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- Savremeno fizičko vaspitanje i zdravlje mladih
- Studentski sport kao faktor zdravog življenja
- Sport u funkciji rekreacije građana- stanovništva i zdravlja
- Sportsko- rekreativne aktivnosti kao faktor borbe protiv stresa
- Primjena sportsko-rekreativnih aktivnosti u promjeni načina života ljudi
- Moderne sportsko-rekreativne aktivnosti (fitnes, ekstremni sportovi i dr.) I zdravlje vježbača
- Korektivna gimnastika i kineziterapija u otklanjanju posturalnih poremećaja
- Sport osoba sa posebnim potrebama u funkciji osposobljavanja za život i rad
- Sport invalida kao faktor zdravlja i resocijalizacije
- Vrhunski sport i zdravlje
- Ostale aktuelne teme vezane za sportske nauke i zdravlje
- Preschool education in the function of child development
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- Top sport and health
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Poštovani čitaoci,

Pred vama je novi broj Časopisa ''Sportske nauke i zdravlje''. U jedanaestoj godini izdavanja Časopisa i dalje smo uzbuđeni i odgovorno pristupamo pripremi radova za objavu. Sa velikom odgovornosti i sa velikim entuzijazmom i dalje nastavljamo da radimo. Uvrštavanjem našeg Časopisa u Scopus citatnu bazu dobijamo novi zamah i očekivano nam pristiže veći broj radova.

U ovom broju izabrali smo 11 radova naučnika iz Alžira, Crne Gore, Hrvatske, Italije, Srbije i Bosne i Hercegovine. Tematika radova je raznovrsna: ritmička gimnastika, tenis invalidnih osoba, korisnička evaluacija sportsko-rekreativnih programa, morfološke karakteristike kao prediktivni faktor biotičkih motoričkih znanja, razlike u motoričkim sposobnostima učenica, sportašica i nesportašica, sociodemografske varijable, perfekcionizam, anksioznost i somatizacija kao prediktori uspjeha odbojkaša, uticaj trenažnog procesa na stabilnost i mobilnost lokomotornoh aparata, valorizacija upitnika za mjerenje kvaliteta usluga u plesnom klubu, trkačke performance evropskih i latinoameričkih fudbalera, uticaj škole sporta na status svoda stopala, motoričke sposobnosti i morfološke karakteristike i korektivna gimnastika kao obavezan predmet za učenike i vaspitače.

Zahvaljujemo svim autorima na saradnji. Zahvaljujemo na svim dobronamjernim komentarima, kako bismo bili još bolji.

''Nauka i literature nisu dvije stvari, nego su dvije strane jedne stvari''. (Thomas Huxley, 1825-1895)

UREDNIŠTVO ČASOPISA

Dear readers,

In front of you is the new issue of the Journal "Sports Science and Health". In the eleventh year of publishing the Journal, we are still excited and responsibly approach the preparation of papers for publication. We continue to work with great responsibility and great enthusiasm. By including our Journal in the Scopus citation database, we are gaining new momentum and, as expected, we will receive a larger number of papers.

In this issue, we have selected 11 works by scientists from Algeria, Montenegro, Croatia, Italy, Serbia and Bosnia and Herzegovina. The topics of the works are diverse: rhythmic gymnastics, tennis for the disabled, user evaluation of sports and recreational programs, morphological characteristics as a predictive factor of biotic motor knowledge, differences in motor abilities of students, athletes and non-athletes, socio-demographic variables, perfectionism, anxiety , the impact of the training process on the stability and mobility of locomotor apparatus, valorization of questionnaire to measure the quality of services in the dance club, racing performance of European and Latin American football players, the impact of sports school on the status of the arch, motor skills and morphological characteristics educator.

We thank all the authors for their cooperation. Thanks for all the well-meaning comments, to make us even better.

"Science and literature are not two things, but two sides of one thing." (Thomas Huxley, 1825-1895)

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A field study conducted on the beginners of artistic gymnastics at Al-Afaq Mostaganem School

The effect of a mental perception training program on improving the level of skillful performance of some ground movement apparatus skills among artistic gymnastics beginners (11-12) years

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Abstract: *This study introduces one of the modern techniques in the field of cognitive psychology and complements to the training process for artistic gymnastics coaches, in order to develop the level of athletic performance and skill performance in general.*

In particular, the study contained two homogeneous and equal groups, one experimental and the other controlled. The researcher applied a training program on the skill of mental imagery accompanying the skill training on the experimental sample consisting of (8) juniors in artistic gymnastics, to know the effect of this type of training in developing the level of skill performance of some basic skills on the ground movement apparatus (wheel with quarter turn – back flip – back somersault straight).

The duration of the program was defined as (08) weeks at the rate of (03) training units per week, and the units of the proposed program included exercises (muscle and mental relaxation, basic mental imagery and multidimensional mental perception).

The results indicated that there is a positive direct relationship between the development of the level of mental imagery and the level of skill performance of the motion skills under study.

Accordingly, the researcher recommends the need to incorporate such mental programs while planning various preparation programs, in order to develop the mental abilities of athletes to improve the level of skill performance.

Keywords: *progressive relaxation, mental perception, skill performance, floor movements, artistic gymnastics.*

Theoretical aspect Methodological steps for the scientific article

Introduction and the study's problematic

Men's artistic gymnastics is a competitive sport activity that is important in the competitive world and Olympic fields, and in which players compete on six devices where the nature of performance on each machine varies according to the geometric elements of each machine.

Floor movements are the mainstay of all gymnastics movements, and considered as a preparation for the gymnastics movements by machines, beginners start to learn them in a young age, and in order to get the player to perform ideally with the least muscle effort, modern techniques should be adopted during the preparation stages. The training of mental skills such as relaxation, mental imagery and focusing attention are one of the most important ways to help achieve skill and movement requirements in a good and fast way. (Mohamed Hussein, 2009, p. 56).

Performance on floor movements machine is linked to certain motion paths that depend on the connection between brain and motion performance, which requires the player to be fully focused, good with visualization and linking motion skills to each other so that he can perform a dynamic skill. So, the physical and skill preparations on this machine are not enough to excel and make achievement.

Mental imagery in the athletic field is a type of mental process and an important technique when retrieving or recalling the experiences of an individual's learning that draws a memory image of the movement or skill to be performed which improves the performance of the movement or skill. (Kassem, 2005, p. 226)

In light of this, Allawi (2002) emphasized on the importance of mental imagery as a key element in developing motion skills and performance, and plays an important role in developing players' abilities and level, and has many benefits in learning motion skills, and that the movement's pre-training eases the development of movement's guidelines to stabilize them" (Allawi, 2002, p. 14)

And through the work experience of gymnastics training researchers and their field knowledge on the content of training programs for some gymnastics trainers, they noted that most of their main focus is on physical, professional and planning aspects, with complete disregard for the mental aspects that should go simultaneously with other methods of preparation. Mental aspects are an integral and essential complement to the training process.

And relying on what is mentioned above and taking by the opinions of experts and specialists in the field of athletic psychology and motion learning, researchers tried with this study to highlight the positive impact a mental-imagery based training program on developing the skill performance of some skills of the floor mat set is for beginner of artistic gymnastics (11-12) years.

The practical aspect

Research methodology: The researchers relied on the experimental method with its scientific steps for its suitability to the nature of the study and its objectives.

Appropriate experimental design: The researcher chose the experimental design with the two equal groups (controlled, experimental).

Research community: It was represented in all the beginners of the artistic gymnastics of the Al-Afaq School in Hai Tajdid Mostaganem, with a number of 30 players.

Sample research: The main research sample consisted of 20 youngsters of artistic gymnastics at Al-Afaq Mostaganem School, who were deliberately chosen, as they were divided into two equal and homogeneous groups, and each group consisted of 10 players.

Data and Information Collection Tools

Morphological measurements

The length in centimeters of the (body, arm length, torso length, leg length) and body weight in kilograms, chronological age in year, and the training age.

Skills tests

Through the researchers' access to the various sources, a set of floor movement device skills was obtained, which was presented in a survey form 5 experts in gymnastics, and accordingly the skills were nominated for which more than 80% of the judges agreed, and thus the study concluded that the following skills were identified: (wheel with quarter turn – back flip – back somersault straight – somersault).

Preparation of the skills performance assessment form

A form was prepared to evaluate the motion skills under study and it was divided into three sections (preparatory section, main section, final section), and the skill degree was determined from (10) grades, and each section had a specific grade, and the type of error and the value of the discount were suggested and then presented to 5 experts specialized in international arbitration of gymnastics, after the experts' agreement, the final score for each skill section was fixed, the discount value was determined for the type of error, and its final form is shown in Table (1).

Table 1. *Arbitration system*

Skill sections	Grade	Overall grade	Error Type	The value of the discount
Preparatory Section	3	10	Simple	0.10
Main Section	5		Medium	0.30
Final section	2		Large	0.50
			Fall	1

Evaluation of skill Performance

The researchers filmed the motion skills under study in the form of a video and presented them with a form of evaluation of the level of performance on 4 experts specialized in international arbitration law for gymnastics, where

the highest and lowest scores were disqualified and the average of the two intermediate scores was calculated according to Article 11 of the law.

Scale of mental imagery in sports

Through the researchers reviewing previous references and studies that dealt with the mental training in sports, they selected the mental imagery scale designed by Martinez (1982) and the Arabization of Osaama Ratib (2000) and its paragraphs were reformulated by Diaa Jaber (2002), due to the ease of its paragraphs. And it measures the degree to which a player can use senses during mental imagery and consists of 4 dimensions (visual perception, auditory perception, kinesthetic perception, emotional perception) and 4 situations (practicing alone / practicing with others / watching a colleague / performing in a competition).

Statistical methods used in the study

The researchers in this study relied on the (Spss19) program to calculate: the arithmetic mean, standard deviation, T-test for the significance of differences, correlation coefficient.

The devices used in the study

Floor movements device, wall bars, Swedish seats, stopwatch, Restameter, medical scale, video camera.

The proposed mental imagery program

The researcher determined the content, time, dimensions, and objectives of the mental imagery program through a reference survey of the most important scientific theses that dealt with mental training in the sports field in addition to experts' opinions poll.

Objectives of the proposed program

Defining the research sample of the importance of training mental skills to raise the level of skill performance in artistic gymnastics.

Eliminate stress and anxiety through gradual relaxation exercises of Jacobson.

Improve the ability of the basic mental imagery and the multidimensional mental imagery.

Isolate stimulations that are not related to performance and reach the highest levels of concentration of attention.

Access to anger control and its guidance during training and competitions.

Developing the skill level of some of the skills of the floor mat among the beginners of artistic gymnastics youngsters.

Duration of the proposed mental imagery program

Based on the scientific references and previous studies, the duration of the application of the program was determined to be (08) weeks, at (3) units per week, at a rate of (15) minutes per unit. Thus, the total number of training units in the proposed program as a whole is (24) training units, and the number of hours of mental imagery in the program as a whole is (06) hours, i.e. (360) minutes, and table (7) illustrates this.

Table 2. *shows the percentage of the time distribution of the proposed program dimensions*

Program dimensions	Weeks	Units	Time per minute	percentage
Progressive relaxation	1	3	45	12.5%
Main mental imagery	2	6	90	25%
Multidimensional mental imagery	2	6	90	25%
Mental imagery of motion skills under study	3	9	135	37.5%
Total	08	24	360	100%

Program implementation steps

The player begins to visualize the performance and is free from stress by sitting in an appropriate relaxation position closed eyes, then he starts to visualize the performance that he wants to develop begins with the realization of the realistic image of the performance in an ideal form for it without stopping from the beginning to the end of determining the place and the nature of the place, while invoking the different senses in relation to realistic images of performance, with focus on the breathing accompanying the performance, in order to reach the complete perception for the skill to be developed.

Presentation, analysis and discussion of results

Presentation, analysis and discussion of the results of the 1st hypothesis

There are statistically significant differences at the level of significance (α = 0.01) between the pre and post measurements of the experimental group in the level of mental imagery and the skill variables under study in favor of the post measurement.

Table No. 3: shows the calculation of the "T" test to indicate the differences between the mean of the pre and post measurements for the experimental group in the level of dimensions of mental imagery and skill variables under study.

Table 3. *The "T" test for the experimental group in the level of dimensions of mental imagery and skill variables under study the first hypothesis*

Mental and skill variables		Pre		Post		Value "T"	Statistical significance
		A	σ	A	σ		
Mental imagery	Visual perception	10.80	1.476	14.20	1.317	-5.437	S. statistically at 0.01
	Audio perception	10.00	1.247	13.60	1,578	-5.661	S. statistically at 0.01
	Kinesthetic perception	10.00	1.247	13.60	1.350	-6.194	S. statistically at 0.01
	Emotional perception	7.40	1.430	11.40	1.506	-6.092	S. statistically at 0.01
	Overall perception	38.30	3.917	53.00	3.972	-8.333	S. statistically at 0.01
Skills	Side Somersault on two hands with a quarter turn	2.80	.632	5.70	1.252	-6.539	S. statistically at 0.01
	Back flip on two hands	3.00	.667	6.20	1.033	-8.232	S. statistically at 0.01
	Back somersault straight	2.50	.527	5.50	1.179	-7.348	S. statistically at 0.01
	Total of experimental skills	13.20	1.619	29.00	2.309	-17.714	S. statistically at 0.01

Through the results obtained and shown in Table 3, we note that there are statistically significant differences at the level of significance 0.01 between the pre and post measurement of the experimental group in the level of the mental imagery dimensions and the skill variables under study in favor of the post measurement.

The researchers believe that these differences and the results obtained are due to the proposed mental imagery program, in which its training units contain exercises to develop the main mental perception and the multi-dimensional mental perception (visual, auditory, kinesthetic, emotional) and clarity of the image, which helped the player to visualize performance in all its details with full control over retrieval of performance strategies with clearly seeing them without actually performing them.

This is in agreement with what Shamoun (2001) pointed out, that mental imagery is an essential factor in the development of motion skills and performance. (Shamon M., 1996, page 219)

And Martin & Hall (1999) The mental perception process aims to facilitate the process of learning a new movement or improving its performance. The cognitive function of mental perception is to facilitate the process of acquiring and performing motor skills. (Martin & Hall, 1999, page245-268).

And Allawi (2001) adds that mental imagery requires the use of all senses to retrieve perceptions, images, and ideas that the individual has previously perceived, or requires the production of new images and ideas in the individual's mind. (Muhammad Hassan, 2001, page 249)

This also agrees with the study of Boujemaa (2008) entitled: The effect of mental training on some skills of the floor movement device among second-year students, Department of Management and Sports Management Mesilla. And the results of which reached the group whose members benefited from the proposed training program aimed at developing psychological skills (relaxation, mental imagery, focus and concentration), recorded much better results at psychological skills and motion skills tests under study.

The researchers also attributed these differences to progressive relaxation exercises for different areas of the body in which stress is concentrated, which had a great effect in reducing tension, anxiety and feeling comfortable before starting on the mental imagery of skills.

And what Shamon (2001) mentioned that relaxation is the common factor and the main entrance to mental retrieval, and the mastery of this skill is usually made sure before entering any of the other dimensions of the mental imagery program, and on the extent of mastering this skill depends on the success and effectiveness of these programs. (Shamon 2001, page 158).

