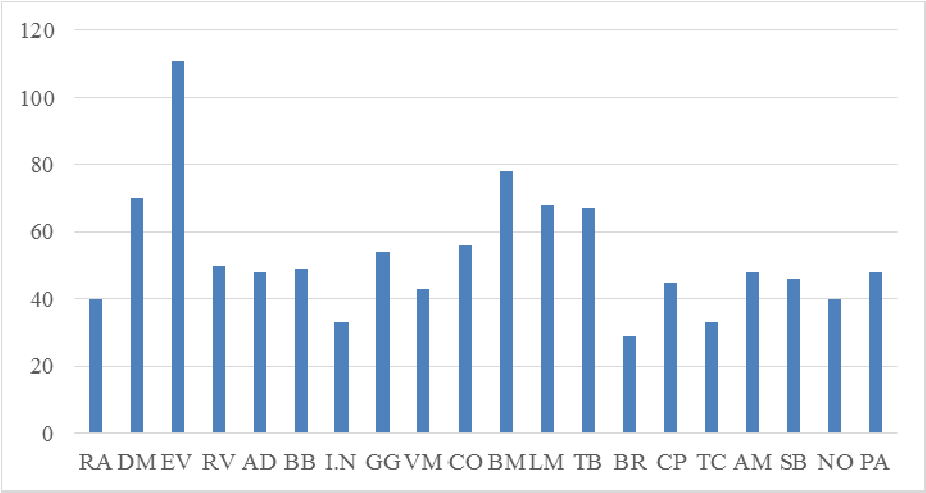
Graph 5. Results when testing **the strength of palm flexors (cm)**



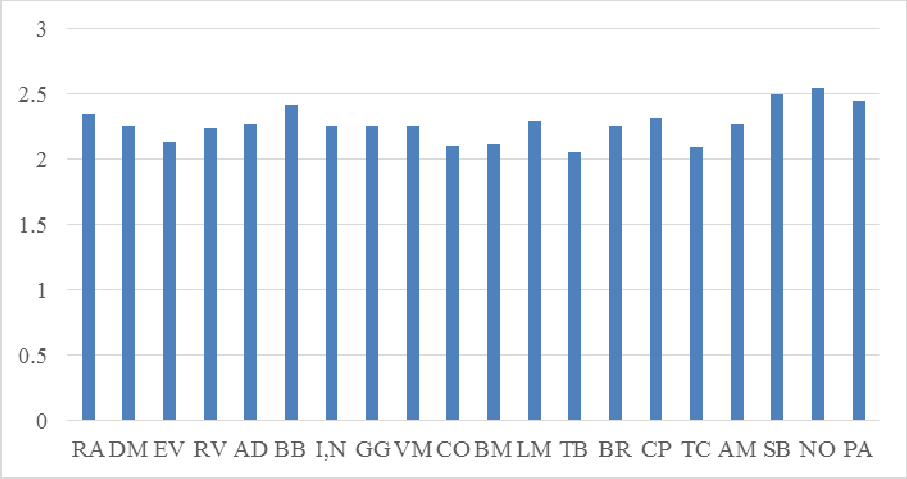
Graph 6. Results when testing **trunk lifting from dorsal lying (no./30sec).**



Graph 7. Results when **maintaining bent arm hanging (min/sec)**



Graph 8. Results when testing **race 10x5m(sec)**



Graph 9. Results when testing **race 24x20**(min/sec)

Travel speed/ speed was tested by using the 10x5m race, the arithmetic mean of 12.37sec being exceeded by 9 subjects, 11 subjects being below the mean level, the amplitude level being 1.7 sec. (Table 2, Graph 8).

Cardio-respiratory resistance tested by using the 24x20m race (min/ sec) gives an average value of 2.28min, 7 subjects performing above the arithmetic mean level, 13 performing below average level at an amplitude value of 49 sec (Table 9, Graph 9).

Conclusions

By analyzing the results of the EUROFIT battery test at the level of the subjects, it is noticed that for a number of 5 tests the results are above the average of the tested subjects while the results in 4 tests are below the average.

Given the fact that the average of the subjects with results above the average of the sample for Eurofit battery is 5 (1, 3, 4, 5 and 9), it can be estimated that the tests 6 and 8 are close to these

values, the physical condition factors evaluated are consistent with the level of growth and development of the tested subjects.

The absence of programs by which young people at this age should be aware of the negative effects of a low level of physical condition, as well as of methods and means of coping with specific requests.

Recommendations

The assessments regarding the level of physical condition at the level of young people should be correlated with that of the environmental and social factors.

In the situation when it is found out that a part of the young people do not meet the imposed requests, they will be integrated into appropriate training groups in order to improve the level of physical condition.

In order to achieve objective results as well as for an optimal level of physical condition, the tests will be performed and communicated to the tested ones twice a year.

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STUDY ON THE SOCIAL SIGNIFICANCE OF RECREATIONAL SPORT

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SUMMARY

The acceleration of contemporary world events, global social, political and economic transformations that have changed traditions and ideologies into new forms adopted by young generations have also brought new content, methods and skills to the field of physical education and sport that have reformed the system and are able to respond to solving unknowns that have pushed to another stage the practice of sports activities.

The development of information technology has attracted the lack of interest of young people for movement through forms of practice, known as sometimes unattractive.

The purpose of this study is to argue the rethinking of the composition of physical education programs, the discovery of solid evidence based on the reasons for practicing physical sports, the presentation of models to follow and the adaptation of basic structures to human evolution.

Assumption. In this study we tried to find out what are the elements that could motivate students to practice physical sports.

The results we reached after the study confirmed that more and more students prefer to spend their free time with activities other than sports and those who still prefer movement choose activities that offer fun, play and recreation.

Keywords*: recreational sports, physical education, leisure, health.*

INTRODUCTION.

Performing physical exercises can be put into practice in the physical education lesson, as an educational instructional process or by practicing independent sports or leisure activities that can be organized by the school as a sports ensemble, with family, friends, or playing sports.

Time management and the educational program often do not allow young people to practice movement in their free time, they limit themselves to participating in physical education lessons.

Free time is mostly occupied by fun or more attractive, comfortable activities, which often means gadgets and other electronic toys.

Practicing physical exercises by participating in recreational sports physical activities is in the attention of society and especially of the family since the birth of the child and then in all stages of life.

The importance that has movement is found in biological development of the human being and is the natural basis of society and personality development.

In the 21st century, society faces global challenges, such as sedentary lifestyles, obesity, unemployment and conflicts of all kinds. These risk factors are at the heart of the goal of sustainable development, on quality education, which advocates for lifelong learning opportunities and innovative content (Strategy 2014-2021, UNESCO).

During childhood, the tasks of physical education are to ensure the necessary conditions to allow the timely maturation of internal organs, body functions and the optimal development of personality. With the evolution of society, physical demands are influenced by the appearance of negative factors, for a normal physical development and even for health. Physical education in interaction with the other branches of education will include in its educational-formative content new problems, such as those related to hygiene education, sex education, correction of physical deficiencies.

In fact, we live in a world with predispositions to sedentary lifestyles and nervous overload, in which maintaining health and developing motor skills has become a major issue of global educational interest.

Physical exercise and the sport has always been a social activity with real biological character, both contributing to improved qualities motive of man and thereby increase the level and quality of life. From time immemorial, systematic, organized physical exercises have influenced the harmonious growth and development of the body in childhood and adolescence, have contributed to maintaining health and the formation of positive behaviors necessary for man in adulthood.

The practice of some sports is done voluntarily, based on the establishment of objectives that aim to obtain performance or for recreation.

The fundamental characteristics of physical education are the following (Cârstea, G., 2000):

- is physiological by the nature of the exercises;
- is pedagogical by method;
- is biological by effects;
- is social through organization.

According to Prodea, C., (2014) physical education always involves practical and applied activities. This is a fundamental type of motor activity that is carried out on the basis of laws, norms, methodologies, etc., in order to obtain general and special competencies. Physical education comes in two forms: physical education lesson and independently practiced sports activities.

The independent activity of practicing physical exercises should be part of the daily activities of each of us, to be a permanent means that is practiced efficiently and pleasantly in our free time.

The Sports and Fitness Industry Association (SFIA) has conducted an online survey in 39 US states for people over the age of 6 on their favorite sports and other favorite physical activities. A ranking of the first 10 activities grouped by age was prepared and a number of participants participated 287,138,000 subjects.

Swimming is the most popular activity for almost all age groups. Apart from swimming, most options are for outdoor activities. Children aged 6 to 12 are particularly interested in excursions, young people aged 18-24 are more interested in running / jogging. The bicycle is also a more attractive means for adults aged 25-54.

With the development of physical education courses, we proceeded to apply a questionnaire to first and second year students of the Faculty of Law at "Titu Maiorescu" University, on their availability regarding free time and how much they could allocate from this time for physical exercise.

Assumption. We proposed that by analyzing the answers to some questions addressed to students to find out their preferences regarding the ways of practicing sports activities in their free time.

The aim of this study is to optimize the effects of students' physical development and to help encourage as many of them as possible to spend their free time actively.