Ratib (2004) adds that progressive relaxation training achieves the acquisition of the skill of de-stressing and the feeling of comfort for different areas of the body, and the skill of easy breathing leads to the acquisition of the skill of relaxation for athletes, and mental training contributes positively in the development of physical performance and then the development of athletic performance, this helps in performing the skills smoothly and providing mental responses properly (Ratib, 2004, page 317).

Therefore, it can be said that the first hypothesis which states that there are statistically significant differences at the level of significance ($\alpha = 0.01$) between the pre and post measurements of the experimental group in the level of mental perception and the skill variables under study and in favor of the post measurement have been achieved.

Presentation, analysis and discussion of the results of the 2nd hypothesis:

There are statistically significant differences in the level of significance ($\alpha = 0.01$) in the post measurements of the controlled and experimental group in the level of mental imagery and skill variables under study in favor of the experimental group.

Table 4. The "T" test for the significance of the differences between the post measurements averages of the experimental and control groups in the level of mental imagery dimensions and the skill variables under study is illustrated.

Table 4. *The "T" test for the experimental group in the level of dimensions of mental imagery and skill variables under study the second hypothesis*

Mental and skill variables		Pre		Post		Value "T"	Statistical significance
		A	σ	A	σ		
Mental imagery	Visual perception	14.20	1.317	9.90	1.370	7.156	S. statistically at 0.01
	Audio perception	13.90	1.449	9.50	1.080	7.698	S. statistically at 0.01
	Kinesthetic perception	14.10	1.101	9.50	0.850	10.462	S. statistically at 0.01
	Emotional perception	12.00	1.333	7.40	1.430	7.440	S. statistically at 0.01
	Overall perception	55.00	3.972	38.30	3.917	9.466	S. statistically at 0.01
Skills	Side Somersault on two hands with a quarter turn	6.40	0.699	4.60	0.516	6.548	S. statistically at 0.01
	Back flip on two hands	6.40	0.699	4.40	0.516	7.276	S. statistically at 0.01
	Back somersault straight	6.20	0.632	4.30	0.483	7.550	S. statistically at 0.01
	Total of experimental skills	31.60	1.174	22.10	1.101	18.671	S. statistically at 0.01

Through the results obtained, which are shown in Table 4, we note that there are statistically significant differences at the level of significance 0.01 in the post measurements of the experimental and controlled group in the level of the mental imagery dimensions and the skill variables under study in favor of the experimental group.

The researchers attribute this improvement to the effect of the proposed mental imagery program, which was applied to the members of the experimental group in parallel with the skill training, meaning that the method of combining skill training and mental training of the experimental group led to the correct learning of the skill in its stages, that is, correcting errors inside the player's mind and visualizing the correct skill mentally and focusing on the subtle aspects that most players may overlook from performing properly and isolating all unrelated stimulations, all this allowed the formation of an ideal image within the player's mind and thus forming a correct imprint of the skill and free of mistakes.

This is what Allawi (2002) mentioned, that mental imagery is used to help speed learning and mastery of motion skills and to practice some psychological skills. (Muhammad Hassan, 2001, page 251)

This is consistent with the study of Abdulkader Akil (2008) entitled: The extent of the influence of mental training on the development of open motion skills (counter-attack) for the Karaté-Do athletes, the results of which concluded that the application of the mental training program has an important effect in developing the level of mental

imagery for elite athletes of Karaté-Do. And that there is a proportional positive relationship between mental training and the development of the counter-attack skill of Karaté-Do.

Also, Bouchareb Rafahia Study (2018) entitled: The Impact of a Mental Imagination Program on Golf Players' Performance in Close-Ups (PUTTS). Its results reached the proposed training program that improved the level of mental imagery in its four dimensions (Visual, auditory, kinesthetic, and emotional) and the level of skill performance of close-hits in golf among the members of the experimental sample.

Accordingly, it can be said that the second hypothesis, which states that there are statistically significant differences, the level of significance ($\alpha = 0.01$) in the post measurements of the controlled and experimental group in the level of mental imagery and the skill variables under study in favor of the experimental group have been achieved.

Conclusions

An improvement in the level of mental imagery dimensions (visual, auditory, kinesthetic, emotional) among the members of the experimental group. Improving the level of performance of the skills: the floor movements device for the experimental group that benefited from the mental imagery program accompanying the skill training

Future suggestions and hypotheses

Standing on results and conclusions reached by the researchers, we propose the following:

- Giving the use of mental imagery more space in planning the various preparation programs to reach the best results.
- Study the methods of training on mental imagery of all kinds.
- To rely more on mental imagery in preparing athletes in various sports disciplines and for all age groups.
- The need to pay attention to training coaches in the field of mental training in order to develop the skills and mental abilities of athletes.
- Developing methods of measuring and evaluating the athlete's mental abilities by urging researchers and research centers to do so.
- Conducting further studies on the uses of mental imagery in the sports field.

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The impact of the racket on mobility performance in wheelchair tennis

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Abstract: *This study aimed to assess how the act of holding a tennis racket affected the manual propulsion of the wheelchair. The hypothesis was that the presence of the racket during acceleration and the change of direction of wheelchair players negatively affected the execution of shots. The research sample consisted of ten wheelchair tennis players. They completed four tests, which evaluated sprinting and manoeuvrability abilities in wheelchair tennis. The results of the paired sample t-test analysis showed the existence of a statistically significant difference in the tests performed with and without the use of the racket in wheelchair tennis players. All tests showed high ICCs (0.95–0.99) for the inter-trial reliability times. Higher level players, who should have a better and more efficient movement technique, due to their fitness and the way they use strength, are still able to overcome these difficulties more than lower-level players. The study also proposes a methodological approach to ensure that players with less experience could compete while guaranteeing sports inclusion.*
Keywords: *Sports inclusion, Wheelchair tennis, Adapted Physical Activity.*

Introduction

despite many difficulties, the practice of sporting activities for people with disabilities is now an established reality (Cassese & Raiola, 2017). The combination of sport and disability is representative of an approach that has collected the socio-cultural and scientific evolution of sports and physical-motor activity in a phenomenological key on the one hand, and of the vision of the disabled person in terms of biopsychosocial functioning on the other (D'Elia et al., 2020). The benefits of sporting activity and the importance of enhancing everyone's skills were highlighted, trying to overcome the prejudices that over time have limited sporting activity and the lives of people with disabilities (Cascone et al., 2020). Wheelchair tennis has over time become one of the most popular sports of the Paralympics, with international competitions taking place all over the world. It is a discipline that has many similarities to conventional tennis. It is very similar, in fact, both from a regulatory point of view but also from a technical and tactical level (Pisapia & D'Isanto, 2018). The measures of the field, the tools used, and the score do not vary. The only different rule is the double bounce of the ball. The wheelchair is considered part of the player's body, so all rules regarding the player's body also apply to the wheelchair (Cassese & Raiola, 2017). Sports coaches and scientists interested in this discipline are continually trying to improve current training methods and optimize specific training (Raiola, 2020). However, to ensure that training can reflect the needs of the sport and to try to find a link between adapted and conventional tennis, an understanding of the competitive and physiological sporting needs of the discipline is needed (Sindall et al., 2013). An important aspect of wheelchair sports is wheelchair mobility performance, defined as the skill of the wheelchair athlete on the field (Roy et al., 2006). This aspect seems to influence the performance of a disabled tennis player more than an able-bodied tennis player in the dynamics of movement, nullifying the possibility of sports inclusion (Di Palma et al., 2016). The dynamics of movement of wheelchair tennis are in fact specifically related to the push of the wheelchair while holding the tennis racket (Croft et al., 2010). The tennis racket is an important additional constraint of wheelchair tennis compared to other wheelchair sports, affecting mobility performance (Croft et al., 2010).

The presence of the racket seems to negatively affect the dynamics of the movement, especially for less experienced athletes (Goosey-Tolfrey & Moss, 2005). They have difficulty in being able to maintain the inertia of the wheelchair in going to hit the ball (Rietveld et al., 2019). This difficulty occurs at the time of preparation for the shot. The twisting action of the trunk and shoulders that is carried out in the preparation phase of the forehand is limited, therefore the players are able to accumulate energy in lesser quantities (Reid et al., 2007). This affects the

effectiveness and precision of the shots, as well as the speed of impact and the production of power (Sánchez-Pay et al., 2016).

To better understand the needs of the racket in wheelchair tennis, several studies were carried out using an ergometer in laboratory tests (Di Palma et al., 2016, Invernizzi et al., 2020). These studies have provided important insights into the difficulty of coupling/uncoupling the racket/hand to the wheel, and therefore on speed and power production (Diaper & Goosey, 2009). Furthermore, holding the racket while pushing the wheelchair in addition to having a negative influence on the propulsion technique could also lead to injuries of the upper limbs (De Groot et al., 2017). This may be due to the longer time it takes to hold the racket and wheel simultaneously with the hand, which leads to greater power losses and consequently more power generated during the shorter push phase (DeGroot et al., 2017). In addition to laboratory tests, several validated field tests have also been designed to monitor the influence of the racket on the player's mobility performance (Invernizzi et al., 2020). Field tests are very important to perform and often preferred by coaches, as they involve play-related wheel skills, such as sprinting, turning or stopping (Reina et al., 2007). The aim of this study was to verify how the act of holding a racket affects the efficiency of the manual propulsion of the wheelchair. Possible differences in propulsion technique between pushing the wheelchair with and without a racket in hand were investigated. The hypothesis was that the presence of the racket during acceleration and the change of direction of wheelchair players negatively affected the execution of shots.

Methods

ten wheelchair tennis players (age: 23 ± 0.3 years; height: 184.4 cm; body mass: 80.92 kg; training experience: 6 ± 0.3 years) participated in this study. The study involves the use of tests developed specifically for the needs of a wheelchair tennis match. These court tests were developed by the Royal Dutch Lawn Tennis Association (KNLTB) to evaluate the mobility performance of their players (Rietveld et al., 2019). They were the 20 m sprint test, the Spider test, the Butterfly sprint test and the Illinois test. Each participant took the test three times without a racket and three times with the racket with a 2-minute rest time between each repetition. All tests were analysed separately, mean times per test was calculated. In the 20m sprint test the participant was positioned in the centre of the field, behind the baseline, and had to perform a straight 20 m sprint, with markers placed at the starting point, at 5m, 10m and 20m (simulates the network advancement). In the Spider test and Butterfly sprint test, the athlete had to cover a course as quickly as possible (they simulated moving on the pitch during an exchange). Finally, the Illinois test was a speed-related agility test. In this last test, the player stood ready behind the starting line (cone 1). At the acoustic signal he had to run forward towards cone 2 located 10 m away from the starting line, and then suddenly turn back towards the starting line (cone 3) around which he had to turn, and then continue in slalom around others 3 cones positioned at 3.33 m from each other, to then go back, always in slalom up to cone 3. Here it makes a change of direction, turning around cone 3 and sprinting towards cone 4, reached which reverses the direction of travel to make the last sprint towards cone 5.

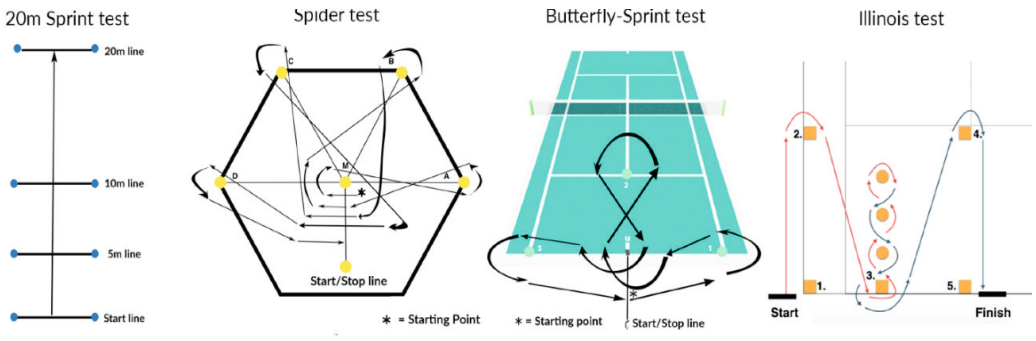

Figure 1. *Outline of the tests carried out*

Each test was filmed with two GoPro Hero5 cameras positioned to analyse movements in the frontal plane and the sagittal plane and films were used for post-test assessment. The performance, expressed in seconds, was measured with a stopwatch.

Statistical analysis

A Shapiro-Wilks test revealed that values were normally distributed within each group and evaluation moment (P>0.05). Paired sample t-test was selected as the analytical method to check for the presence or absence of a significant difference between two data series. Specifically, the t-test allowed to compare the mean of the tests with and without a racket. Descriptive statistics were presented as estimated marginal mean ± standard error unless otherwise stated. Statistical significance was set at $P \leq 0.05$. For the relative reliability the intraclass correlations (ICC) and standard error of the mean (SEM) were calculated. Data analyses were performed using Statistical Package for Social Science software (IBM SPSS Statistics for Windows, Version 25.0. Armonk, NY).

Results

Table 1. *Average time recorded in the execution of field tests with and without a racket.*

	With racket	Without racket	ICC (CI)	Std. Error Mean	t	p
20m sprint (s)	7.27 (0.29)	6.76 (0.92)	0.99 (0.96-0.99)	0.63	1.57	0.21
Spider test (s)	18.54 (2.14)	17.79 (2.10)	0.96 (0.89 -0.98)	0.33	2.72	0.24
Butterfly-sprint test (s)	17.15 (1.32)	16.87 (1.30)	0.95 (0.83-0.98)	0.38	0.77	0.44
Illinois test (s)	22.03 (2.61)	21.14 (2.46)	0.98 (0.92-0.99)	0.37	2.37	0.04

Discussion

the results showed that the use of the racket had a negative impact on the mobility of the players. This loss of speed with the use of the racket resulted in reaching the ball later and not being able to hit it correctly. Players took longer to cover distances of 5 and 10 meters when using the racket, but it was not like that at 20 meters. The data seem to indicate that the ability to accelerate from a static position was most affected using the racket in the first few meters. However, maintaining high speed levels did not appear to be significantly affected by racket use. This may be since once the initial inertia of the chair in a static position was overcome, the wheelchair itself made it easier to move when in motion. While higher-level players seem to perform specific movements more efficiently with or without the racket than lower-level players, the maximum speeds and peak speeds achieved are limited due to the racquet's presence. This may have been since higher level players had a better technique for pushing the wheelchair both with and without the racket.

With a view to sports inclusion, the use of facilitating tools in progression could work very well with both disabled and non-disabled athletes (Santopietro et al., 2020). Already in mini tennis various types of balls characterized by different colours are used:

- red ball (75% slower than a normal one and larger in diameter)
- orange ball (50% slower than a normal ball)
- green ball (or mid, 25% slower than a normal ball)
- yellow (or normal)

Specifically, the use of depressurized balls and reduced playing spaces produces four advantages:

- activation of the practice-success combination,
- activation of the practice-fun combination,
- interactivity between players in a short time
- correct learning of the technique.