The research methods used are: pedagogical observation, study of documents and specialized bibliography, questionnaire, tabulation of results, graphic method.

Research objectives

The main objective of the research is to discover the preferences, among students, of those physical activities of a sporting nature that can be practiced in their free time.

Another objective of the research is the analysis of physical activity trends, based on the options registered by students, because they prove receptivity, responsibility for their own training, they are motivated by their interests, motivations, inclinations, aspirations.

Materials and methods.

For data collection we used the survey (based on questionnaire) and the observation method.

For data processing and analysis we used the statistical-mathematical method, the formation of tables and the graphical method.

Subjects.

This study was applied to a number of 240 students in years I and II of the university, during the academic year 2018-2019.

Table no.1 Students participating in the answers to the questionnaire according to the year of study

Years I		Years II	
girls	boys	girls	boys
71	49	64	56
Total = 120		Total = 120	
Total subjects = 140			

Fig. no.1 Graphic representation of the number of subjects, by years of studies

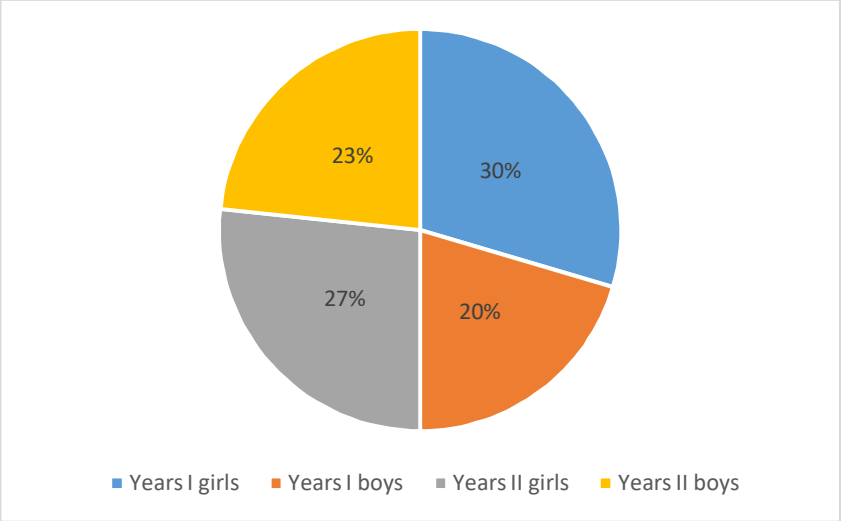
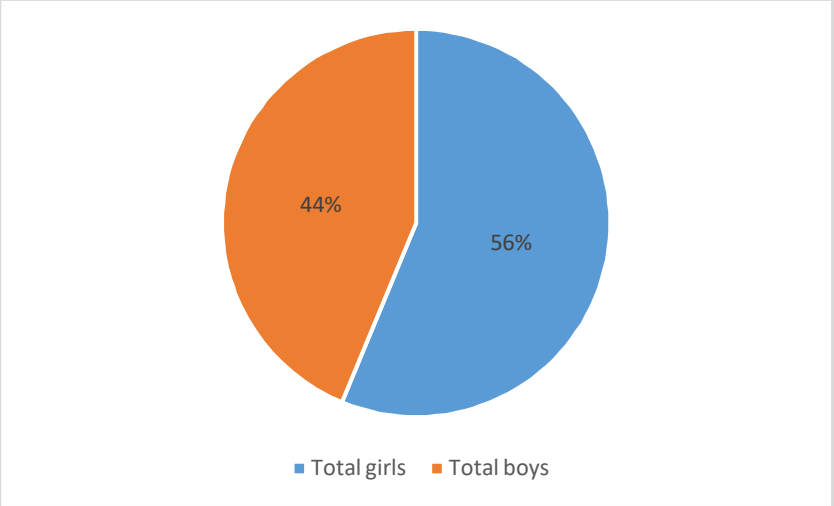


Table no. 2 Students participating in the answers to the questionnaire according to gender

Total girls	Total boys
135	105
Total subjects = 140	

Fig. no.2 Graphic representation of the number of subjects, depending on gender



Results

Of the 12 questions used in the questionnaire, I illustrate the following three questions, which are the most representative:

In question no. 1. How much free time do you have, on average, a day to exercise?

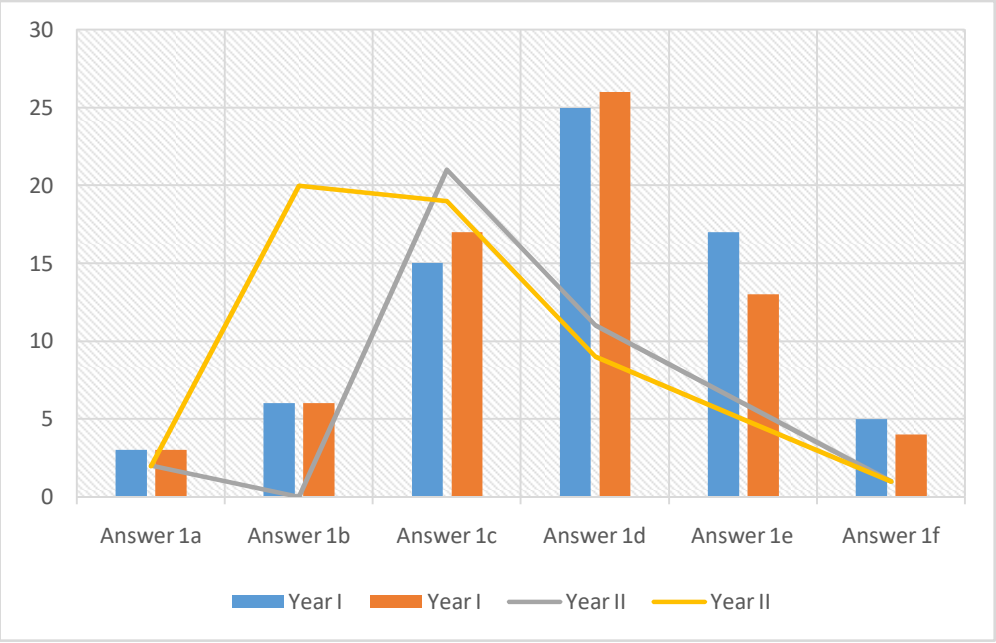
Note: a) do not have, b) less than an hour, c) 1 - 2 hours, d) 2 - 3 hours, e) 3 - 4 hours

f) over 4 hours

Table no.3 Answers to question no.1

Answers	Year I		Year II	
	girls	boys	girls	boys
Answer 1a	3	3	2	2
Answer 1b	6	6	2. 3	20
Answer 1c	15	17	21	19
Answer 1d	25	26	11	9
Answer 1e	17	13	6	5
Answer 1f	5	4	1	1
Total	71	69	64	56

Fig. no. 3 Graphic representation of the answers to question no.



Note from the students' answers that their free time is concentrated in greater numbers around the answers that correspond to the period of less than 1 hour for the second year girls and boys and the first year students allocate approximately 2 hours for the practice of sports activities . Most well it initiates students do not have free time for sports or limited to less than 1 hours.

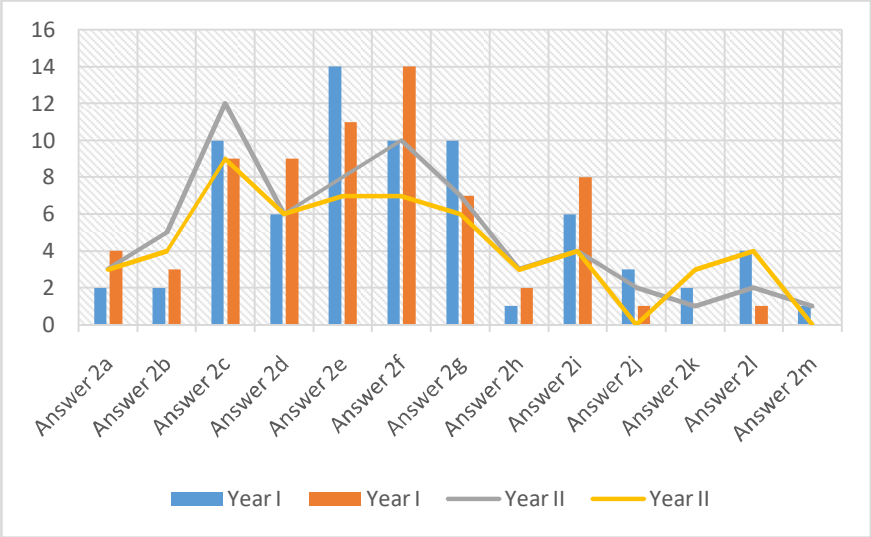
Question no. 2. In what form would you like to practice your physical exercises?

a) gymnastics; b) basic gymnastics c) jogging, running; d) tourism, excursions, hikes, walks; e) movement games, fun; f) aerobic gymnastics, dance; g) sports games; h) swimming; i) table tennis, tennis, badminton; j) martial arts; k) fitness; l) sports; m) chess

Table no. 4 Answers to question no.2

Answers	Year I		Year II	
	girls	boys	girls	boys
Answer 2a	2	4	3	3
Answer 2b	2	3	5	4
Answer 2c	10	9	12	9
Answer 2d	6	9	6	6
Answer 2e	14	11	8	7
Answer 2f	10	14	10	7
Answer 2g	10	7	7	6
Answer 2h	1	2	3	3
Answer 2i	6	8	4	4
Answer 2j	3	1	2	0
Answer 2k	2	0	1	3
Answer 2l	4	1	2	4
Answer 2m	1	0	1	0
total	71	69	64	56

Fig. no.4 Graphic representation of the answers to question no. 2



From the students' answers to question no. 2 it results that most people prefer light sports activities represented by jogging, running, tourism, excursions, hiking, walking, movement games, fun, aerobic gymnastics, dance. Fewer students practice fitness and performance sports.

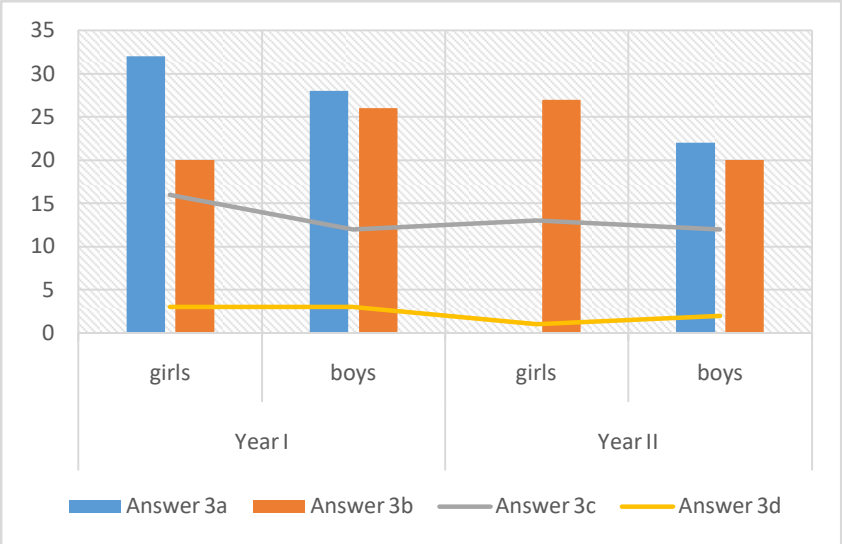
Question no. 3. How important are exercise to you?

a) very important ; b) important ; c) I should pay more attention to the sport; d) not at all important

Table. No.5 Answers to question no. 3

Answers	Year I		Year II	
	girls	**boys**	**girls**	**boys**
Answer 3a	32	28	2. 3	22
Answer 3b	20	26	27	20
Answer 3c	16	12	13	12
Answer 3d	3	3	1	2
Total	71	69	64	56

Fig. no.5. Graphic representation of the answers to question no. 3



From the answers to question no. 3 it results that the students agree with the importance of practicing physical exercises and this determines them to try to make time for this type of activities.

Interpretation of results.

From the answers of the subjects we would notice that the students agree and have a variety of physical activities with sports character and know the consequences of the sedentary lifestyle represented by the lack of movement.

There are some significant differences regarding the occupation of free time with physical activities determined by the sex of the subjects, namely the girls were constantly in second place, they prefer walking.

Regarding the structure of free time and the place occupied by the practice of physical exercises in the leisure budget, they are influenced by how busy the subjects are.

At the same time, the material conditions available to the students, the geographical position, the local tradition, etc. are very important.

Most of the answers received confirm the personal beliefs regarding the practice of physical education, the recognition of favorable influences on health and intellectual performance, which are widely accepted.

Other conditions on which the practice of sports activities in their free time depends are represented by the material situation, the state of health, the favorable climate.

The investigated students mostly prefer the following types of sports activities: fitness, aerobic gymnastics, jogging, tennis, swimming, volleyball, karate, cycling, etc.

Girls generally motivate not to participate in sports activities due to lack of free time, allocating too much space for other sedentary activities.

Subjects who have difficulty practicing sports agree that most often the reasons are: lack of will, material conditions, fatigue after classes, work, financial problems, lack of sports education, poor health.

CONCLUSIONS

Following the study, we appreciate that the practice of physical exercises in the future is part of the concerns, if not daily, at least weekly, of students, this type of activity being a logical and absolutely necessary continuation of the physical education activity.

The physical effort made in the physical education lessons is completed with recreational, disconnecting, diversified activities with an adequate and successful content, able to attract continuous practice throughout life.

At the same time, where possible, universities can motivate students to participate in leisure sports by providing them with their material bases, terrain, halls, trails, swimming pools to offer a greater variety of sports.

In support of the recommendations coming from the educational, social, family environment, it is necessary a continuous information and stimulating actions from the mass media for the knowledge, understanding and acceptance by different categories of the population of the need to exercise in the future in various forms.

We believe that the media, the family, the university need to put more emphasis on creating the environment available for students in terms of the importance of independent exercise in their free time.

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CONSIDERATIONS REGARDING THE EVOLUTION OF ROLLER SPEED SKATING IN ROMANIA

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Abstract

The fact that in Romania, in the last years, this sport has experienced some regression in terms of number of practitioners is trying to establish whether this affects the achieved results, as the vast majority of the clubs that have speed skating sections still work. Sport selection is of particular importance in achieving the best sports performance, which should be carried out on a continuous basis.

This study aims to highlight the evolution of speed skating in our country between 2014-2019, for the senior category, at the national roller speed skating Championship. The events that were targeted in this study are 500m, 1000m, 1500m and 3000m seniors (boys and girls) competitions. The first 3 (or 2, depending on the situation) results per year investigated were collected. The research methods used are: Bibliographic method, data collection and graphical method.

From the data shown above it can be noted that, with the exception of the years 2015/2016 (when poor results are most frequently shown) and in two cases during2018, the achieved results were improved in both girls and boys, in some cases the achieved progress being significant.

Although speed skating in Romania is not a sport as publicized as other sports branches, the results are on an ascending line, in the process of improving, which shows that trainers in our country have a level of knowledge comparable to other countries with tradition in the world, increasing funding and attracting sponsorship is one of the factors that can accelerate the advancement of athletes by increasing cantonal numbers, using state-of-the-art equipment, using effort supporters according to their preparation time and age, etc.

Keywords: *speed skatingevolution, roller*

Introduction

The fact that in Romania, in the last years, this sport has experienced some regression in terms of number of practitioners is trying to establish whether this affects the achieved results, as the vast majority of the clubs that have speed skating sections still work.

Richard J. Fisher and Jan Borms (1994, pp.27) pointed out that "although there is a large amount of information on the psychological and social profile of elite performance, the current knowledge pool does not allow the selection of talented sportsmen to be made solely on the basis of these data".

Madella A. (2000, pp. 75) considers the problem of tracing children with a tendency to certain sports, to be at the center of discussions held by researchers, coaches and federations, international bodies, etc. The same author, Madella A. (2000, pp. 75), argues that the factors most used for the search and provision of talent are: "anthropometric and morphological criteria, conditional capacities, coordination capacities, psychological variables, functional parameters, environmental conditions, tolerance of specific loads and stress".

Psychological factors also play a very important role in achieving world-class sporting performances, the assessment of psychological attributes cannot be done without specialist guidance, because here, as in other areas, certain codes, ethical and procedural, must be respected. Richard J. Fisher and Jan Borgs (1994, pp. 31) considers that once the basic requirements are met, it should be possible to introduce more specialized screening methods, thus constituting more sophisticated profiles of young people involved in this complex process. Sports professionals consider sportspeople as "complex psychological bodies".

Until the results are achieved, speed skating operators must pass several stages, with precise objectives, means and criteria for action which differ from one stage to the next. C.N.E.F.S. (1987, pp. 14-15) classifies the steps above into four stages and shall be carried out according to the specialist federation as follows:

"**Stage I**

Objective: Screening and initiation (minimum duration one year).

- sports training groups in schools (5 hours a week);
- sports associations in schools (6 hours a week);
- local level sections for screening and initiation tasks;
- learning centers for sport branches

Means and criteria for acting:

- the system of assessing the overall physical training of pupils and tracing talent for performance sport;
- training programs for these forms;
- local competition system, at school level.

Stage II

Objective: Admission in organized forms of training, sport training.

- beginner groups for sports unit departments,
- advanced groups for sports units.

Means and criteria for action:

- evidence and rules for selection - general and specific to each sport branch;

- branch-based training programs;
- local and county competitive system.

Stage III

Objective: Promoting and sport training

- the performance groups of the sports unit departments;
- county training centers for the juniors;
- national olympic junior training centers;
- national junior and youth lots;
- exceptions, in national lots of seniors.

Means and criteria for action:

- probes and rules specific to the level for selection;
- branch-based training programs;
- republican competitive system;
- official international competitive system.

Stage IV

Objective: Promoting and sport training

- high-performance groups of the olympic and international-level sections;
- olympic and national lots of seniors.