These are the same goals that a beginner of any age wants to achieve when he enrols in a tennis course. Recent studies by the Australian Federtennis, concerning the differences in terms of teaching between the green ball (also called Mid) and the Yellow ball (normal) carried out on a sample of about 200 beginners from different countries, show that players who play tennis with Mid type make far fewer mistakes than those who practice it with the normal ball (Hewitt & Edwards, 2013). Furthermore, the Mid ball, traveling at a speed 25% lower than the standard

one, gives wheelchair athletes more time to think about the choices to make, improving the game tactics much more quickly (Pisapia & D'Isanto, 2018). Furthermore, this type of ball, bouncing at a height less than 25% compared to the normal one, allows an optimal impact quality, contributing to a faster learning of the correct playing technique (Sánchez-Pay et al., 2015). The introduction of slower balls could allow a change in training methodology by making it easier for coaches to move from a prescriptive teaching methodology, with relatively static teaching situations and little play, to an active approach in which active tasks are based on the game (Richardson et al., 2017). Coaches could then provide relevant instructions and use the most appropriate type of ball to differentiate activity and ensure success. It is important that the experience for novice tennis players is not only active and fun, but also that it implies reasonable success from the very first lesson (Esposito et al., 2020). Beginner players who try their hand at slower balls find themselves moving 1 or 2 meters in different directions to reach the ball with a heart rate rapidly exceeding 140 beats per minute (Greenwood et al., 1990). They are doing interval training, having fun at the same time. It is important not only to introduce the game effectively, but also to adapt the game of tennis to the needs and skill levels of the players by organizing user-friendly play opportunities in combination with slower balls.

Conclusion

the use of the racket has a negative impact on the motion time and in the execution and effectiveness of the shots, although not in the same way in its different sections and depending on the level of the players. Higher level players, who should have a better and more efficient movement technique, due to their fitness and the way they use strength, are still able to overcome these difficulties more than lower-level players. For the purposes of sports inclusion, the introduction of measures such as the use of depressurized balls or a reduction in the height of the net could allow to limit the major difficulties encountered by tennis players in wheelchairs.

Announcement
We announce that the authors have equally contributed to this paper.

Conflict of interests
There is no conflict of interests among the authors themselves.

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User Evaluation of Quality of Sports and Recreational Programs

Korisnička evaluacija kvaliteta sportsko-rekreativnih programa

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Abstract: *Sports and recreational programs are an important segment of a healthy lifestyle with which health and work abilities can be prevented and improved. Regular and systematic practice of various sports and recreational programs enables a positive impact on several dimensions of quality of life such as physical, psychological, social, economic and spiritual wellness. This research was conducted in sports and recreational clubs using the survey method. The aim of the research was to assess satisfaction with the quality of performed recreational programs. On a sample of 328 respondents (M = 142; F = 186), aged 30 to +60 years, a questionnaire was used to assess the elements of program quality, and the obtained data were processed by descriptive and comparative statistics. The obtained results show that all seven elements of quality assessment of used sports and recreational programs have high average grades (above four), and among them with a zone of high intensity is the element "Total feeling of satisfaction after the program" (4,65) and the element " Group atmosphere during the implementation of the program "(4,56). The results of the analysis of variance showed that women show significantly more intense expression of satisfaction resulting from participation in sports and recreational programs, and the evaluation of the program is most intensively assessed by respondents aged 30-40 (4,52).*

Keywords: *sports and recreational programs, recreational athletes, assessment scale.*

Sažetak: *Sportsko-rekreativni programi su važan segment zdravog načina života sa kojima se može prevenirati i poboljšati zdravlje i radne sposobnosti. Redovno i sistematsko upražnjavanje različitih sportsko-rekreativnih programa omogućuje pozitivan uticaj na više dimenzija kvaliteta života kao što su fizički, psihološki, socijalni, ekonomski i duhovni welnes. Ovo istraživanje provedeno je u sportsko-rekreativnim klubovima uz primjenu Servej metoda. Cilj istraživanja je bio da se izvrši procjena zadovoljstva kvalitetom upražnjenih rekreativnih programa. Na uzorku od 328 ispitanika (M=142; Ž=186), starosti 30 do +60 godina, primjenjen je upitnik za procjenu elemenata kvaliteta programa, a dobijeni podaci su obrađeni postupcima deskriptivne i komparativne statistike. Dobijeni rezultati govore o tome da svih sedam elemenata procjene kvaliteta korišćenih sportsko-rekreativnih programa imaju visoke prosječne ocjene (iznad četvorke), a među njima sa zonom visokog intenziteta je elemenat „Ukupan osjećaj zadovoljstva nakon završetka programa" (4,65) i elemenat „Grupna atmosfera tokom realizacije programa" (4,56). Rezultati analize varijanse pokazali su da se kod žena uočava znatno intenzivnije iskazivanje zadovoljstva koje proizilazi iz učešća u sportsko-rekreativnim programima, a vrednovanje programa najintenzivnije ocjenjuju ispitanici starosne grupe od 30-40 godina (4,52).*

Ključne riječi: *sportsko-rekreativni programi, rekreativci, skala procjene.*

Introduction

Doing sports, whether professionally or recreationally, is important for all people because exercise and every sports activity is a predictor of a healthy and long life (Torbarina, 2011), and as physical activity activates the complete locomotor system crucial for energy trans-

Uvod

Bavljenje sportom, bilo profesionalno ili rekreativno, važno je za sve ljude jer je vježbanje i svaka sportska aktivnost prediktor za zdrav i dug život (Torbarina, 2011), a kako fizička aktivnost aktivira kompletan lokomotorni sistem presudan za transformaciju energije koja je od

formation which is essential for activity of all cells in the body, sport and physical activity can be treated as a determinant for the harmonious development of all children's traits and anthropological characteristics (Krzelj, 2009). Scientific findings convincingly show that physical inactivity is one of the strongest factors of health disorders (Vuori, 2004), and that any targeted systemically repeated physical activity is important in health care (Andrijasevic, 2000). Regular physical activity is very important for the health of both men and women (US Department of Health and Human Services, 1996), with the recommendation that adults and the elderly actively participate in all forms of moderate-intensity physical activity for a minimum of 30 minutes daily to maintain mobility (WHO, 2010). Physical activity plays a significant role in the life satisfaction of individuals (Melin, Fugl-Meier, & Fugl-Meier, 2003), and one of the valuable means of increasing life satisfaction is considered to be physical activity (Maher, Pincus, Ram, & Conroyd, 2015). Physical activity affects quality of life (Pucci et al., 2012). Childhood and youth are the most important developmental periods, and some segments of development, e.g. specific motor skills, can be developed only by means used in sports (Doupona & Petrovic, 1997), so it is important that the chosen sports activity is not overloaded and will fill them with pleasure and joy (Martincevic, 2010), which will relieve stress at the same time , and above all create, from an early age, a habit of playing sports which will continue during adolescence and grow into a part of everyday life (Krzelj, 2009). According to the World Health Organization (Global Recommendations for Physical Activity for Health, WHO, 2010), physical activity in adults includes leisure-time activity, transportation (e.g walking or cycling), occupational (i.e. work), household chores, play, games, sports or planned exercise, carried out within the family, school and sports community. Physical exercise should ensure upright posture and good functioning of organs (Jajcevic, 1997, Sekulic & Metikos, 2007), so physical fitness is defined as the ability to perform moderate to vigorous physical activity without excessive fatigue, i.e. the ability developed by exercise based on which a person can perform the basic activities of everyday life and spend free time in an active way (Trninic, 2006). Because a habit leads to a need to move, if developed, it will have an optimal effect (O'Sullivan, 2004; Tappe & Burgeson, 2004), on those activities for which, based on research in target groups, a positive attitude and acceptance is determined (Fras, 2002). Sports recreation is part of a wide area of recreation, where physical activation meets general human

suštinskog značaja za aktivnost svih ćelija u tijelu, to se sport i fizička aktivnost mogu tretirati kao odrednica za harmoničan razvoj svih dječjih osobina i antropoloških karakteristika (Krželj, 2009). Naučna saznanja uvjerljivo pokazuju da je fizička neaktivnost jedan od najjačih faktora zdravstvenih poremećaja (Vuori, 2004), te da je svaka ciljana sistemski ponovljena fizička aktivnost važna u zdravstvenoj zaštiti (Andrijašević, 2000). Redovna fizička aktivnost veoma je važna za zdravlje, kako muškaraca tako i žena (U.S. Department of Health and Human Services, 1996), sa preporukom da odrasli i starije osobe aktivno učestvuju u svim vidovima fizičke aktivnosti umjerenog intenziteta minimalno 30 minuta svakodnevno kako bi kroz aktivnost održavale mobilnost (WHO,2010). Fizička aktivnost igra značajnu ulogu u životnom zadovoljstvu pojedinaca (Melin, Fugl-Meier i Fugl-Meier, 2003), a jednim od vrijednih sredstava za povećanje zadovoljstva životom smatra se tjelesna aktivnost (Maher, Pincus, Ram i Conroyd, 2015). Fizička aktivnost utiče na kvalitet života (Pucci i sar., 2012). Djetinjstvo i mladost su najvažniji razvojni periodi, a neki segmenti razvoja, npr. specifična motorička znanja, mogu se razviti samo sredstvima koja se koriste u sportu (Doupona i Petrović, 1997), pa je važno da izabrana sportska aktivnost ne bude preopterećena i ispuniće ih zadovoljstvom i radošću (Martinčević, 2010), što će ih istovremeno osloboditi stresa, a prije svega stvoriti od malih nogu naviku bavljenja sportom koja će se nastaviti tokom adolescencije i prerasti u dio svakodnevnog života (Krželj, 2009). Prema Svjetskoj zdravstvenoj organizaciji (Global recomendations on Physical activity for health, WHO, 2010), fizička aktivnost kod odraslih osoba uključuje aktivnosti u slobodno vrijeme, prevoz (hodanje ili vožnja biciklom), aktivnosti na poslu, obavljanje kućnih poslova, igranje, sport, organizovano i individualno vježbanje i sve aktivnosti koje se sprovode u okviru porodice, škole i sportske zajednice. Fizičko vježbanje treba da obezbjedi uspravno držanje tijela i dobro funkcionisanje organa (Jajčević, 1997., Sekulić & Metikoš, 2007), pa se fizički fitnes definiše kao sposobnost obavljanja umjerene do snažne fizičke aktivnosti bez prekomjernog umora, odnosno sposobnost koja se razvija vježbanjem na osnovu koje čovjek može obavljati osnovne aktivnosti svakodnevnog života i provoditi slobodno vrijeme na aktivan način (Trninić, 2006). Budući da navika dovodi do potrebe za kretanjem, ako se razvija, imaće optimalan efekat (O'Sullivan, 2004; Tappe & Burgeson, 2004), na one aktivnosti za koje se, na osnovu istraživanja kod ciljanih grupa, utvrdi pozitivan stav i prihvaćanje (Fras, 2002). Sportska rekreacija dio je širokog područja rekreacije, gdje fizička aktivacija zadovoljava opšte čo-

needs, maintenance and improvement of psychophysical abilities (Andrijasevic, 2010). Group fitness programs are the most widespread form of sports recreation, and as systemically repeated recreational forms of exercise have positive effects on the transformation of functional abilities of the organism and changes in the body system (McCord, Nichols & Patterson, 1989; Furjan-Mandic, G. 2011). Recreational activities include activities classified into 7 groups, such as: tours, water activities (rivers and lakes), air activities, sports activities, curiosity discovery activities, work process activities, cultural and health activities (Demonja, Ruzic, 2010). The research was conducted with the aim of determining attitudes of users towards the quality of sports and recreational activities in order to perform an evaluation of the satisfaction of user participation on the basis of which data useful for improving the quality of sports and recreational activities covered by this research would be obtained.

Method

this research was implemented in the environment of sports and recreational clubs that have a different content offer in their program representation, as an empirical transversal study (survey method). The emphasis was on programs dominated by outdoor activities (walking, biking, mountain climbing, Nordic walking, outdoor fitness, aerobics, excursions, skiing and swimming). The aim of the research was to identify satisfaction with the quality of recreational programs, through the prism of perception of their immediate participants. The research sample consisted of a total of 328 respondents, users of sports and recreational clubs services. Subsampling was performed through two segments: (a) in relation to gender (M=142; F=186) and (b) by age, the subsample was divided into four levels using the Transform Visual Binning procedure: (1) of 30 to 40 years of age, (2) 41 to 50 years of age, (3) 51 to 60 years of age, and (4) over 60 years of age). Empirical data were collected using questionnaires used in some previous similar studies (Nesic, Nesic & Peric, 2016). In addition to personal data on gender and age, the instrument contained a set of items intended for assessing certain aspects of the quality of recreational programs: the environment where the program is held/implemented; program organization; the atmosphere that prevails during the implementation of the program; quality of professional information during the implementation of the program; program attractiveness; subjective feeling of satisfaction after the end of the program and safety of the participants during the implementation of the program. Respondents expressed their assessment

vjekove potrebe, održavanje i unapređenje psihofizičkih sposobnosti (Andrijašević, 2010). Grupni fitnes programi su najrasprostranjeniji oblik sportske rekreacije, a kao sistemski ponavljani rekreativni oblici vježbanja imaju pozitivne efekte na transformaciju funkcionalnih sposobnosti organizma i promjene u tjelesnom sistemu (McCord, Nichols & Patterson, 1989; Furjan-Mandić, G. 2011). Rekreativne aktivnosti uključuju aktivnosti klasifikovane u 7 grupa, kao što su: ture, vodene aktivnosti (rijeke i jezera), vazdušne aktivnosti, sportske aktivnosti, aktivnosti otkrivanja zanimljivosti, aktivnosti radnog procesa, kulturne i zdravstvene aktivnosti (Demonja, Ružić, 2010). Istraživanje je provedeno sa ciljem utvrđivanja stavova korisnika prema kvalitetu sportsko-rekretivnih aktivnosti kako bi se izvela evaluacija o zadovoljstvu učestvovanja korisnika na osnovu koje bi se dobili podaci korisni za poboljšanje kvalitete sportsko-rekretivnih aktivnosti obuhvaćenih ovim istraživanjem.

Metod

ovo istraživanje je realizovano u okruženju sportsko-rekreativnih klubova koji u svojoj programskoj zastupljenosti imaju različitu sadržajnu ponudu, kao empirijska transverzalna studija (Survay metod). Akcenat je bio na programima u kojima dominiraju aktivnosti na otvorenom (pješačenje, biciklizam, planinarenje, nordijskao hodanje, fitnes na otvorenom, aerobik, izleti, skijanje i plivanje). Cilj istraživanja je bio usmjeren na identifikaciju zadovoljstva kvalitetom upražnjavanih rekreativnih programa, kroz prizmu percepcije njihovih neposrednih učesnika. Istraživački uzorak je sačinjavalo ukupno 328 ispitanika, korisnika usluga sportsko-rekreativnih klubova. Subuzorkovanje je sprovedeno kroz dva segmenta: (a) u odnosu na pol (M=142; Ž=186) i (b) prema starosnoj dobi (subuzorak je podjeljen na četiri nivoa primjenom procedure presjeka (*Transform Visual Binning*): (1) od 30 do 40 godina života, (2) od 41 do 50 godina života, (3) od 51 do 60 godina života i (4) preko 60 godina života). Prikupljanje empirijskih podataka obavljeno je primjenom upitnika korišćenim u nekim prethodnim sličnim istraživanjima (Nešić, Nešić & Perić, 2016). Instrument je, pored personalnih podataka o polu i starosnoj dobi, sadržavao set ajtema namjenjenih procjeni pojedinih aspekata kvaliteta upražnjavanih rekreativnih programa: ambijenta gdje se održava/realizuje program; organizaciju programa; atmosferu koja vlada tokom realizacije programa; kvalitet stručnih informacija tokom realizacije programa; atraktivnost programa; subjektivni osjećaj zadovoljstva nakon završetka programa i bezbjednost učesnika tokom realizacije programa. Svoju procjenu, ispitanici su iskazivali izborom

by choosing one of the five positions on the Likert-type scale, where the value "1" represented the lowest, and the value "5" the highest level of quality perception.