Means and criteria for acting:

- probeses and rules specific to the level for selection;
- training programs by each branch of sport;
- republican competitive system;
- official international competitive system."

Material and methods

This study aims to highlight the evolution of speed skating in our country between 2014-2019, in the senior category, at the national roller speed skating Championship. The events that were targeted in this study are 500m, 1000m, 1500m and 3000m seniors (boys and girls) competitions. The first 3 (or 2, depending on the case) results per year investigated were collected. The research methods used are: Bibliographic method, data collection and graphical method.

Results

The results are presented in the 4 tables and 9 graphs shown below.

Table 1. Men500m and 1000m results

	SENIORS					
	500m			1000m		
	1st place	2nd place	3rd place	1st place	2nd place	3rd place
2014	0.44.82	0.46.32	0.45.30	1.31.57	1.32.75	1.33.12
2015	0.45.17	0.46.64	0.49.10	1.33.70	1.37.89	1.40.36
2016	0.44.60	0.46.13	-	1.33.13	1.35.26	-
2017	0.43.24	0.44.52	0.44.52	1.28.64	1.29.43	1.31.22
2018	0.43.30	0.43.52	0.43.54	1.28.65	1.30.31	1.30.79
2019	0.42.11	0.46.55	-	1.26.83	1.43.37	-

Table 2. Men 1500m and 3000m results

	SENIORS					
	1500m			3000m		
	1st place	2nd place	3rd place	1st place	2nd place	3rd place
2014	2.21.27	2.22.30	2.28.34	-	-	-
2015	2.23.32	2.31.92	2.33.67	5.15.02	5.30.23	5.39.02
2016	2.25.80	2.35.23	-	5.20.50	5.55.54	-
2017	2.20.54	2.22.60	2.25.53	5.01.74	5.14.24	5.27.37
2018	2.17.41	2.23.70	2.24.16	4.54.45	5.09.27	5.13.29
2019	2.13.65	2.49.15	-	4.53.29	6.04.29	-

Table 3. Ladies 500m and 1000m results

	SENIORS					
	500m			1000m		
	1st place	2nd place	3rd place	1st place	2nd place	3rd place
2014	0.50.10	0.62.32	-	1.39.64	2.11.58	-
2015	0.49.13	0.50.36	0.54.02	1.40.80	1.41.76	1.51.89
2016	0.48.92	0.49.67	0.50.11	1.38.86	1.40.82	1.40.90
2017	0.46.51	0.47.46	0.49.83	1.34.17	1.35.46	1.41.13
2018	0.44.61	0.46.51	0.47.45	1.29.68	1.32.60	1.35.40
2019	0.44.40	0.44.75	0.45.19	1.29.57	1.29.72	1.32.57

Table 4. Ladies1500m and 3000m results

	SENIORS					
	1500m			3000m		
	1st place	2nd place	3rd place	1st place	2nd place	3rd place
2014	2.33.70	3.28.29	-	8.24.24	10.29.76	-
2015	2.33.48	2.35.23	2.55.89	5.23.31	5.33.26	6.12.70
2016	2.33.64	2.36.95	2.38.60	5.23.64	5.33.00	5.34.67
2017	2.26.21	2.26.91	2.34.48	5.07.60	5.11.47	5.28.58
2018	2.20.45	2.21.56	2.27.73	5.07.54	5.11.23	5.11.27
2019	2.18.15	2.21.12	2.21.36	5.02.38	5.04.49	5.17.92

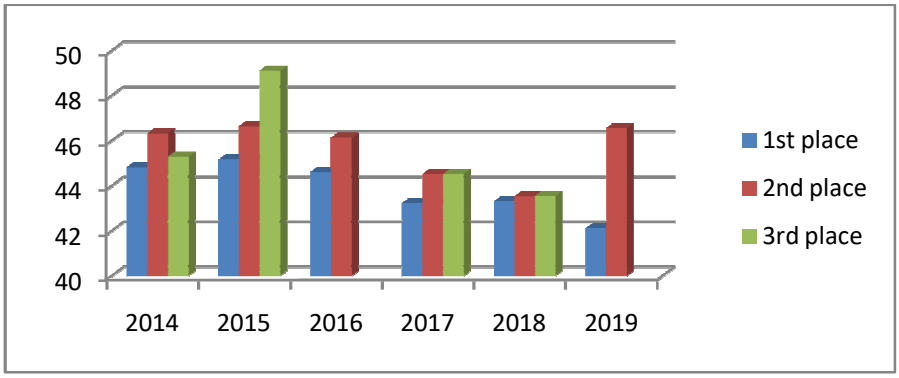

Figure 1. The performance for the 500m Men

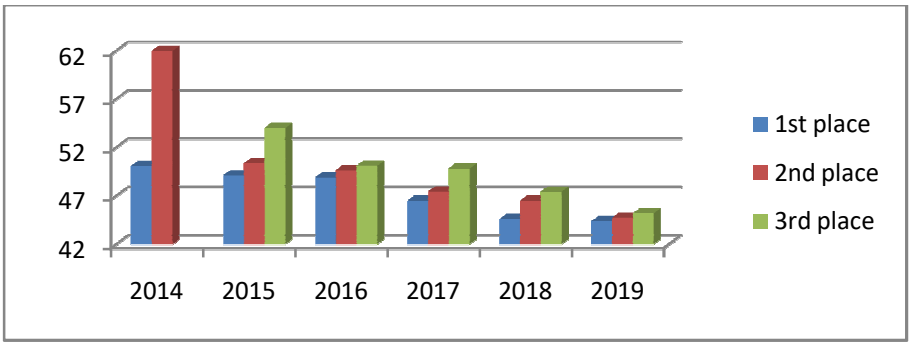

Figure 2. The performance for the 500m Ladies

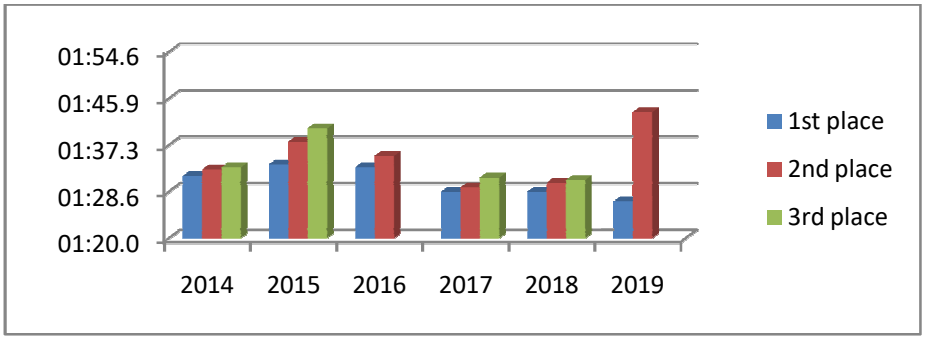

Figure 3. The performance for the 1000m Men

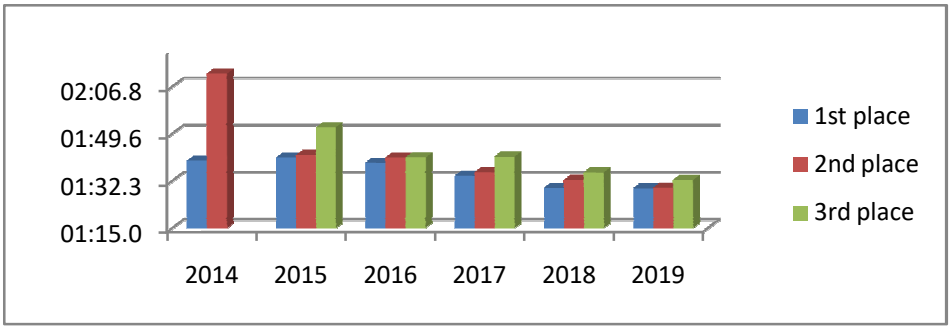

Figure 4. The performance for the 1000m Ladies

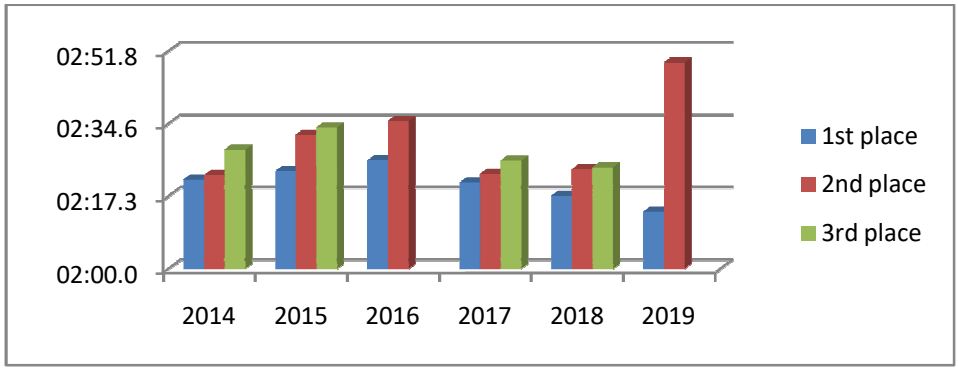

Figure 5. The performance for the 1500m Men

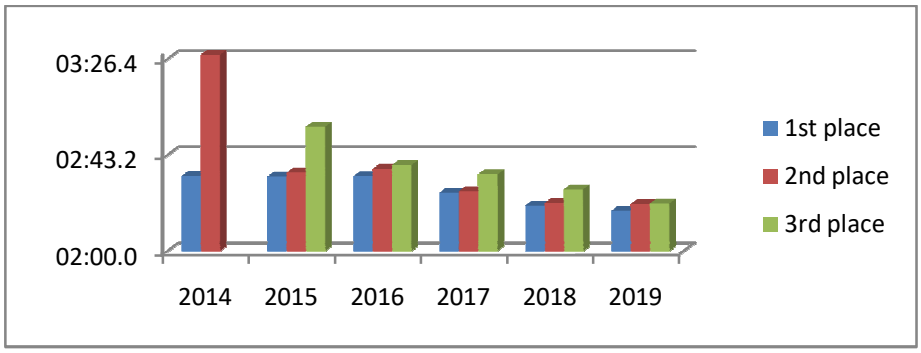

Figure 6. The performance for the 1500m Ladies

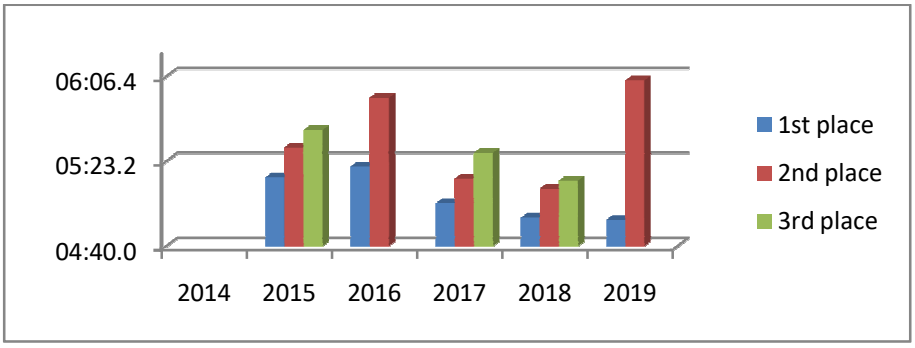

Figure 7. The performance for the 3000m Men

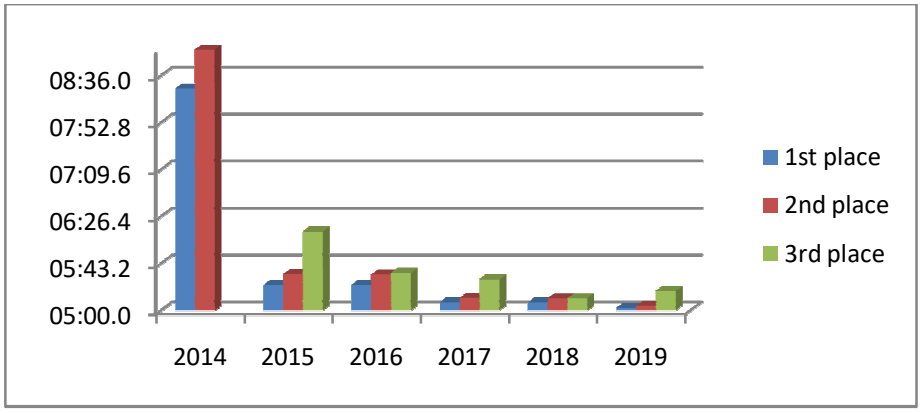

Figure 8. The performance for the 3000m Ladies

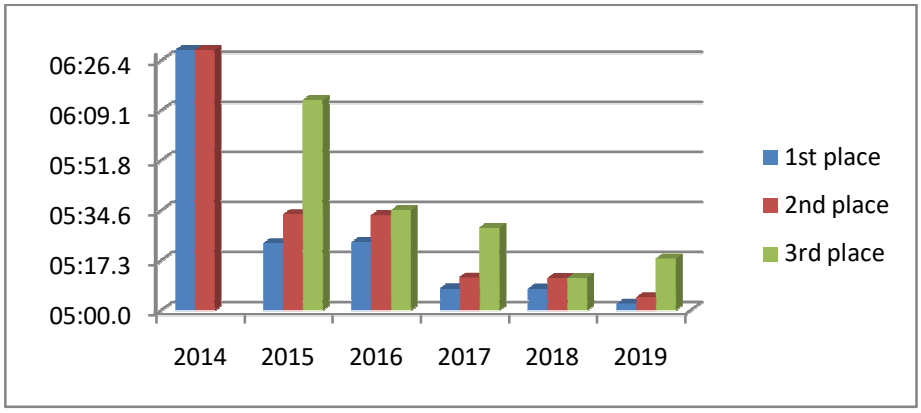

Figure 9. The performance for the 3000m Ladies

Discussions

As shown above, a constant development can be observed in the 500m girl test competition in the 6 years studied, starting from 50,10 sec in 2014 and reaching 44,40 sec in 2019. The boys' competition, with the exception of 2015 and 2018, shows progress, starting from 44,82 sec in 2014 and reaching 42,11 sec in 2019.

The 1000m competition shows a lower result in girls in 2015, and for the rest of all the years studied, an improvement in the results is observed, starting from 1:39.64 min in 2014 and reaching 1:29.57 min in 2019, with considerable improvement in results. In the same competition, in boys, the improvement of the six years is lower compared to girls, except for 2015 and 2018 where the results were worse than the previous year, progress is noted, the results being 1:31,57 min in 2014 and 1:26,83 min in 2019.

The 1500m competition is characterized by a considerable development of results of the six years, with the exception of 2016, as the results have been improved from 2:33,70 min in 2014 to 2:18,15 min in 2019. The 1500m boys' competition is characterized by weaker results in the years 2015 and 2016, followed by a steady improvement in results until 2019. In 2014 the best result was 2:21,27 min compared to 2019 where the result of 2:13,65 min stands out.

The longest distance evaluated is the 3000m run, where 2014 results are low for the girls (8:24,24 min) compared to 2019 where the best result was 5:02,38 min. Excepting 2016 (which' results are close to 2015), for all the years studied, values have improved. In the 3000m boys' competition, the study has been carried out since 2015 because in 2014 there is no data, with the evolution of the best result being constant, except for 2016 where the results are poor. In 2015 the best result was 5:15,02 min compared to 2019 when the result was 4:53,29 min.

Conclusions

From the data shown above, it can be noted that, with the exception of the years 2015/2016 (when poor results are most frequently shown) and in two cases during 2018, the achieved results have been improved in both girls and boys, in some cases the progress achieved being significant.

Although speed skating in Romania is not a sport as publicized as other sport branches, the results are on an ascending line, in the process of improving them, which shows that trainers in our country have a level of knowledge comparable to other countries with tradition in the world, increasing funding and attracting sponsorship is one of the factors that can accelerate the advancement of athletes by increasing cantonal numbers, using state-of-the-art equipment, using effort supporters according to their preparation time and age, etc.

The human resource in Romania is of quality, the athletes in our country achieve good results compared to other countries where this sport is considered national sport and which have much higher funds but also state-of-the-art equipment. I make a parallel to the speed skating on ice, where athletes from our country benefit from specific track training clubs of 400m on average maximum one month per year, compared to countries where training is carried out for 11 months.

Another incentive for children would be to increase the prizes for results achieved at national level and not only at world level, which would even encourage the broadening of the selection base by registering as many children as possible in speed skating clubs as a performance section.

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PRACTICAL ASPECTS REGARDING THE RELIEF OF BACK PAIN WITH THE THERMAL MASSAGE BED

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Abstract

The beneficial effects of massage beds and massage chairs are well known. They are more and more complex but also more accessible for the population. In this study we showed the possibility of introducing the Ceragem massage bed in multidisciplinary programs for pain relief and recovery from back diseases. Although massage beds are frequently used all over the world, they are generally used only for relaxation and there are not many specialized studies that provide details about concrete ways of their use. In this study we presented some general practical aspects regarding the use of this device and a synthesis of its efficiency of integration in physical activity sessions. We made observations during 40 months (2017-2020) over 3600 sessions in which we used the massage bed. These conclusions must be accepted with caution, because they concern only this group of subjects and the study carried out in the specific conditions of adapted motor activities.

Keywords: *Back diseases, elongation of the spine, prophylaxis*

Introduction

Currently Ceragem sells massage beds in about 80 countries. Since 2010, the Korean company has even marketed a luxury model, C, which "incorporates massage and CERAGEM PRESSURE while radiant heat with far infrared is optimized using jade and an epoxy carbon panel".