The metric of the questionnaire used in this study was reassessed using two procedures: (1) checking its internal compliance (Scale Reliability Analysis based on the Cronbach's alpha coefficient), (Table 1) and (2) factor analysis (*Principal Components Analysis*) with the method of oblique rotation (*Direct Oblimin*), (Table 2). Empirical research data were processed by procedures of descriptive and comparative statistics. From the space of descriptive statistics, for each variable (both at the level of the complete sample and subsamples) the following were calculated: a) frequency distribution (absolute and relative), arithmetic mean (*Mean*), Standard deviation (*Std. Deviation*) and standard error (*Std. Error*). Comparative statistical procedures were represented using contingency analysis (X^2 test) as well as one-factor analysis of variance. The factor analysis procedure was used to determine the latent satisfaction structure. All statistical inferences were conducted at a significance level of 0,05 (*Sig*. < ,05).

Results

the basis for the correct analysis of empirical data and the creation of conditions for drawing valid research conclusions was identified by assessing the validity of the applied seven-item satisfaction scale. The performed assessment of the suitability of the data for factor analysis showed that there is a sufficient number of coefficients of 0,3 value and more in the correlation matrix. According to the Kaiser-Meyer-Olkin Measure of Sampling Adequacy, the required recommended value of 0,6 (Kaiser, 1970, 1974) was exceeded at a statistically high level (0,880) in this case. Also, Bartlett's test of sphericity (Bartlett, 1954) reached statistical significance (*Sig.*=,000), which all indicates the appropriate factor stability of the correlation matrix (Table 1). Also, the results obtained by applying this seven-item scale of quality (satisfaction) perception show that the instrument has good internal consistency, as indicated by the Cronbach's alpha coefficient (0,879), which is significantly higher than the recommended theoretical value of 0,7 (De Vellis, 2003) (Table 1).

jedne od pet pozicija na skali Likertovog tipa, gde je vrijednost „1" predstavljala najniži, a vrijednost „5" najviši nivo percepcije kvaliteta. Metrika upitnika primjenjena u ovom istraživanju ponovo je procjenjena i to primjenom dva postupka: (1) provjerom njene unutrašnje saglasnosti (*Scale Reliability Analysis* koja je zasnovana na Kronbahovom alfa koeficijentu), (Tabela 1) i (2) faktorskom analizom (analiza glavnih komponenti – *Principal Components Analysis*) sa metodom kose rotacije (*Direct Oblimin*), (Tabela 2). Empirijski istraživački podaci obrađeni su postupcima deskriptivne i komparativne statistike. Iz prostora deskriptivne statistike, za svaku varijablu (kako na nivou kompletnog uzorka, tako i subuzoraka) izračunati su: a) distribucija frekvencije (apsolutna i relativna), aritmetička sredina (*Mean*), standardna devijacija (*Std. Deviation*) i standardna pogreška (*Std. Error*). Komparativne statističke procedure bile su zastupljene korišćenjem kontigencijske analize (X^2 test), kao i jednofaktorske analize varijanse. Za utvrđivanje latentne strukture zadovoljstva primjenjena je procedura faktorske analize. Sva statistička zaključivanja sprovedena su na nivou značajnosti od 0,05 (*Sig*. < ,05).

Rezultati

osnova za korektnu analizu empirijskih podataka i stvaranje uslova za izvođenje validnih istraživačkih zaključaka identifikovana je procjenom validnosti primjenjene sedmoajtemske skale zadovoljstva. Izvršena procjena prikladnosti podataka za faktorsku analizu pokazala je da u korelacionoj matrici ima dovoljan broj koeficijenata vrijednosti 0,3 i više. Prema Kajzer-Majer-Olkinovom kriterijumu (*Kaiser-Meyer-Olkin Measure of Sampling Adequacy*) neophodna preporučena vrijednost od 0,6 (Kaiser, 1970, 1974) je u ovom slučaju bila premašena na statistički visokom nivou (0,880). Takođe je i Bartletov test sferičnosti (*Bartlett's test of sphericity*) (Bartlett, 1954) dostigao statističku značajnost (*Sig.*= ,000), što sve ukazuje na odgovarajuću faktorsku stabilnost korelacione matrice (Tabela 1). Takođe, rezultati dobijeni primjenom ove sedmoajtemske skale percepcije kvaliteta (zadovoljstva) pokazuju da instrument ima dobru unutrašnju saglasnost, na šta ukazuje Kronbahov koeficijent alfa (0,879) koji je značajno veći od preporučene teorijske vrijednosti 0,7 (De Vellis, 2003) (Tabela 1).

Table 1: *Elements of internal consistency of the satisfaction scale* | ***Tabela 1:*** *Elementi unutrašnje saglasnosti skale zadovoljstva*

Indicator / **Indikator**	***Elements of recreational program quality /*** **Elementi kvaliteta rekreativnog programa**	***Influence of item removal on alpha coefficient /*** **Uticaj uklanjanja stavke na alfa koeficijent**
1.	*Environment where program is implemented /* Ambijent gdje se realizuje program	.864
2.	*Organizational aspects of the program /* Organizacioni aspekti programa	.850
3.	*Atmosphere that prevails during the implementation of the program /* Atmosfera koja vlada tokom realizacije programa	.858
4.	*Quality of professional information during the program implementation /* Kvalitet stručnih informacija tokom realizacije programa	.855
5.	*Attractiveness of the program /* Atraktivnost programa	.857
6.	*Subjective feeling of satisfaction after program completion /* Subjektivni osjećaj zadovoljstva nakon završetka programa	.866
7.	*Safety of participants during the implementation of the program /* Bezbjednost učesnika tokom realizacije programa	.858
Cronbach's alpha coefficient / Kronbahov alfa koeficijent:		.879

The analysis of the collected data showed that the sample is characterized by a higher representation of females (186; 56,7%) compared to men (142; 43,3%), which can be interpreted that women, in the context of this research, use sports and recreational content more and more creatively and thus improve their fitness status, and men are more oriented towards improving the social status that they achieve through the implementation of some of the sports and recreational programs. Regarding the age structure, it was identified that the majority of respondents are between the ages of 30 and 50 (82,1%), while the least are those who are actively involved in recreational programs after the age of sixty (7,6%). On the other hand, it is noticeable that in the ages of 30-40 and 51-60 years, females dominate (35,1%; 7,9%), compared to men (18,3%; 2,4%), which supports the differentiated basis for statistical significance (Sig. =,000) (Table 2).

Analizom prikupljenih podataka uočeno je da uzorak karakteriše veća zastupljenost osoba ženskog pola (186; *56,7%*) u odnosu na muškarce (142; *43,3%*) što se može tumačiti da žene, u kontekstu ovog istraživanja, više i kreativnije koriste sportsko-rekreativne sadržaje i tako poboljšavaju svoj fitenes status, a muškarci su više orijentisani za poboljšanje socijalnog statusa koje ostvaruju realizacijom nekih od sportsko-rekreativnih programa. U pogledu starosne strukture identifikovano je da se većina ispitanika nalazi u dobi od 30 do 50 godina (82,1%), dok je najmanje onih koji se u rekreativne programe aktivno uključuju nakon šezdesete godine života (7,6%). Sa druge strane uočljivo je da u uzrasnim dobima od 30-40 i od 51-60 godina dominiraju osobe ženskog pola (35,1%; 7,9%), u odnosu na muškarce (18,3%; 2,4%), što ide u prilog diferenciranoj osnovi za statističku značajnost (Sig. = ,000*)* (Tabela 2).

Table 2: *Distribution of representation of respondents in relation to age*

Tabela 2: *Distribucija zastupljenosti ispitanika u odnosu na starosnu dob*

Age / **Godine**	***Sex /*** **Pol**		***Σ***
	M / **M**	***F /*** **Ž**	
30- 40	60	115	175
	18.3%	35.1%	53.4%
41 - 50	64	30	94
	19.5%	9.1%	28.7%
51 - 60	8	26	34
	2.4%	7.9%	10.4%
+60	10	15	25
	3.0%	4.6%	7.6%
Σ	142	186	328
	56.7%	100.0%	
Chi = 35.283; Sig. = .000			

Respondents gave their assessment of perceived satisfaction with the quality of sports and recreational programs in relation to individual items of the scale, which related to certain aspects of the program construct. Very high average scores (above four) were recorded for all seven quality elements (Table 3). Scalar averages that can be classified in the zone of high intensity of satisfaction were obtained for: overall feeling of satisfaction after the program (4,65), group atmosphere during the program (4,56), attractiveness of the program (4,48), safety aspects during the implementation of the program (4,47), organizational/management aspects of the program they practiced (4,43), professional information that the respondents received during the implementation of the program by the instructor (4,41) and the environment in which the programs were implemented (4,36). The total scalar average, derived from all seven indicators was 4,48 and allowed the overall quality of consumed program content to be assessed as above average, but also to indicate room for quality improvement (and thus potential user satisfaction), (Table 3).

Ispitanici su svoju ocjenu percepiranog zadovoljstva kvalitetom upražnjavanih sportsko-rekreativnih programa davali u odnosu na pojedine ajteme skale, koji su se odnosili na određene aspekte programskog konstrukta. Za svih sedam elemenata kvaliteta evidentirane su veoma visoke prosječne ocjene (iznad četvorke), (Tabela 3). Skalarni prosjeci koji se mogu svrstati u zonu visokog intenziteta zadovoljstva dobijeni su za: ukupan osjećaj zadovoljstva nakon realizovanog programa (4,65), grupnu atmosferu tokom realizacije programa (4,56), atraktivnost/privlačnost samog programa (4,48), bezbjednosne aspekte tokom realizacije programa (4,47), organizacione/menadžmentske aspekte programa koje su upražnjavali (4,43), stručne informacije koje su ispitanici dobijali tokom realizacije programa od strane instruktora/voditelja (4,41) i ambijent/okruženje u kojem su programi realizovani (4,36). Ukupni skalarni prosjek, izveden iz svih sedam indikatora iznosio je 4,48 i omogućavao da se ukupni kvalitet konzumiranih programskih sadržaja ocjeni kao nadprosječan, ali i da se ukaže prostor za unapređenje kvaliteta (time i potencijalnog zadovoljstva korisnika), (Tabela 3).

Table 3: *Scalar values of program elements evaluation*

Tabela 3: *Skalarne vrijednosti procjene elemenata programa*

Indicator / **Indikator**	***Mean***	***Std.dev.***	***Std.err.***
Environment where program is implemented / Ambijent gdje se održava/realizuje program	4.36	.801	.044
Organization of the program / Organizacija programa	4.43	.755	.042
Atmosphere that prevails during the implementation of the program / Atmosfera koja vlada tokom realizacije programa	4.56	.679	.037
Quality of professional information during the program implementation / Kvalitet stručnih informacija tokom realizacije programa	4.41	.873	.048
Safety of participants during the implementation of the program / Bezbjednost učesnika tokom realizacije programa	4.47	.827	.046
Attractiveness of the program / Atraktivnost programa	4.48	.754	.042
Subjective feeling (satisfaction) after program completion / Subjektivni osjećaj (zadovoljstvo) nakon završetka programa	4.65	.528	.032
Total Sv / Ukupno Sv:	4.48	.574	.032

The results of the analysis of variance showed that the scalar averages by which the quality of recreational programs was evaluated differed statistically significantly in relation to gender (Sig. =,000). Although the scalar averages of the subsamples showed high values (at the extremely positive end of the scale), in women there is a much more intense expression of satisfaction resulting from participation in sports and recreational programs (Table 4). This can be explained by participating in group-led programs where women identify with an instructor and are thus strongly motivated to achieve their

Rezultati analize varijanse pokazali su da se skalarni prosjeci kojima je vrednovan kvalitet rekreativnih programa statistički signifikantno razlikuju u odnosu na pol (Sig. = ,000). Mada su skalarni prosjeci subuzoraka pokazali visoke vrijednosti (na krajnje pozitivnom kraju skale), kod žena se uočava znatno intenzivnije iskazivanje zadovoljstva koje proizilazi iz učešća u sportsko-rekreativnim programima (Tabela 4). To se može tumačiti učešćem u grupno vođenim programima gdje se žene identifikuju sa voditeljem i time su snažno motivisane da postignu svoj najbolji rezultat. Muškarci tokom korišće-

best result. Men during the use of sports and recreational programs are more individuals, less use the services of instructors, but in a unique way achieve their goals/satisfaction in improving fitness status.

Table 4: *Descriptive indicators for the satisfaction scale in relation to gender*

Sex	*N*	*Mean*	*Std. Deviation*
Men	142	4.32	.647
Women	186	4.60	.482
∑	328	4.48	.574

One-factor ANOVA: F = 19.252; Sig. = .000

Also, the results of the analysis of variance for the scale as a whole showed that in relation to the subsamples according to the age criterion, there are no statistically significant differences (Sig. =,181). Although minor differences in the values of the scalar averages are observed, they are primarily the result of the intensity of the evaluation, rather than the direction on the scale. It is noticeable that the most intensive programs are valued as a whole by respondents in the age group 30-40 years (4,52), then participants aged 41-50 years (4,50), from 51-60 years (4,39), and only finally persons over 60 years of age (4,27), (Table 5).

Table 5: *Descriptive indicators for the satisfaction scale in relation to age*

Age	*N*	*Mean*	*Std. Deviation*
30-40	175	4.52	.590
41-50	94	4.50	.567
51-60	34	4.39	.516
+60	25	4.27	.539
∑	328	4.48	.574

One-factor ANOVA: F = 1.634; Sig. = .181

Principal Component Analysis (PCA) after oblimin rotation revealed the presence of one component with characteristic values (*Eigenvalues*) over one (4,060). The scree plot diagram also showed the existence of a breakpoint behind the first component. As the quantitative framework of PCA analysis showed adequate and statistically justified content, and based on Kattel's criterion (1966) it was decided to keep this component and thus define a one-factor scale, which explained 57,999% of the total variance (Table 6; Figure 1).).

nja sportsko-rekreativnih programa su više individualci, manje koriste usluge voditelja, ali na svojstven način ostvaruju svoje ciljeve/zadovoljstvo u poboljšanju fitnes statusa.

Tabela 4: *Deskriptivni pokazatelji za skalu zadovoljstva u odnosu na pol*

Pol	N	Mean	Std. Deviation
Muškarci	142	4,32	,647
Žene	186	4,60	,482
∑	328	4,48	,574

Jednofaktorska ANOVA: F = 19,252; Sig. = ,000

Takođe, rezultati analize varijanse za skalu u cjelini su pokazali da u odnosu na subuzorke prema kriterijumu starosne dobi, ne postoje statistički značajne razlike (Sig. = ,181). Mada se uočavaju manje razlike u vrijednostima skalarnih prosjeka, one su prvenstveno rezultat intenziteta vrednovanja, a ne smjera na skali. Uočljivo je da najintenzivnije programe u cjelini vrednuju ispitanici starosne grupe 30-40 godina (4,52), zatim učesnice starosne dobi 41-50 godina (4,50), od 51-60 godine (4,39), a tek na kraju osobe u životnoj dobi preko 60 godina (4,27), (Tabela 5).

Tabela 5: *Deskriptivni pokazatelji za skalu zadovoljstva u odnosu na godine života*

Godine	N	Mean	Std. Deviation
30-40	175	4,52	,590
41-50	94	4,50	,567
51-60	34	4,39	,516
+60	25	4,27	,539
∑	328	4,48	,574

Jednofaktorska ANOVA: F = 1,634; Sig. = ,181

Analizom glavnih komponenti (PCA) je nakon oblimin rotacije otkrila prisustvo jedne komponente sa karakterističnim vrijednostima (*Eiegenvalues*) preko jedan (4,060). Takođe je i dijagram preloma (*Screeplot*) pokazao postojanje tačke loma iza prve komponente. Kako je kvantitativni okvir PCA analize pokazao adekvatan i statistički opravdan sadržaj, a na osnovu Kattel-ovog kriterijuma (1966) odlučeno je da se zadrži ova komponenta i time definiše jednofaktorski prostor skale, koji je objasnio 57,999% ukupne varijanse (Tabela 6; Slika 1).

Table 6: *Characteristic values-total variance of the program quality assessment scale*

Tabela 6: *Karakteristične vrijednosti-ukupna varijansa skale procjene kvaliteta programa*

Component /	Initial Eigenvalues /			Extraction Sums of Squared Loadings /		
	Total /	% of Variance /	Cumulative % /	Total /	% of Variance /	Cumulative % /
1	4.060	57.999	57.999	4.060	57.999	57.999
2	.695	9.930	67.930			
3	.668	9.546	77.475			
4	.473	6.764	84.240			
5	.460	6.575	90.814			
6	.336	4.795	95.610			
7	.307	4.390	100.000			

Extraction Method: Principal Component Analysis.

The identified communalities and factor weights, as well as the hierarchical structure on the basis of which they are manifested within the factors, imposed the determination to semantically define the context of the content of items describing the quality of recreational programs as - *Program organization and management factor* (Table 7).

Identifikovani komunaliteti i faktorske težine, kao i hijerarhijska strukturu na osnovu koje se ispoljavaju u okviru faktora, nametnuli su opredeljenje da se kontekst sadržaja ajtema koji opisuju kvalitet rekreativnih programa semantički definiše kao – *Faktor organizacije i menadžmenta programa* (Tabela 7).

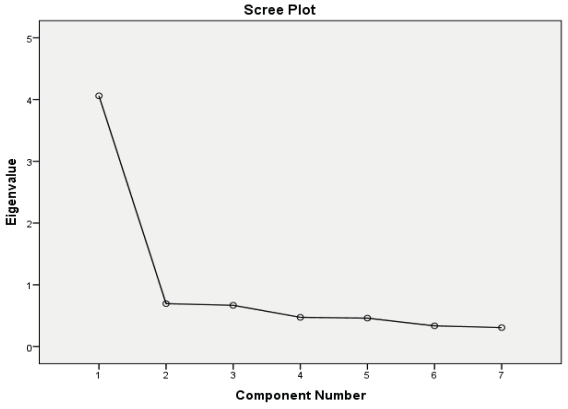

Figure 1: *Scree plot for program quality assessment indicators*

Slika 1: *Dijagram preloma (Screeplot) za indikatore procjene kvaliteta programa*

Table 7**:** *Factor structure of program evaluation indicators*

Tabela 7: *Faktorska struktura indikatora procjene programa*

Indicator / Indikator	Item / Ajtem	Factor / Faktor	Communalities / Komunaliteti
2	*Organizational aspects of the program /* Organizacioni aspekti programa	.805	.648
4	*Quality of professional information during the program implementation /* Kvalitet stručnih informacija tokom realizacije programa	.780	.609
3	*Atmosphere that prevails during the implementation of the program /* Atmosfera koja vlada tokom realizacije programa	.773	.598
6	*Attractiveness of the program /* Atraktivnost programa	.768	.589
5	*Safety of participants during the implementation of the program /* Bezbjednost učesnika tokom realizacije programa	.759	.576
1	*Environment where program is implemented /* Ambijent gdje se realizuje program	.725	.525
7	*Subjective feeling of satisfaction after program completion /* Subjektivni osjećaj zadovoljstva nakon završetka programa	.718	.516
Sample adequacy indicator (KMO) = .880		*Bartlett's test of sphericity = 1023.566*	*Sig.= .000*
Pokazatelj adekvatnosti uzorka (KMO) = ,880		Bartletov test sferičnosti = 1023,566	Sig.= ,000

Discussion

In a positive sense, a person strives to realize himself/herself through certain various activities (observational, creative, active recreational), using sports-recreational and other activities of a compensatory nature (Vuckovic & Mikalacki, 1999). As a prerequisite for a better life, many authors state: proper physical exercise, quality and proper nutrition, maintaining the experience of one's identity, socialization, rejection of bad habits and stressful situations, positive attitude towards life (Saban, 2004; Sidman, 2001; Strunz, 2002; Misigoj -Durakovic et al., 2000; Andrijasevic, 2000). There is a very small number of modern researches that were conducted in sports and recreational clubs and had the quality of the content of the program as their topic, ie the identification of user satisfaction after their practice. This research shows that in terms of age structure, it is identified that most respondents are between the ages of 30 and 50, while the least are those who are actively involved in recreational programs after the age of sixty. On the other hand, it is noticeable that in the ages of 30-40 and 51-60, females dominate, in relation to men. People aged 30-50 are the most productive people with their potentials, and for the efficiency of professional and private work, they need regular sports and recreational activities, which are most often found in well-organized recreational sports clubs (Sabic, 2018). It has been shown that older people (over 60 years of age) are interested in organized and professionally led group sports and recreational programs (Nesic, Srdic, Jovanovic & Vukajlovic, 2014), but program contents intended for this part of the population are much less represented in sports and recreational organizations. One of the reasons is probably the obvious lack of professional leaders who are trained to work with middle-aged and elderly people. It can be considered that there are several reasons that indicate a more conscientious attitude of women towards their health, among which the following usually dominates - they are more responsible for their health in middle age (in most cases women enter perimenopause period), and from 50-60 years they prepare for retirement; they consciously accept their age characteristics and better organize their free time for sports and recreational activities; that is, they can gain the knowledge that engaging in physical exercise/recreation is a useful means of preventing health problems). On the other hand, men of the same age are mostly spontaneous towards possible health problems (eg. the end of professional work and preparation for retirement are often depressing experiences, which has a negative approach in the organization of free

Diskusija

U pozitivnom smislu čovjek nastoji da realizuje sebe kroz određene raznovrsne aktivnosti (posmatračke, stvaralačke, aktivno rekreativne), koristeći sportsko-rekreativne i druge aktivnosti kompezatornog karaktera (Vučković & Mikalački, 1999). Kao preduslov za kvalitetniji život mnogi autori navode: pravilno fizičko vježbanje, kvalitetnu i odgovarajuću prehranu, održavanje doživljaja vlastitog identiteta, socijalizaciju, odbacivanje loših navika i stresnih situacija, pozitivan stav prema životu (Šaban, 2004; Sidman, 2001; Strunz, 2002; Mišigoj-Duraković i sar., 2000; Andrijašević, 2000). Veoma je mali broj savremenih istraživanja koja su se sprovodila u sportsko-rekreativnim klubovima i za svoju tematiku imala kvalitet sadržaja programa, odnosno identifikaciju zadovoljstva korisnika nakon njihovog upražnjavanja. Ovo istraživanje je pokazalo da je u pogledu starosne strukture identifikovano da se većina ispitanika nalazi u dobi od 30 do 50 godina, dok je najmanje onih koji se u rekreativne programe aktivno uključuju nakon šezdesete godine života. Sa druge strane uočljivo je da u uzrasnim dobima od 30-40 i od 51-60 godina dominiraju osobe ženskog pola, u odnosu na muškarce. Osobe od 30 – 50 godina su sa svojim potencijalima najproduktivije osobe, a za efikasnost profesionalnog i privatnog posla neophodna im je redovna sportsko-rekreativna aktivnost kakvu najčešće nalaze u dobro organizovanim klubovima rekreativnog sporta (Šabić, 2018). Pokazalo se da su starije osobe (preko 60 godina) zainteresovane za organizavane i stručno vođene grupne sportsko-rekreativne programe (Nešić, Srdić, Jovanović & Vukajlović, 2014), ali su programski sadržaji namjenjeni ovom dijelu populacije znatno manje zastupljeni u sportsko-rekreativnim organizacijama. Jedan od razloga je vjerovatno i evidentan nedostatak stručnih voditelja koji su edukovani za rad sa osobama srednje i starije životne dobi. Može se smatrati da postoji više razloga koji ukazuju na savjesniji odnos žena prema svom zdravlju, među kojima najčešće dominira sljedeći - odgovornije su prema svom zdravlju u srednjoj životnoj dobi (u najvećem broju slučajeva žene ulaze u period perimenopauze), a od 50-60 godina pripremaju se za penzionisanje; svjesno prihvataju svoje starosne osobenosti i bolje organizuju slobodno vrijeme za sportsko-rekreativne aktivnosti; odnosno mogu da steknu spoznaju da je bavljenje fizičkim vježbanjem / rekreacijom korisno sredstavo prevencije zdravstvenih tegoba). Sa druge strane muškarci u istom životnom dobu uglavnom se stihijski odnose prema eventualnim zdravstvenim problemima (npr. završetak profesionalnog rada i pripreme za penzionisanje često depresivno doživljavaju, što ima negativan pristup u organizaciji slobodnog vreme-

time) (Balaban, M., et al. 2002, Durakovic , Z., et al., 2007). In that context, the findings of our research were implicitly reflected. The respondents rated their perception of perceived satisfaction with the quality of sports and recreational programs in the zone of high intensity of satisfaction they feel after the program, because of the group atmosphere during the program, attractiveness of the program, safety aspects during the program, organizational/management aspects of the practiced program, professional information that respondents received during the implementation of the program by the instructor and the environment in which the programs were implemented, which resulted in above-average quality of implemented program content, but also to indicate space for quality improvement (and potential satisfaction of users). In women, much more intense expression of satisfaction resulting from participation in sports and recreational programs was observed, and in group-led programs women identify with the instructor and thus are strongly motivated to achieve their best result, while men have an individual approach for sports and recreational activities, less they use the services of an instructor, but in their own way achieve their goals/satisfaction in improving their fitness status. By analyzing the collected data, it can be concluded that women, in the context of practicing sports and recreational content outdoors, use them more creatively to improve their fitness status by participating in various recreational sports programs. On the other hand, men are more oriented to improve the quality of life through social contacts that they achieve through the implementation of some of the outdoor programs offered by available sports and recreational organizations in the immediate living environment. In this research, an instrument was applied which was previously validated in similar research (Nesic, Nesic & Peric, 2016), and is primarily focused on intangible aspects of quality (perception of service quality and experiences of direct participants in programs).

Conclusion

Proper understanding of what encourages people to participate in sports and recreational activities and programs (in the case of this research, these are outdoor activities) can be a significant factor which contributes to effective planning of certain outdoor recreational programs. Regular and quality implementation of recreational programs can have implications for the health of the immediate participants, given that it is known with certainty that physical activity improves the quality of life, both in young and older adults. In this context, it is necessary

na) (Balaban, M., sar. 2002, Duraković, Z., i sar. 2007). U tom kontekstu su se implicitno reflektovali i nalazi našeg istraživanja. Ispitanici su svoju ocjenu percepiranog zadovoljstva kvalitetom upražnjavanih sportsko-rekreativnih programa ocijenili u zoni visokog intenziteta zadovoljstva koje osjećaju nakon realizovanog programa, zbog grupne atmosfere tokom realizacije programa, atraktivnosti/privlačnosti samog programa, zbog bezbjednosnih aspekata tokom realizacije programa, organizacionih/menadžmentskih aspekata programa koje su upražnjavali, stručnih informacija koje su ispitanici dobijali tokom realizacije programa od strane instruktora/voditelja i ambijenta/okruženja u kojem su programi realizovani, što je rezultiralo nadprosječnom kvalitetom realizovanih programskih sadržaja, ali i da se ukaže prostor za unapređenje kvaliteta (time i potencijalnog zadovoljstva korisnika). Kod žena se uočilo znatno intenzivnije iskazivanje zadovoljstva koje proizilazi iz učešća u sportsko-rekreativnim programima, a u grupno vođenim programima se žene identifikuju sa voditeljem i time su snažno motivisane da postignu svoj najbolji rezultat, dok muškarci za sportsko-rekreativne aktivnosti imaju individualni pristup, manje koriste usluge voditelja, ali na svojstven način ostvaruju svoje ciljeve/zadovoljstvo u poboljšanju fitnes statusa. Analizom prikupljenih podataka može se zaključiti da žene, u kontekstu upražnjavanja sportsko-rekreativnih sadržaja na otvorenom, kreativnije koriste iste za poboljšavanje svog fitnes-statusa uključujući se u različite programe rekreativnog sporta. Sa druge strane muškarci su više orijentisani za unapređenje kvaliteta života kroz socijalne kontakte koje ostvaruju realizacijom nekog od progama na otvorenom koje im nude dostupne sportsko-rekreativne organizacije u bližem životnom okruženju. U ovom istraživanju je primijenjen instrument, koji je prethodno validiran u sličnim istraživanjima (Nešić, Nešić & Perić, 2016), a prioritetno je usmjeren na nematerijalne aspekte kvaliteta (percepciju kvaliteta usluga i doživljaje neposrednih učesnika u programima).