Recent studies showed that massage is effective in reducing back pain, while heat during massage increases a person's sense of well-being. Ceragem thermal massage bed uses the principles of thermal massage to provide a therapeutic tool for people with medical conditions but it is also a means of prophylaxis for these problems. We noticed a significant reduction in reported pain in the thoracic and lumbosacral areas. Thermal massage with jade increases the production of white blood cells by promoting the rejuvenation of cells in the body. As a result, the body's immune system is stronger and more active. It ensures the health of the musculoskeletal system, metabolism, nervous system and all vital organs of the body. Spinal decompression is performed (A. Chohan et al. in 2014). The efficiency of using this massage bed in pain relief was also demonstrated by Stan Z. in 2019.

The effectiveness of using this device in relation to manual massage is emphasized by Zuzana Heinzovaa, Juraj Borovskya and Petr Pelcb in 2019. Following a study by Lee YH he all in 2011, it turned out that massage and heat applied with a massage bed, 40 minutes a day, in 10 sessions (assessing heart rate variability, sympathetic skin response and serum levels of cortisol and norepinephrine) resulted in relaxation of autonomic nervous system without side effects. In the case of post herniated disc diseases, by restoring the normal position of the vertebrae, a massage bed becomes a powerful tool in the fight against the hernia itself and its unpleasant consequences. The massage rollers roll over the entire dorsal area and gently stretch the spine. This eliminates the movement of the vertebrae, pinching and pressure on the nerve endings thus revitalizing the nervous system as a whole. The intervertebral cartilage and discs are restored, the symmetry of the pelvic bones and humeral returns, while infrared heating suppresses inflammation, stimulates blood circulation and metabolism (budivel.ru/)

In 2010, Marienke van Middelkoop et al., studied the application of multidisciplinary treatment (transcutaneous electrical nerve stimulation, low-level laser therapy, education, massage, behavioural treatment, traction, compared to behavioural treatment). It has been found that multidisciplinary treatment reduces pain intensity and short-term disability) and that degeneration of the vertebrae and discs and misalignment of the spine is considered to be the cause of many health problems. When the spine is deformed, the intervertebral spaces change and can cause pressure on the nerves. It is possible that some treatments, performed slowly by certain mechanical devices may have a very good effect on the rearrangement of the vertebrae. At the same time, it can help relieve muscle pain, correct body posture, promote blood circulation, improve muscle stiffness, etc. (drhealthbenefits.com)

Methods

The study includes observations made in over 3600 sessions in which we used the massage bed, during 2017-2020 (approximately 40 months). We selected 64 adult subjects who followed the program of adapted motor activities for at least 18 months. At the beginning of the program, they performed 3 sessions per week and, depending on the condition and the progress registered, we set only one 90 min session per week for maintenance. We didn't include in this study people who performed a smaller number of sessions, who had conditions that were within the prohibitions of the device, children and those who did not want to include this method in their training program. The use of this method of recovery and relaxation is closely related to exercise programs that have the role of stabilizing the alignment of the spine in terms of muscle-joint. The massage bed is very effective only together with a customized program, with physical exercises to maintain the correct positions during elongations and traction performed by it. In

addition to physical exercises, acupressure, inversion bed, vibromassage, TENS, analgesic stations, isokinetic bands, medical orthotic insoles or electroacupuncture can be used in the same time.

CERAGEM MASSAGE BED MB - 1101 **(ro.ceragem.com)**

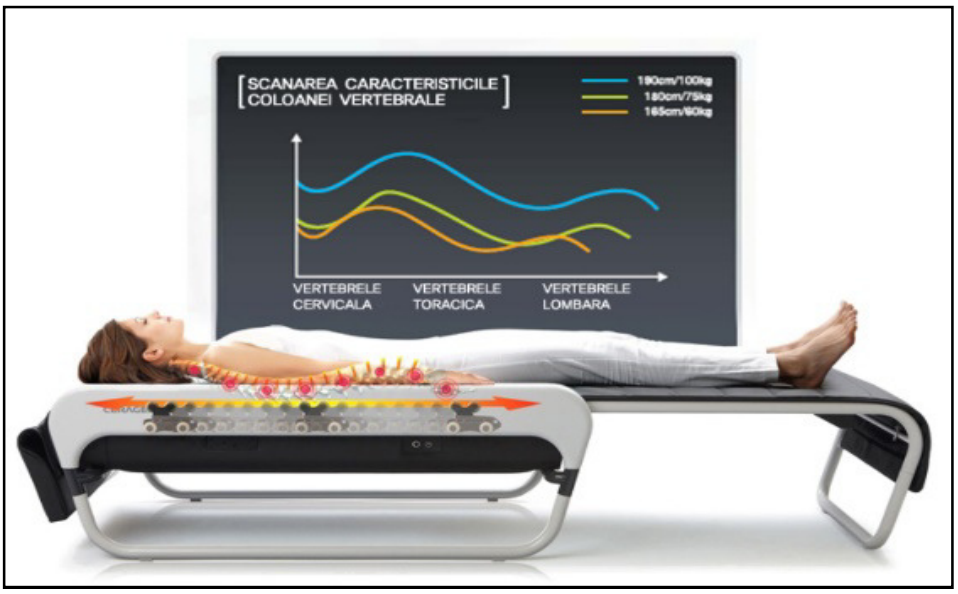

Figure 1. Ceragem Massage Bed

The bed's internal projector moves along the spine from the cervix to the pelvis and analyses the length and curves of the spine to perform a proper body massage. The internal projector descends from the cervical vertebrae and reaches the coccyx to stimulate the different points of application of the spine in each of us, namely the points of application located on the muscles that support the vertebrae (figure 1).

Figure 2. Programs accessible thru the remote control

Figure 2 shows the accessible programs: Relaxation, Circulation, Energy, Deep Sleep, Stability, Health, Concentration, Balance, Manual, Semi-automatic. Spine scanning is performed as the internal projector moves along the body from head to pelvis while the length of the spine and the degree of curvature of the spine are measured to suggest a massage that best fits your body. The curves of each subject using the bed are measured. Working between the cervical vertebrae and the coccygeal vertebrae, the internal projector also stimulates points along the spine that vary from person to person, especially the pressure points in the muscles on the sides of each vertebra. (www.bodycurehealth.com)

Results and Discussions

Body pain and especially back pain is a result of the following conditions of the subjects: dehydrated intervertebral discs; compressed intervertebral spaces; intraspongios hernias in the dorsal area; disc protrusions in the dorsal and lumbar area; post herniated disc recovery in the lumbar area; pain in the sacral and coccygeal area; pain in the knee area (internal and posterior) in the lower limb (usually in the MI opposite the right arm) associated with pain in L5-S1 on the same side; pain and contractions in the calves; heel pain; pain in the scapular girdle and in the MS, bursitis in the scapular girdle, etc. After the complete evaluation, we established a program of adapted motor activities. Next, we presented the general structure of a program and the practical way in which the massage bed was integrated in close correlation with the other methods. We also listed the stages and the way in which each stage was applied as well as the percentage covered by each activity.

Stage 1. Evaluation of the health condition at that moment, synthesis of information from medical doctors and other therapists, recovery methods used until that moment, results obtained and motor and functional evaluation performed in the room.

Stage 2. In the first sessions, after the evaluation stage, we established the program of adapted motor activities. According to the health condition, out of the 64 people, we included the massage bed as follows (diagram 1): at 34% after 1-2 sessions; at 12% after 3-4 sessions and at 54% we introduced the bed right from the first session, under certain conditions.

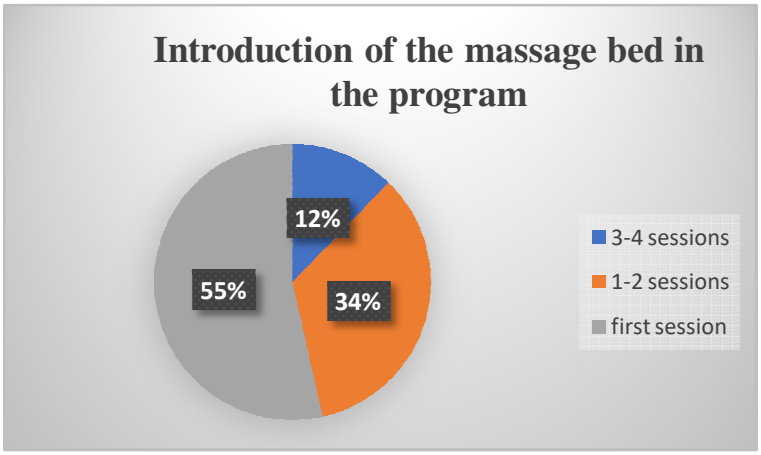

Diagram 1. Introduction of the massage table in the program

Step 3. Once we established if the subject has no prohibitions to perform this type of massage (there are prohibitions very clearly specified in the technical manual of the device), we assessed of how it supports this type of massage. Depending on the rigidity of the spine, the pain perceived during the pressure of the jade rollers on the muscles, the muscle-joint elasticity, etc., we established under what conditions the available automatic massage programs was performed.

For this purpose, we first adjust the pressure, using the manual control from the remote control. If the physical impact was too high, we placed over the trolley roller a blanket folded in 2 or even in 4. We avoided the painful areas, set the sensitive areas and pain radiation points in case of compressed nerves in the intervertebral spaces.

The duration of this first direct contact with the massage rollers was between 10 and 20 minutes. We perform the manual directed massage at level 1 of intensity so that the impact is as small as possible. In 56% of the subjects, only one manual directed session was needed, in 14% 2 sessions were needed and in 30% a period of body accommodation in 4-5 sessions was needed (diagram 2).

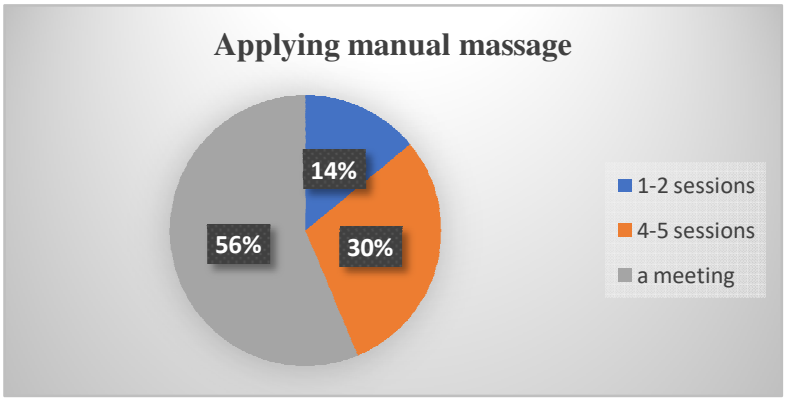

Diagram 2. Applying the manually directed massage, level 1 of intensity

Step 4. In the following sessions, we applied the short automatic massage program of 18 minutes. It is a relaxation program and the massage rollers do not perform acupressure. They just massage the paravertebral muscles and elongate the spine, area by area. It starts with level 1 intensity. Diagram 3 shows that 59% of those subjects needed 1 or 2 short sessions and 41% needed 3-4 sessions. These short automatic massage sessions, without putting high pressure on the curves of the spine, are performed in any of the other stages when the subject is in a more delicate health condition. At any time, the massage on this bed can be excluded if the situation requires it.

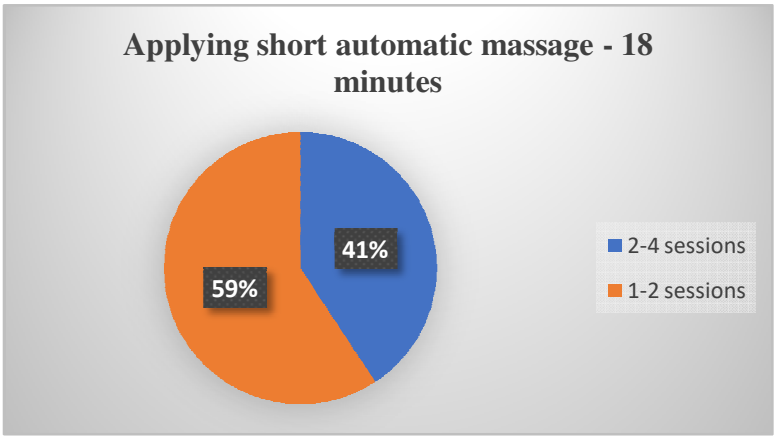

Diagram 3. Application of the short automatic program (18 minutes)

Stage 5. In diagram 4 we observed how many sessions were needed at intensity level 1. The programs were individualized, they were at the maximum duration (36 minutes,), heat and acupressure were applied (depending on prohibitions). Thus, only a small percentage (5%) needed only 1-2 sessions, 13% 5-6 sessions, 39% 10 sessions and 43% needed 15-25 sessions before reaching the level 2 intensity.

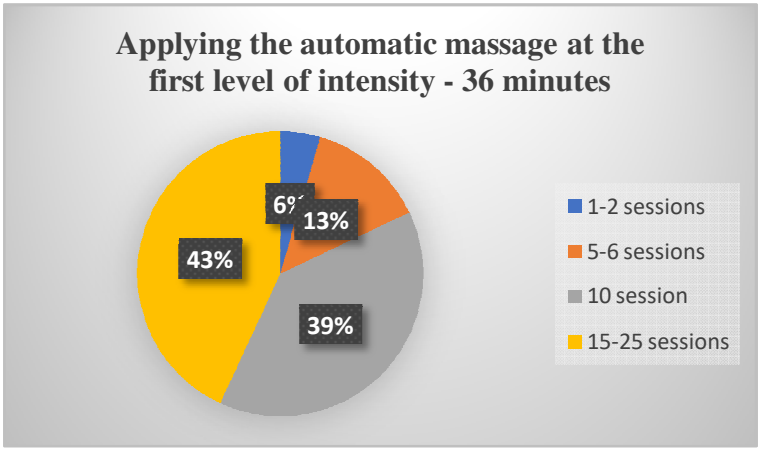

Diagram 4. Application of individualized massage, complete program, level 1

Stage 6. The advanced stage. Diagram 5 shows what percentage of those observed reached the maximum level of this device (level 6). Thus, it is observed that 42% did not reach the last level, 39% reached level 6 after 80-90 sessions and only 19% in a relatively short time (30-50 sessions).

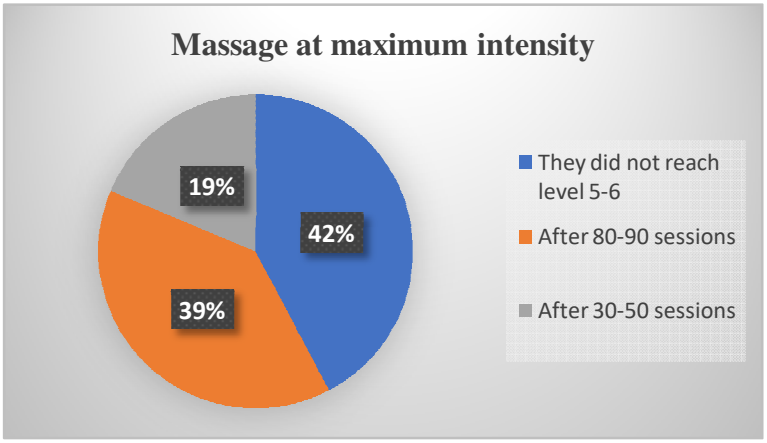

Diagram 5. Applying the complete massage at maximum intensity level

These stages are a result of our practical activity and each of them represents only a part of the 90 minute session. It is not effective to apply this type of massage without support with individualized exercise programs, except for healthy people who want to perform a complete relaxation session. Any correction of the curves of the spine with this massage only, is maintained just for a short period. The deficient position of the body is installed in time and it takes patience and a lot of work to correct as efficiently as possible everything that needs to be corrected. Since 2000, Jang Jun-Hyuk et al., Have demonstrated the effectiveness of this system of massage and elongation of the spine, with effects on pain in the cervical area and the entire

posterior area. They also observed effects on mental stability and recovery from fatigue. C. So et al. in 2007, highlights the effect of thermomechanical massage on the function of human immune cells. Contrary to these studies, there have been observations that there may be side effects on those who use this massage system (www.chinacsr.com). Because there have been several incidents in Romania, it is very important that those who use this device do not forget that it has enough contraindications and that they must be strictly observed.

Conclusions

The results of this study can help specialists who want to use this type of massage, elongation and pressure on the spine. We noticed that a long period of time is necessary for a body to restore the correct alignment of the vertebrae, to increase its musculoskeletal mobility so that the massage can be performed at maximum intensity (80-90 sessions). The use of this very useful device must be made respecting all the rules required by the manufacturer and in very strict relation to the real possibilities of acceptance of the subjects. In this study we highlighted the importance of designing a detailed program for applying this massage and using exercise programs in parallel. The results are perceived quickly, sometimes even from the first session, but they have no effect without physical support. Those who want to restore their posture, to improve certain conditions caused by the pressure of the vertebrae on the nerves, must allocate enough time and complete the work at the gym with a minimum program of physical activity at home. In future studies we can detail each model of improvement with the help of the massage bed of the various deficiencies mentioned in this study.

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CHANGES IN THE 2019-2020 COMPETITION SEASON, IN THE NATIONAL HANDBALL LEAGUE, AS A RESULT OF THE COVID-19 PANDEMIC

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Abstract

The crisis launched by the COVID-19 had immediate consequences in all areas of activity, including the sports world. If initially in Romania the handball matches were played without spectators, then they were stopped, the players being forced to preventively isolate themselves at their homes. The first objective of this research is to identify and analyze the Romanian Handball Federation's decisions taken at the beginning of the pandemic and the second objective is to identify the structural differences between a normal competitive season and the competitive season affected by the Covid-19 pandemic, in Romanian handball.