Zaključak

Pravilno razumijevanje onoga što podstiče ljude da učestvuju u sportsko-rekreativnim aktivnostima i programima (u slučaju ovog istraživanja to su aktivnosti na otvorenom) može biti značajan faktor koji doprinosi efikasnom planiranju određenih rekreativnih programa na otvorenom. Redovna i kvalitetna realizacija rekreativih programa može imati implikacije na zdravlje neposrednih učesnika, obzirom da se sa sigurnošću zna da fizička aktivnost poboljšava kvalitet života, kako kod mladih tako i kod starijih odraslih osoba. U tom kontekstu ne-

that the choice of activities is consistent with the goal, age and gender of the immediate participants, which is a prerequisite for the program to result in positive effects. As people with increasing age generally stop playing sports or recreational activities, it is desirable to use various organizational and marketing activities, to encourage them to actively engage in some physical activity in middle and old age. Sports and recreational programs are an important segment of a healthy lifestyle with which one can take preventive action and improve health and work abilities. Sports and recreational programs are an important segment of a healthy lifestyle with which one can take preventive action and improve health and work abilities. Regular and systematic practice of various sports and recreational programs enables a positive impact on several dimensions of quality of life, such as physical, psychological, social, economic and spiritual wellness. In that context, the characteristics of sports and recreational programs that determine their quality must also be observed. This primarily refers to the organizational approach - that the programs offered should be treated as a specific sports service. Determinants of success/quality of each sports service are primarily exposed as a relationship which indicates the extent to which the service provided met the expectations of immediate users. Although the expectations of clients (users of sports and recreational programs) may be influenced by various factors (fashion trends, availability according to the character of the motor structure and individual goals of participants, etc.), creating the perception of a particular service (as well as its value) appears at the individual level of the users. Therefore, the constant identification of customer satisfaction is one of the important tasks of the management of a particular organization that creates and delivers the service (exercise program). In this way, information is obtained (knowledge created) about the most important factor of organizational success - a satisfied user/client (a satisfied user is only one who has fulfilled his/her expectations by using a specific sports and recreational program). Thus, the success and value (quality) of specific sports and recreational programs is essentially "measured" by the level of satisfaction of immediate users and by comparing the relationship between *what was expected - what was gained*. In this regard, program participants must be treated as an essential factor in quality evaluation. This research showed that respondents feel satisfaction after using recreational activities outdoors, that women much more intensely express satisfaction which arises from participating in these sports and recreational programs, and that respondents like the group atmosphere during the implementation of the program. All this indicates the need

ophodno je da odabir aktivnosti bude usklađen sa ciljem, uzrastom i polom neposrednih učesnika, što je preduslov da program rezultira pozitivnim efektima. Kako se ljudi sa povećanjem starosne dobi uglavnom prestaju baviti sportom ili rekreativnim aktivnostima, poželjno je različitim organizacijskim i marketinškim aktivnostima, podsticati ih na aktivno upražnjavanje neke fizičke aktivnosti u srednjoj i starijoj životnoj dobi. Sportsko-rekreativni programi su važan segment zdravog načina života sa kojima se može prevenirati i poboljšati zdravlje i radne sposobnosti. Redovno i sistematsko upražnjavanje različitih sportsko-rekreativnih programa omogućuje pozitivan uticaj na više demenzija kvaliteta života kao što su fizički, psihološki, socijalni, ekonomski i duhovni welnes. U tom kontekstu se moraju posmatrati i karakteristike sportsko-rekreativnih programa koje određuju njihov kvalitet. U prvom redu se to odnosi na organizacijski pristup - da se ponuđeni programi trebaju tretirati kao konkretna sportska usluga. Determinante uspješnosti/kvaliteta svake sportske usluge se prvenstveno eksponiraju kao odnos koji ukazuje na informaciju u kojoj mjeri je isporučena usluga ispunila očekivanja neposrednih korisnika. Mada očekivanja klijenata (korisnika sportsko-rekreativnih programa) mogu biti pod uticajem različitih faktora (modni trendovi, dostupnost prema karakteru motoričke strukture i individualni ciljevi učesnika, i sl.), kreiranje percepcije konkretne usluge (kao i njene vrijednosti) pojavljuje se na individualnom nivou samih korisnika. Stoga je stalna identifikacija zadovoljstva korisnika jedan od bitnih zadataka menadžmenta konkretne organizacije koja kreira i isporučuje uslugu (program vježbanja). Na ovaj način se dobijaju informacije (stvara spoznaja) o najznačajnijem faktoru organizacijske uspješnosti - zadovoljnom korisniku/klijentu (zadovoljan korisnik je samo onaj koji je korišćenjem konkretnog sportsko-rekreativnog programa ispunio svoja očekivanja). Dakle, uspješnost i vrijednost (kvalitet) konkretnih sportsko-rekreativnih programa suštinski se „mjeri" nivoom zadovoljstva neposrednih korisnika i poređenjem na relaciji šta se očekivalo – šta se dobilo. U tom pogledu se učesnici programa moraju tretirati kao suštinski faktor evaluacije kvaliteta. Ovo istraživanje je pokazalo da ispitanici osjećaju zadovoljstvo nakon korišćenja rekreativnih aktivnosti na otvorenom, da žene mnogo intenzivnije izražavaju zadovoljstvo koje proizilazi iz učešća u ovim sportsko-rekreativnim programima i da se ispitanicima dopada grupna atmosfera tokom sprovođenja programa. Sve ovo ukazuje na potrebu sprovođenja istraživanja slične prirode kako bi se ljudima različitih starosnih grupa i polova omogućilo bavljenje sportom i rekreativnim

to conduct research of a similar nature in order to enable people of different ages and genders to engage in sports and recreational activities which would meet their needs for movement, socialization, appropriate level of program quality, and which do not require too much effort and have a positive effect on their health status.

aktivnostima koje bi zadovoljile njihove potrebe za kretanjem, socijalizacijom, odgovarajućim nivoom kvaliteta programa, a koje ne zahtjevaju previše napora i imaju pozitivan efekat na njihov zdravstveni status.

Announcemet
We announce that the authors have equally contributed to this paper.

Conflict of interests
There is no conflict of interests among the authors themselves.

Izjava
Izjavljujemo da su autori podjednako doprineli radu.

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Morphological Characteristics as a Predictive Factor of Biotic Motor Knowledge

Morfološke karakteristike kao prediktivni faktor biotičkih motoričkih znanja

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Abstract: *On a sample of a total of 56 subjects, divided into two subsamples: 30 boys and 26 girls, measurements of 8 anthropometric measures and assessment of biotic motor knowledge were performed using the motor test "The Test of Gross Motor Development" (TGMD-2). The aim of the study was to determine gender differences in morphological characteristics between preschool children as well as the association of morphological characteristics with the motor test for the assessment of biotic motor skills for both sexes. The results of the research indicate the existence of statistically significant differences between boys and girls in morphological characteristics. These differences were manifested in the motor test, transverse dimensionality and subcutaneous fat in favor of boys, and in longitudinal dimensionality and volume and mass in favor of girls. It was further determined that the system of predictor variables in girls was significantly related to the variable for the assessment of biotic motor knowledge, while this cannot be stated for boys. This linearity of results indicates that the percentage of body fat in the body reduces the ability of girls to achieve better results in the motor test, which is largely under the control of the movement structuring system. It should also be noted that it would be good to use these types of motor tests with preschool children in which the child repeatedly confronts different situations on the one hand, and on the other hand improves the speed of alternative hand movements, explosive power, and a good part of the structuring mechanism. movements.*
Keywords: *analysis of variance, correlation, preschool age, morphological characteristics.*

Sažetak: *Na uzorku od ukupno 56 ispitanika, podeljenih u dva subuzorka: 30 dečaka i 26 devojčice, izvršeno je merenje 8 antropometrijskih mera i procena biotičkih motoričkih znanja putem motoričkog testa The Test of Gross Motor Development" (TGMD-2). Cilj istraživanja bio je utvrditi polne razlike u morfološkim karakteristikama između dece predškolskog uzrasta kao i povezanost morfoloških karakteristika sa motoričkim testom za procenu biotičkih motoričkih znanja za oba pola. Rezultati istraživanja ukazuju na postojanje statistički značajnih razlika između dečaka i devojčica u morfološkim karakteristikama. Te razlike ispoljene su u motoričkom testu, transverzalnoj dimenzionalnosti i potkožnoj masti u korist dečaka, te u longitudinalnoj dimezionalnosti i volumenu i masi u korist devojčica. Dalje je utvrđeno da je sistem prediktorskih varijabli kod devojčica bio značajno povezan sa varijablom za procenu biotičkih motoričkih znanja, dok se to ne može konstatovati za dečake. Ovakva linearnost rezultata ukazuje da procenat telesne masti u telu umanjuje sposobnost devojčica u ostvarivanju boljih rezultata u motoričkom testu, koji je većim delom pod kontrolom sistema za strukturiranje kretanja. Takođe treba napomenuti da bi bilo dobro sa decom predškolskog uzrasta koristiti ovakve vidove motoričkih testova u kojima se dete više puta konfrontira sa različitim situacijama sa jedne strane, a sa druge strane poboljšava se brzina alternativnih pokreta ruku, eksplozivnost, te dobar deo mehanizma za strukturiranje kretanja.*
Ključne reči: *morfološke karakteristike, biotička motorička znanja, povezanost, predškolski uzrast.*

Introduction

The processes of growth and development take place intensively in both preschool and younger school age, they

Uvod

Procesi rasta i razvoja se intenzivno odvijaju kako u predškolskom tako i u mlađem školskom uzra-

are interdependent and complementary. Physical growth and development of children, their motor, intellectual and emotional development, their behavior, socialization, physical and other activities need to be constantly measured and evaluated. This is especially important while children are in preschool age, when their body is very susceptible to various influences, and whose effects are manifested in the later period, and which cannot or are very difficult to repair at a later age (Popović, 2010). According to scientific research, a significant number of adolescents have one or more risk factors for the development of chronic cardiovascular diseases that manifest in adulthood (Mišigoj-Duraković, & Sorić, 2015), preliminary empirical data presented by the same authors show a worrying level of sedentary activity in 15-year-olds. That is why it is especially important to form healthy living habits from an early age, with kinesiological activity certainly being one of the most important ones.

Morphological characteristics as a factor of anthropological status should be understood as a biological and physiological foundation that generates the manifestation of anthropometric measures, such as body height and weight, trunk and limb circumference, length and thickness of long bones (limbs and corresponding joints), skin folds, etc. They define the growth and development of children, as their body structure, by determining the structure of morphological characteristics (Bala, 2004). The constant interaction between the hereditary basis and the environment shapes the growth and development of the child. Endogenous factors that affect the growth and development of children include biological inheritance, hormones; while exogenous factors are: diet, socioeconomic and psychological status, climate, seasons, secular trend (Malina, Bouchard, & Bar-Or, 2004). All these factors are important in body growth and development, with the length and width of the body being more influenced by hereditary factors, while body weight and the amount of subcutaneous adipose tissue are more affected by the external environment (Musalek, Coxtein, Papez, Scheffler, Mumm, Czernitzki, & Koziel, 2017). Body height increases even when body weight stagnates. The growth of the skeleton, especially the long bones of the extremities, is the basis for the increase in body height. As a rule, the dimensions of the extremities reach their maximum, first the distal, then the proximal parts. The growth of the extremities is accompanied by the growth of the trunk and chest, and the shoulders reach their adult size. This pattern results in a disproportion in appearance that disappears when the adolescent stops growing (Đorđević-Nikić, 1995). The first phase of slow growth starts from the 3rd year of life and

stu, međusobno su zavisni i dopunjuju se. Fizički rast i razvoj dece, njihov motorički, intelektualni i emotivni razvoj, njihovo ponašanje, socijalizacija, fizičke i druge aktivnosti potrebno je neprestano meriti i procenjivati. To je naročito važno dok su deca u predškolskom uzrastu, kada je njihov organizam veoma podložan raznim uticajima, a čiji efekti se manifestuju u kasnijem periodu, i koje nije moguće ili je veoma teško popraviti u kasnijem uzrastu (Popović, 2010). Značajan deo adolescenata prema naučnim istraživanjima ima jedan ili više faktora rizika za razvoj hroničnih kardiovaskularnih bolesti koji se manifestuju u odrasloj dobi (Mišigoj-Duraković, & Sorić, 2015), preliminarni empirijski podaci istih autora pokazuju zabrinjavajući nivo sedentarne aktivnosti petnaestogodišnjaka. Zbog toga je posebno važno od malena formirati zdrave životne navike, od kojih bi kineziološka aktivnost svakako trebala biti među prvima.

Morfološke karakteristike kao faktor antropološkog statusa treba shvatiti kao biološku i fiziološku osnovu koja generiše manifestaciju antropometrijskih mera, kao što su telesna visina i težina, obim trupa i ekstremiteta, dužina i debljina dugačkih kostiju (delovi udova i odgovarajući zglobovi), kožni nabori i dr. Njima se definiše rast i razvoj dece, kao njihova telesna građa i to tako što se utvrđuje struktura morfoloških karakteristika (Bala, 2004). Konstantna interakcija između nasledne osnove i okoline oblikuje rast i razvoj deteta. U endogene faktore koji utiču na rast i razvoj dece spadaju biološko nasleđe, hormoni; dok su egzogeni faktori: ishrana, socioekonomski i psihološki status, klima, godišnje doba, sekularni trend (Malina, Bouchard, & Bar-Or, 2004). Svi ovi faktori su bitni kod telesnog rasta i razvoja, s tim da na dužinu i širinu tela više utiče nasleđe, dok na telesnu masu i količinu potkožnog masnog tkiva više utiče spoljašnja sredina (Musalek, Kokstejn, Papez, Scheffler, Mumm, Czernitzki, & Koziel, 2017). Visina tela raste čak i onda kada telesna težina stagnira. Rast skeleta, posebno dugih kostiju ekstremiteta, osnova je povećanja telesne visine. Po pravilu, dimenzije ekstremiteta dostižu svoj maksimum i to prvo distalni, zatim proksimalni delovi. Rast ekstremiteta prati rast trupa i grudnog koša, a ramena dostižu svoju adultnu veličinu. Ovakav obrazac rezultira nesrazmerom u izgledu koja nestaje kada adolescent završi sa rastom (Đorđević-Nikić, 1995). Prva faza usporenog rasta počinje od 3. godine života i traje do početka puberteta, prosečni godišnji prirasti visine su 5 cm. Druga faza usporenog rasta se javlja kod devojčica od 16,5 godina, kada dostignu 98% od

lasts until the beginning of puberty, and the average annual increments of height are 5 cm. The second phase of slow growth occurs in girls from their 16.5 years of age, when they reach 98% of their final height (Malina, & Katzmarzyk, 2006) and it lasts until the age of 18, while in boys it starts at 17.5 years of age and with individual differences, ends when they turn 20 years of age.

The factor approach was defined a long time ago and it can be claimed with considerable certainty that the latent morphological space is essentially four-dimensional, that is, we can talk about the model of the structure of morphological characteristics, which consists of the following four morphological factors (Bala, 1981): longitudinal dimensionality of the skeleton factor - responsible for the growth of bones in length; transverse dimensionality of the skeleton factor - responsible for bone growth in width; body mass and volume factor - responsible for the total mass and volume of the body, and subcutaneous adipose tissue factor - responsible for the total amount of fat in the body.

Changes and differences in the latent structure of morphological characteristics of children of younger school age (7-14 years of age) were analysed by Sturm, Strel and Ambrozic (1995). The differences identified in all age and gender categories indicate a great instability of the latent structure of morphological characteristics. Based on the analysis of the structure of morphological characteristics, it was determined that in boys the rate of change is somewhat faster during the entire observed period, that the development is more harmonious, in contrast to girls where larger structural changes occur in periods of 7-8 and 11-12 years of age.

This age period is very important, because in the early motor development stage, the formation of the so-called Fundamental motor patterns (FMO) occurs, which are extremely important because they allow children to interact with the environment. FMOs are organized series of related activities in certain spatio-temporal stages. Therefore, it is believed that FMOs are very closely related to physical development, and especially to the development and maturation of the brain and central nervous system (Brady, 2004), and directly to the development of the entire locomotor system.

Hence, the aim of the research would be to define, in addition to gender differences in morphological characteristics, the connection of morphological characteristics of children of both genders with the basic motor knowledge of children, which will refer to the assessment of biotic knowledge.

svoje konačne visine (Malina, & Katzmarzyk, 2006) traje do 18. godine, a kod dečaka sa 17,5 godina i uz individualne razlike, traje do 20. godine.

Još davno je definisan faktorski pristup te se sa znatnom sigurnošću može tvrditi da je latentni morfološki prostor u suštini četvorodimenzionalan, odnosno, može se govoriti o modelu strukture morfoloških karakteristika, koji se sastoji od sledeća četiri morfološka faktora (Bala, 1981): faktor longitudinalna dimenzionalnost skeleta – odgovorna za rast kostiju u dužinu; faktor transverzalna dimenzionalnost skeleta – odgovorna za rast kostiju u širinu; faktor mase i voluminoznosti tela – odgovorna za ukupnu masu i obim tela i faktor potkožno masno tkivo – odgovorno za ukupnu količinu masti u organizmu.

Promenama i razlikama u latentnoj strukturi morfoloških karakteristika dece mlađeg školskog uzrasta 7-14 godina bavili su se Šturm, Strel i Ambrožić (1995). Utvrđene razlike u svim uzrasnim i polnim kategorijama, ukazuju na veliku nestabilnost latentne strukture morfoloških karakteristika. Na osnovu analize strukture morfoloških karakteristika utvrđeno je da je kod dečaka nešto brži tempo promena tokom celog posmatranog perioda, da je razvoj harmoničniji, za razliku od devojčica gde se veće stukturalne promene javljaju u periodima od 7-8 i od 11-12 godine.

Ovaj uzrasni period je jako bitan, jer upravo u ranom motoričkom razvoju, dolazi do formiranja tzv. Fundamentalnih motoričkih obrazaca (*eng. fundamental motor patterns, FMO*), čiji je značaj veliki, jer omogućava interakciju dece sa okolinom. FMO predstavljaju organizovane serije povezanih aktivnosti u određenim prostorno-vremenskim etapama. Stoga, važi mišljenje da FMO su veoma blisko povezane sa telesnim razvojem, a posebno sa razvojem i sazrevanjem mozga i centralnog nervnog sistema (Brady, 2004), a neposredno i sa razvojem celokupnog lokomotornog sistema.

Otuda bi cilj istraživanja bio definisati pored polnih razlika u morfološkim karakteristikama i povezanost morfoloških karakteristika dece oba pola sa temeljnim motoričkim znanjima dece koji će se odnosi se na procenu biotičkih znanja.

Material and Method

The research was of a transversal character, which means that one measurement was conducted in a sample of preschool children from Belgrade. The sample of participants was taken from the population of children by a non-random sampling method, a quota sample from Belgrade. The sample included 56 children, 30 of which were boys and 26 were girls who attended the preschool institution "Čukarica", aged 6 and 7, who were attending two school-preparation preschool groups at the time of measurement.

The measurement was conducted in May 2019, and the parents of the children who were planned to be part of the sample were given a survey questionnaire before the measurement. Testing their children could be performed only after their parents granted the approval, which is in line with the Declaration of Helsinki (World Medical Association Declaration of Helsinki, 2013).

The following basic anthropometric measures were chosen to assess the morphological characteristics: I - To assess the longitudinal dimensionality of the skeleton: 1) *Body height (cm),* 2) *Arm span (cm)* and 3) *Arm length (cm);* II - To assess the transverse dimensionality of the skeleton: 4) *Shoulder width (cm),* 5) *Pelvic width (cm)* and 6) *Wrist diameter (cm);* III - To assess the volume and weight of the body: 7) *Body weight (kg*), 8) *Average circumference of the outstretched upper arm (cm*) and 9) *Average circumference of the outstretched forearm (cm);* IV - To assess subcutaneous adipose tissue: 10) *Abdominal skinfold (cm),* 11) *Back skinfold (cm*) and 12) *Triceps skinfold (cm).*

The motor test called "The Test of Gross Motor Development – Second Edition (TGMD-2)" (Ulrich, 2000a) was used to assess biotic motor knowledge: V - Biotic motor knowledge: 13) TGMD-2 (sec).

When measuring morphological characteristics, there are certain standards that must be met (according to IBP standards): The participant's posture was standard standing (the participant was barefoot in underwear, head in the Frankfurt horizontal position). Measurement of anthropometric characteristics was performed during the morning hours (from 7 to 13 o'clock). The instruments were standard ones and were calibrated daily before the start and during the measurement after 10 measured participants. The participants were measured in the gyms and classrooms where physical education classes are organized. The gym was spacious and bright enough, and the air temperature was such that the participants felt comfortable (from 17 ºC to 22 ºC). It was necessary to set up two positions where measurements in the gym would take place before the start of the measurement. The distance between those places had to be at least 5 meters.

Materijal i metod

istraživanje je bilo transverzalnog karaktera, što znači da je bilo sprovedeno jedno merenje na uzorku dece predškolskog uzrasta iz Beograda. Uzorak ispitanika bio je izveden iz populacije dece neverovatnosnom metodom uzorkovanja, kvotnim uzorkom iz Beograda. Ukupan broj uzorka činilo je 56 dece, od toga 30 dečaka i 26 devojčice polaznika Predškolske ustanove "Čukarica", starosti 6 i 7 godina, koji su u trenutku merenja pohađali dve pripremne predškolske grupe.

Merenje je bilo izvršeno u maju mesecu 2018/2019. školske godine, a roditeljima dece koji su planirani uzorkom je pre merenja podeljen anketni upitnik. Testiranje na njihovoj deci je usledilo tek nakon odobrenja njihovih roditelja, što je u skladu sa Helsinskom deklaracijom (World Medical Association Declaration of Helsinki, 2013).

Za procenu morfoloških karakteristika bile su izabrane sledeće osnovne antropometrijske mere: I Za procenu longitudinalne dimenzionalnosti skeleta: 1) *Telesna visina (cm),* 2) *Raspon ruku (cm)* i 3) *Dužina ruke (cm);* II Za procenu tranverzalne dimenzionalnosti skeleta: 4) Širina ramena *(cm),* 5) Širina karlice *(cm)* i 6) *Dijametar ručnog zgloba (cm);* III Za procenu volumena i mase tela: 7) *Telesna težina (kg),* 8) *Srednji obim opružene nadlaktice (cm)* i 9) *Srednji obim opružene podlaktice (cm);* IV Za procenu potkožnog masnog tkiva: 10) *Kožni nabor trbuha (cm),* 11) *Kožni nabor leđa (cm)* i 12) *Kožni nabor nadlaktice (cm).*

Za procenu biotičkih motoričkih znanja izabran je motorički test „The Test of Gross Motor Development– Second Edition" (TGMD-2)" (Ulrich, 2000a): V Biotička motorička znanja: 13) *TGMD-2 (sek.)*

Prilikom merenja morfoloških karakteristika postoje određeni standardi koji se moraju ispoštovati (prema standardima IBP-a): Stav ispitanika bio je standardni stojeći (ispitanik bos u donjem vešu, glava u položaju franfurtske horizontale). Merenje antropometrijskih mera obavljalo se u toku prepodneva (od 7 do 13 časova). Instrumenti su bili standardne izrade i baždareni su svakodnevno pre početka i u toku merenja nakon 10 izmerenih ispitanika. Ispitanici su se merili u salama i kabinetima gde ispitanici obavljaju nastavu fizičkog vaspitanja. Sala je bila dovoljno prostrana i osvetljena, a temperatura vazduha takva da su se svučeni ispitanici osećali prijatno (od 17 °C do 22 °C). U sali pre početka merenja neophodno je bilo pripremiti dva radna mesta za merenja. Razmak između tih mesta je morao da bude najmanje 5 metara. Sva merenja obavljalo je četiri merioca, s tim što je svaki od njih izvršavao uvek ista mere-

All measurements were done by four people, with each of them always performing the same measurements. One of them measured body height and body weight, the other measured limb length, the third measured limb circumference and chest circumference, and the fourth recorded the measurement results. Participants who were measured had to be minimally dressed, barefoot, and wore only sports shorts. The measurement results were read while the instrument was on the measured parameter of the examinee, and the person who records the data, loudly repeated the results before entering it in the examinee's card for verification purposes. Medical measuring scales, a centimeter tape measure, a Martin anthropometer, a sliding caliper and a John Bull caliper were used as measuring instruments. The measurement was performed by a standard procedure following the IBP standard (International Biological Standards for each anthropometric measure).

„The Test of Gross Motor Development–Second Edition" (TGMD-2)" (Ulrich, 2000b).

It is a battery of tests that are used to assess the basic motor skills of children aged 3-10. It consists of 12 tests divided into two groups. The first group of tests refers to the assessment of locomotor knowledge (running, galloping, skipping, vault, long jump and sideways movement) while the second group of tests refers to the assessment of manipulative knowledge (baseball kick, running the ball, catching the ball, kicking the ball, throwing the ball, rolling the ball). The task is evaluated as motor knowledge in the shortest possible time, through correctly performed all subtests in the entire test. The total result is time in seconds. Based on groups of tests, biotic motor knowledge expressed over the shortest possible period of time is calculated.

Statistical analysis of data by using kinesiological statistics took place in several stages: Basic descriptive statistical parameters were determined for all variables. Starting with the measures of central tendency: arithmetic mean (AM); variability measures: standard deviation (S), minimum (MIN) and maximum measurement results (MAX); Measures of Shape of Distribution: skewness - measure of symmetry of distribution (SKEW) and kurtosis - measure of homogeneity of distribution (KURT). The normality of distribution on the initial and final measurements for all variables was tested using the Kolmogorov – Smirnov test, for both genders. Multivariate analysis of variance (MANOVA) and univariate analysis of variance (ANOVA) were used to determine statistically significant differences between boys and girls. Correlation and regression analysis were used to identify the relationship between morphological characteristics and biotic motor knowledge.

nja. Jedan od merilaca merio je telesnu visinu i telesnu masu, drugi je merio dužine ekstremiteta, treći obime ekstremiteta i obim grudnog koša, četvrti je zapisivao rezultate merenja. Ispitanici koji su bili mereni morali su biti minimalno obučeni, mereni su bosi, a na sebi su imali samo sportske gaćice. Rezultati merenja čitali su se dok je instrument bio na merenom parametru ispitanika, a osoba koja evidentira podatke radi kontrole, glasno je ponavljala rezultate pre upisa u karton ispitanika. Od mernih instrumentarija bili su korišteni medicinska decimalna vaga, centimetarska traka, antropometar po Martinu, klizni šestar i kaliper tipa Jon Bull. Merenje je realizovano standardnim postupkom pridržavajući se IBP (Internacionalnih bioloških standarda za svaku antropometrijsku meru).

„The Test of Gross Motor Development–Second Edition" (TGMD-2)" (Ulrich, 2000b).

To je baterija testova pomoću koje se procenjuju temeljna motorička znanja dece od 3-10 godina života. Sastoji se od 12 testova podeljenih u dve grupe. Prva grupa testova odnosi se na procenu lokomotornih znanja (trčanje, galop, poskoci, preskok, skok u dalj i bočno kretanje) dok se druga grupa testova odnosi na procenu manipulativnih znanja (bejzbol udarac, vođenje lopte, hvatanje lopte, udarac lopte nogom, bacanje loptice, kotrljanje loptice). Zadatak se vrednuje kao motoričko znanje u što kraćem vremenskom periodu, kroz pravilno izvedene sve podtestove u celokupnom testu. Ukupan rezultat iznosi vreme u sekundama. Na temelju grupa testova, izračunavaju se biotičko motoričko znanje izraženo kroz što kraći dati vremenski period.

Statistička obrada podataka kineziološkom statistikom odvijala se u nekoliko etapa:

Za sve varijable utvrđeni su osnovni deskriptivni statistici. Od mera centralne tendencije: aritmetička sredina (AS); od mera varijabilnosti: standardna devijacija (S), minimalni (MIN) i maksimalni rezultati merenja (MAX); od mera oblika distribucije: skjunis -mera simetričnosti distribucije (SKEW) i kurtosis - mera homogenosti distribucije (KURT). Testirana je normalnost disribucije na inicijalnom i finalnom merenju za sve varijable primenom Kolmogorov–Smirnov testa, za oba pola. Za utvrđivanje statistički značajnih razlika između dečaka i devojčica koristila se multivarijatna analiza varijanse (Manova) i univarijatna analiza varijanse (Anova). Za utvrđivanje povezanosti između morfoloških karakteristika i biotičkih motoričkih znanja korišćena je korelaciona i regresiona analiza.

Results

based on the results shown in Table 1, and on the basis of arithmetic mean and standard deviation values of the tested anthropometric variables, it can be said that good discriminant validity was observed, except for the variable *Abdominal skinfold*. Moreover, based on the minimum and maximum measurement results for the abovementioned variable, it can be seen that the range is slightly larger than usual. Measures of Shape of Distribution do not exceed the predicted coefficients, but the Kurtosis values for the variable *Back skinfold* are at the limit allowed. The skewness values for the variables intended to assess skin folds do not exceed the allowed coefficients. Such slight deviations could be expected when it comes to skin folds.

Table 1. *Basic descriptive statistics of anthropometric variables for boys*

Rezultati

Na osnovu vrednosti rezultata koji su prikazani u tabeli 1, a na osnovu aritmetičkih sredina i standardnih devijacija testiranih antropometrijskih varijabli može se konstatovati dobra diskriminativnost merenja, sem u varijabli *Kožni nabor trbuha*. Takođe se na osnovu minimalnog i maksimalnog rezultata merenja u pomenutoj varijabli vidi da je raspon nešto veći od uobičajenog. Mere oblika distribucije ne prelaze predviđene koeficijente, ali su kurtične vrednosti u varijabli *Kožni nabor leđa* na granici dozvoljenih. Skjunične vrednosti kod varijabli za procenu kožnih nabore ne prelaze dozvoljene koeficijente. Ovakva blaga odstupanja su se mogla i očekivati kada su kožni nabori u pitanju.