Key words: COVID-19 pandemic, handball, home isolation, competitive season

Introduction

On March 16th, 2020, on the territory of Romania, the State of Emergency was established for 30 days, caused by the COVID-19 pandemic which then was extended until May 15th, 2020, after which the state of alert has begun. At the beginning of the quarantine, the entire world has experienced unusual living situations imposed by both the restrictive rules in order to protect the public health, as well as for the fear of unknown and danger of the new virus, aspects which led to imbalances on all levels of social life. One of them was the level of physical activity. Home isolation implied limiting and even complete disappearance of outdoor movement, in order to reduce the risk of infection. For a good organization and development of practicing physical exercises some hygienic conditions should be met to strengthen the body's resistance to disease and help to harden the population's body: "performing physical exercises with rational exposure of the body to the sun, combined with practicing exercises in fresh air and using different processes of friction with water, baths in water" are the most efficient methods [1]. Taking into consideration these specifications, living in a home with a yard allowed during this period a more efficient and hygienic organization of physical activities than living in the apartment.

In performance sports, the training of athletes under normal conditions became impossible and thus, the necessity of continuing the training session was raised, according to individual plans

adapted to the period of the current competitive season, with regard to a possible resumption of activity. Coaches were forced to send individual training protocols, adapted to the needs of the athletes and the training conditions they had at home.

In this study we suggest the following:

- Filing and presenting the decisions taken by the Romanian Handball Federation in the context of the pandemic.
- Presenting the changes brought in the structure of the 2019-2020 competition season, from the National Handball League of Romania, as a result of the pandemic.

Methodology

In order to collect the necessary data, we have accessed the Romanian Handball Federation's website and the Ministry of Youth and Sport's website. The keywords that we have introduced for the search were: handball, pandemic, coronavirus, COVID-19, home isolation, quarantine.

Results

Approaches of the Romanian Handball Federation in the pandemic

Table 1. The decisions made by the R.H.F. during the State of emergency, arranged chronologically, by the authors

Date	Decision
01.03.2020	Last official stage Division A men (- 5 stages)
07.03.2020	Last official stage Liga Florilor MOL (*Romanian First League of Women's Handball*) (- 7 stages)
08.03.2020	RHF decides to limit the number of people present in the room to 1000
11.03.2020	Last official stage Division A women (- 3 stages)
12.03.2020	Last official stage Liga Zimbrilor (*Romanian First League of Men's Handball*) (- 3 stages)
13.03.2020	RHF stops all handball competitions until 31.03.2020
19.03.2020	RHF suspends all sports competitions until the end of the State of emergency
13.05.2020	Resumption of training in the case of individual outdoor sports [2]
18.05.2020	The decisions of the Management Board of the R.H.F. on the end of the 2019-2020 season and the organization of promotion tournaments [3]
04.06.2020	Resumption of training in the Romanian handball under certain conditions
15.07.2020	Resumption of team sports, under certain conditions [4]
24.08.2020	Cancellation of the promotion tournament [5]
15.09.2020	Stage 1 in Liga Zimbrilor
14.10.2020	Stage 1 in Liga Florilor MOL

The 2019-2020 handball competitive season was severely affected and it ended ahead of term (March 11th, 2020) and the Romanian Handball Federation will take decisions (Table 1) under the law, in the letter of the law and of international handball regulations, with the recommendation to all participants in handball to strictly respect the measures imposed by the authorities, in order to combat the coronavirus epidemic (Dedu, 2020) [6]. Any form of competition or training activity was forbidden and the players were sent home.

Following the suspension of all sports competitions organized under the auspices of the R.H.F., Asociației Județene de Handbal (*County Handball Association*) and Asociației de Handbal a Municipiului București (*Bucharest Handball Association*), the season in Romania ended without awarding any titles/medals. At the same time, R.H.F.'s Management Board decided on May 18th, 2020, that no team will be demoted from Division A, but a promotion tournament will be organized so that the first three teams from Division A can enter the National League and at the level of Liga Florilor and Liga Zimbrilor, the Federation decided with 11 votes "for" and 5 votes "against" to stop playing the rest of the remaining matches and to end the championship without awarding a title and medals [3].

The decisions that were taken overturned the calculations and objectives of many teams which fought at a high game level almost the entire season, with great physical and psychological stress, having as objective winning the Championship, the Cup and qualifying in major European competitions such as the Champions League. The dissatisfaction and frustration of some players were publicly expressed: "It is an unfair decision which puts us at disadvantage. We were the favourites to win the title this season and the only reason for which we were in 2nd place at this moment is that we had a match less disputed than other teams. A backlog we would most likely have won" […] "the disappointment is not awarding the title, but determining the 1st place which means direct qualification in the Champions League!" [7]. Sponsors, players, coaches, managers, and supporters should have accepted the fact that the performance objectives proposed at the beginning of the season could no longer be touched.

As a result of the Government's decision, the RHF decided to resume sports activity under certain conditions on June 4th. Subsequently, the promotion tournament was abandoned due to the withdrawal from the competition of 4 teams out of the 8 qualified. Thus, CSM Galați, Activ Prahova Ploiești, Dacia Mioveni 2012 and Crișul Chișineu Criș have promoted directly to the National League without any of the games being disputed.

Due to the fact that the teams' activity could not be carried out according to the usual preparation plan and the risk of infection in case of contact sports was still big, the RHF postponed the beginning of the new competitive season until September for men and October for women.

Planning and periodizing the sports training in handball in Romania, for the 2019-2020 edition

In the specialised literature, the process of planning is regarded as a way of manipulating the training in accordance with the specifics of each sport. This aims at the physiological reaction to the respective training plan, in order to achieve the highest possible performance [8].
Periodizing and planning of training must have, as a final goal, obtaining the sports form in the moments of maximum competitive importance. That is why, in 2015, Vărzaru, C. [9] suggested that the essential aspects that must be taken into account in order to realize optimal planning are "developing an optimal ratio between the parameters of the effort, depending on the specifics of the preparation stages of the macrocycle, the individual particularities of the component players of the team, with permanently respecting the characteristics of the effort in the handball game". Moreover, we believe that it is important that coaches should know the principles of training, their effects, as well as their characteristics and tendencies of the handball game which can be observed especially on the occasion of major world competitions, like the Olympic Games, World Handball Championship, European Handball Championship, Champions League, etc.
The official competition calendar established by the Romanian Handball Federation contains a period of 9 months from the beginning of September until the end of April in the case of Division A and the end of May for the National League. During this interval, a break is set in the national calendar for official matches between December-January when major international competitions are scheduled, like the European and World Handball Championship, both for men and women.
The program for the National League and Division A (women and men) set by the Romanian Handball Federation is structured on two and four competitive periods in the home-away system which requires the use of the bi-cycle profile for both Liga Florilor and Division A. The difference between the two competitions is that in the second division there are two home and two away, due to the smaller number of participating teams compared to the National League (6 instead of 14). Each macrocycle contains three distinct periods: training, competitive, transition (Table 2).

Table 2. The usual structure of a handball competitive season in the National League

MACROCYCLE 1					MACROCYCLE 2						
JULY	AUG	SEPT	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUNE
Training Period		Competitive Period		Transition Period	Training Period		Competitive Period				Transition Period

Due to the pandemic, the annual planned training for the 2019-2020 edition of the National Handball Championship experienced for the first time structural changes, like:

- conditioning the organizing system of competitions and subsequently the forced termination of the competitive period;
- failure to achieve performance objectives;
- lack of complete and objective analysis of individual and collective performances, etc.

The competitive period from the second macrocycle of the 2019-2020 edition ceased ahead of term making way for the transition phase. This coincided with the home isolation, situation imposed by the state of emergency set between 11 of March and 15 of May 2020.

Table 3 contains the changes brought to the 2019-2020 edition (National League) by the new coronavirus pandemic and we can easily notice the fact that the main change has occurred during the transition period which was extended three times than the normal period, while the competitive period ceased with approximately three months ahead of term.

Table 3. The structure of the 2019-2020 competition season in the National Handball League, modified following the COVID-19 pandemic

MACROCYCLE 1					MACROCYCLE 2						
JULY	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUNE
Training Period		Competitive Period		Transition Period	Training Period		Competitive Period	Transition Period			Training Period

The women's and men's handball teams from the National League and Division A of Romania have played the last matches:

- Liga Florilor MOL – 7 March 2020, stage no. 19, 7 stages ahead of term;
- Liga Zimbrilor – 12 March 2020, stage no. 23, 3 stages ahead of term;

- Division A women – 11 March 2020, stage no. 17, 3 stages ahead of term;
- Division A men – 1 March 2020, stage no. 15, 5 stages ahead of term.

Conclusions

The Romanian Handball Federation took a series of measures according to the law in order to eliminate the risk of infection with the new coronavirus. As a consequence, any form of training and competitive activity was forbidden and the athletes were sent into quarantine at their homes. One of the most controversial decisions taken by the RHF was ending the competitive season 2019-202 without awarding titles and medals which caused dissatisfaction among athletes and the management of leading teams in Romania [7].

Another consequence of the pandemic was the withdrawal from the championship of some teams which qualified in the promotion tournament in the National League. This situation allowed the RHF to drop out of the promotion tournament.

In the normal structure of the women's handball competition season from the National League of Romania, the main change was made in the case of the transition period which was extended three times over the normal period, while the competitive period was ceased with approximately three months before its term.

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