Tabela 1. *Osnovni deskriptivni statistici antropometrijskih varijabli za dečake*

Variable / Varijabla	*AM*	*S*	*MIN*	*MAX*	*Sk*	*Kurt*
Body height (cm) / Telesna visina *(cm)*	1237.41	43.24	1140.00	1298.00	-.646	-.266
Arm span (cm) / Raspon ruku *(cm)*	1224.05	44.31	1111.00	1288.00	-.941	.538
Arm length (cm) / Dužina ruke *(cm)*	488.50	20.10	447.00	521.00	-.265	-.576
Shoulder width (cm) / Širina ramena *(cm)*	365.41	22.69	322.00	406.00	-.181	-.899
Pelvic width (cm) / Širina karlice *(cm)*	212.95	10.80	198.00	235.00	.346	-.793
Wrist diameter (cm) / D. ručnog zgloba *(cm)*	35.36	2.44	31.00	41.00	.333	.039
Body weight (kg) / Telesna težina *(kg)*	254.36	31.166	208.00	329.00	.811	.742
Circumf. of upper arm (cm) / Obim nadlaktice *(cm)*	195.73	21.80	159.00	218.00	.835	.861
Circumf. of forearm (cm) / Obim podlaktice *(cm)*	182.09	12.86	161.00	218.00	1.012	1.813
Abdominal skinfold (cm) / K. nabor trbuha *(cm)*	85.86	45.13	34.00	210.00	1.252	1.414
Back skinfold (cm) / K. nabor leđa *(cm)*	62.36	23.18	40.00	140.00	1.534	2.934
Triceps skinfold (cm) / K. nabor nadlaktice *(cm)*	96.73	36.94	49.00	192.00	1.156	.876
TGMD-2 (sec) / TGMD-2 (sek)	26.73	12.24	20.94	44.00	1.156	.876

Legend: *AM – arithmetic mean; S - standard deviation; MIN - minimum recorded measurement result; MAX - maximum recorded measurement result; Sk - skewness (symmetry of the distribution of results); Kurt - kurtosis (elongation of the distribution of results)*

Legenda: *AS – aritmetička sredina; S – standardna devijacija; MIN – minimalni zabeleženi rezultat merenja; MAX – maksimalni zabeleženi rezultat merenja; Sk – skjunis (nagnutos distribucije rezultata); Kurt – kurtosis (izduženost distribucije rezultata)*

The results of basic descriptive statistical analysis of anthropometric variables for girls indicate good discriminant validity in all tested anthropometric variables, and even in the variables that assessed skin folds of girls. Girls are almost the same height as boys, but on average they are slightly lighter than boys. This could indicate that they are entering into the second phase of more intensive growth, which usually happens earlier in girls than in boys. Measures of Shape of Distribution indicate

Rezultati osnovnih deskriptivnih statistika antropometrijskih varijabli za devojčice ukazuju na dobru diskriminativnost u svim testiranim antropometrijskim varijablama, pa čak i u varijablama za procenu kožnih nabora devojčica. Devojčice su skoro istog rasta kao i dečaci, ali su u proseku nešto lakše od dečaka. To bi moglo da ukaže na ulazak u drugu fazu intenzivnijeg rasta, što se kod devojčica obično i dešava ranije nego kod dečaka. Mere oblika distribucije ukazuju na dobru homogenost u svim

good homogeneity in all variables, even the kurtosis values for skin folds do not exceed the coefficients +/- 1.50, which is considered to be a highly homogeneous sample.

varijablama, čak kurtične vrednosti kod kožnih nabora ne prelaze koeficijente +/- 1,50 što se smatra izrazito homogenim uzorkom.

Table 2. *Basic descriptive statistics of anthropometric variables for girls*

Tabela 2. *Osnovnih deskriptivnih statistika antropometrijskih varijabli za devojčice*

Variable / **Varijabla**	***AM***	***S***	***MIN***	***MAX***	***Sk***	***Kurt***
Body height / Telesna visina	1235.50	36.15	1164.00	1298.00	-.165	-.772
Arm span / Raspon ruku	1230.46	32.56	1160.00	1285.00	-.254	-.637
Arm length / Dužina ruke	514.58	39.66	452.00	564.00	-.319	-1.55
Shoulder width / Širina ramena	357.73	21.07	319.00	412.00	.384	.678
Pelvic width / Širina karlice	211.27	8.46	195.00	231.00	.395	-.059
Wrist diameter / D. ručnog zgloba	33.27	2.76	28.00	38.00	-.106	-.787
Body weight / Telesna težina	242.04	20.52	210.00	271.00	-.333	-.872
Circumf. of upper arm / Obim nadlaktice	195.69	23.08	162.00	248.00	.817	-.082
Circumf. of forearm / Obim podlaktice	186.31	15.21	163.00	217.00	.624	-.217
Abdominal skinfold / K. nabor trbuha	69.38	27.16	28.00	123.00	.336	-.968
Back skinfold / K. nabor leđa	58.50	17.47	38.00	99.00	1.032	.211
Triceps skinfold / K. nabor nadlaktice	78.42	15.41	50.00	112.00	.227	-.073
TGMD-2	29.42	5.41	22.00	46.00	.227	-.073

Legend: *AM – arithmetic mean; S - standard deviation; MIN - minimum recorded measurement result; MAX - maximum recorded measurement result; Sk - skewness (symmetry of the distribution of results); Kurt - kurtosis (elongation of the distribution of results)*

Legenda: *AS – aritmetička sredina; S – standardna devijacija; MIN – minimalni zabeleženi rezultat merenja; MAX – maksimalni zabeleženi rezultat merenja; Sk – skjunis (nagnutos distribucije rezultata); Kurt – kurtosis (izduženost distribucije rezultata)*

As for the morphological characteristics, there are tables with data on the normality of deviation of distribution from theoretical (normal) distribution for anthropometric variables are presented, all at the level of statistical significance p <0.01.

U prostoru morfoloških karakteristika prikazane su tabele normalnosti odstupanja distribucije od teorijske (normalne) distibucije u antropometrijskim varijablama, a sve na nivou zaključivanja statističke značajnosti p<0,01.

Table 3. *Distribution normality verified with the Kolmogorov - Smirnov test of anthropometric variables for boys*

Tabela 3. *Normalnost distribucije testirana Kolmogorov – Smirnov testom antropometrijskih varijabli za dečake*

Variable	***KS***	***p***	***MEA***
Body height / Telesna visina	.711	.694	.151
Arm span / Raspon ruku	.853	.460	.182
Arm length / Dužina ruke	.555	.918	.118
Shoulder width / Širina ramena	.555	.918	.118
Pelvic width / Širina karlice	.764	.604	.163
Wrist diameter / Dijametar ručnog zgloba	.567	.905	.121
Body weight / Telesna težina	.592	.875	.126
Circumf. of upper arm / Obim nadlaktice	.788	.564	.168

Circumf. of forearm / Obim podlaktice	.662	.772	.141
Abdominal skinfold / Kožni nabor trbuha	.955	.321	.204
Back skinfold / Kožni nabor leđa	1.011	.259	.216
Triceps skinfold / Kožni nabor nadlakta	.800	.544	.171
TGMD-2	.542	.112	.571

Legend: *K-S – Kolmogorov – Smirnov Z coefficient; p – level of statistical significance of Kolmogorov - Smirnov Z coefficient; MEA – the maximum extreme difference between the obtained and expected distribution*

Legenda: *K-S – Kolmogorov – Smirnov Z koeficijent; p – nivo statističke značajnosti Kolmogorov – Smirnov Z koeficijenta; MEA – maksimalna ekstremna razlika između dobijene i očekivane distribucije*

By looking at Table 3, which shows the normality of the distribution of anthropometric variables tested by the Kolmogorov-Smirnov test, it can be concluded that there is no statistically significant deviation of the tested distribution from the normal (theoretical) one. No value of the maximum extreme deviation exceeds the values of the K-S test and is not statistically significant. This justifies the application of parametric statistical methods of data analysis in the remainder of the research.

Iz tabela 3 u kojoj su prikazane normalnosti distribucije antropometrijskih varijabli, testirane Kolmogorov–Smirnov testom može se konstatovati da ne postoji statistički značajno odstupanje testirane distribucije od normalne (teorijske). Nijedna vrednost maksimalnog ekstremnog odstupanja ne prelazi vrednosti K-S testa i nije statistički značajna. To opravdava primenu parametrijskih statističkih metoda obrade podataka u nastavku istraživanja.

Table 4. *Distribution normality verified with the Kolmogorov - Smirnov test of anthropometric variables for girls*

Tabela 4. *Normalnost distribucije testirana Kolmogorov – Smirnov testom antropometrijskih varijabli za devojčice*

***Variable* / Varijabla**	***KS***	***p***	***MEA***
Body height / Telesna visina	.377	.999	.069
Arm span / Raspon ruku	.589	.879	.108
Arm length / Dužina ruke	.724	.672	.132
Shoulder width / Širina ramena	..671	.758	.123
Pelvic width / Širina karlice	.610	.851	.111
Wrist diameter / Dijametar ručnog zgloba	..805	.536	.147
Body weight / Telesna težina	1.009	.261	.184
Circumf. of upper arm / Obim nadlaktice	.522	.948	.095
Circumf. of forearm / Obim podlaktice	.697	.715	.127
Abdominal skinfold / Kožni nabor trbuha	1.038	.231	.190
Back skinfold / Kožni nabor leđa	.424	.994	.077
Triceps skinfold / Kožni nabor nadlakta	.908	.382	.166
TGMD-2	.631	.412	.620

Legend: *K-S – Kolmogorov – Smirnov Z coefficient; p – level of statistical significance of Kolmogorov - Smirnov Z coefficient; MEA – the maximum extreme difference between the obtained and expected distribution*

Legenda: *K-S – Kolmogorov – Smirnov Z koeficijent; p – nivo statističke značajnosti Kolmogorov – Smirnov Z koeficijenta; MEA – maksimalna ekstremna razlika između dobijene i očekivane distribucije*

By looking at Table 4, which shows the normality of distribution of anthropometric variables of girls tested by the Kolmogorov - Smirnov test, it can also be concluded

Iz tabela 4 u kojoj su prikazane normalnosti distribucije antropometrijskih varijabli, devojčica testirane Kolmogorov – Smirnov testom može se takođe konsta-

that there is no statistically significant deviation of the tested distribution from the normal one. As in the previous cases, it is concluded that without standardization and normalization of variables, all parametric methods of data analysis can be applied in the continuation of the research.

The table of analysis of differences at the multivariate and univariate level by gender is presented below, all at the level of statistical significance p <0.01.

Table 5. *Differences in morphological characteristics at the multivariate and univariate level by gender*

tovati nepostojanje statistički značajnog odstupanja testirane distribucije od normalne. Kao i u predhodnim slučajevima, konstatuje se da se bez standardizacije i normalizacije varijabli mogu primenjivati sve parametrijske metode obrade podataka u nastavku istraživanja.

Dalje je prikazana tabela analize razlika na multivarijatnom i univarijatnom nivou po polu, a sve na nivou zaključivanja statističke značajnosti p < 0,01.

Tabela 5. *Razlike u morfološkim karakteristikama na multivarijatnom i univarijatnom nivou po polu*

Variable / **Varijable**	***df***	***f***	***Chi-Square***	***P***
Body height / Telesna visina	3	.117	.001	.733
Arm span / Raspon ruku	3	.175	.002	.677
Arm length / Dužina ruke	3	6.378	.062	.013
Shoulder width / Širina ramena	3	1.574	.016	.213
Pelvic width / Širina karlice	3	.037	.000	.849
Wrist diameter / Dijametar ručnog zgloba	3	7.683	.074	.007
Body weight / Telesna težina	3	4.926	.049	.029
Circumf. of upper arm / Obim nadlaktice	3	8.733	.083	.004
Circumf. of forearm / Obim podlaktice	3	.484	.005	.488
Abdominal skinfold / Kožni nabor trbuha	3	.787	.008	.377
Back skinfold / Kožni nabor leđa	3	.487	.005	.487
Triceps skinfold / Kožni nabor nadlaktice	3	13.328	.122	.000
TGMD-2	3	4.023	.065	.014

F=5,750; P=0,000

Legend: *F-value of the multivariate Wilks' F-test; P- statistical significance of multivariate Wilks' F-test; f-value of f ratio for univariate test; Chi Square - magnitude of impact; p-statistical significance of the univariate f-test*

F=5,750; P=0,000

Legenda: *F-vrednost multivarijatnog Wilksovog F testa; P- statistička značajnost multivarijatnog Wilksovog F testa; f-vrednost f odnosa za univarijatni test; Eta Squared-veličina uticaja; p-statistička značajnost univarijatnog f testa*

Based on the results shown in Table 5 which discusses the differences in morphological characteristics between boys and girls in the whole sample, and based on Wilks' F-test and its statistical significance, a statistically significant difference by gender from the aspect of morphological characteristics is found. On the basis of the univariate f-test, individual differences indicate that the differences were observed in the following variables: *Wrist diameter* and *Skin fold of the upper arm* in favor of boys, as well as in the following variables: *Arm length* and *Upper arm circumference* in favor of girls. A significant difference was also observed in the variable Biotic motor knowledge (TGMD-2) in favor of better, i.e., lower average values for boys. Based on the magnitude of impact on the expressed differences within the

Na osnovu rezultata prikazanih u tabeli 5 koja govori o razlikama u morfološkim karakteristikama između dečaka i devojčica u celokupnom uzorku, a na osnovu Wilksovog F testa i njegove statističke značajnosti konstatuje se statistički značajna razlika po polu u morfološkom prostoru. Pojedinačne razlike ukazuju na osnovu univarijatnog f testa da su razlike ispoljene u varijablama: *Dijametar ručnog zgloba* i varijabli *Kožni nabor nadlakta* u korist dečaka, kao i u varijablama: *Dužina ruke* i *Obim nadlaktice* u korist devojčica. Značana razlika ispoljena je i u varijabli Biotičkih motoričkih znanja *(TGMD-2)* u korist boljih tj. manjih prosečnih vrednosti za dečake. Na osnovu veličine uticaja na ispoljene razlike unutar polnog di-

gender dimorphism, the greatest credit can be attributed to the variable *Triceps skinfold* with as much as 12.2%. The variables *Upper arm circumference* and *wrist diameter* contributed to this difference slightly less with some 8% and the smallest contribution to statistically significant differences was made by the variable *Arm length* with about 6%.

morfizma najveća zasluga se može pripisati varijabli *Kožni nabor nadlakta* čak 12,2%. Nešto manje su razlici doprinele varijable *Obim nadlaktice* i *Dijametar ručnog zgloba* sa nekih 8% i najmanji doprinos statistički značajnim razlikama ispoljen je u varijabli *Dužina ruke* oko 6%.

Table 6. *Correlation and regression analysis of biotic motor knowledge for both genders*

Tabela 6. *Korelaciona i regresiona analiza biotičkih motoričkih znanja za oba pola*

***Variable* / Varijabla**	***Boys* / Dečaci**				***Girls* / Devojčice**			
	r	***p***	***Beta***	***pbeta***	***r***	***p***	***Beta***	***pbeta***
Body height / Telesna visina	-0.14	0.17	-0.86	0.18	-0.17	0.14	-0.33	0.51
Arm span / Raspon ruku	-0.09	0.28	0.23	0.75	-0.14	0.19	0.25	0.72
Arm length / Dužina ruke	0.34	0.01	0.54	0.22	-0.01	0.49	0.01	0.99
Shoulder width / Širina ramena	-0.28	0.03	0.40	0.45	-0.14	0.18	-0.04	0.93
Pelvic width / Širina karlice	-0.13	0.19	0.09	0.58	-0.22	0.07	-0.15	0.31
Wrist diameter / Dijametar ručnog zgloba	-0.26	0.03	-0.07	0.69	0.14	0.19	0.17	0.25
Body weight / Telesna težina	-0.22	0.07	-0.40	0.80	0.28	0.03	0.21	0.32
Circumf. of upper arm / Sr. obim opruž. nadlaktice	-0.03	0.43	-0.27	0.41	0.41	0.00	0.42	0.13
Circumf. of forearm / Sr. obim opruž. podlaktice	0.08	0.29	0.59	0.07	-0.01	0.47	-0.17	0.47
Abdominal skinfold / Kožni nabor trbuha	-0.02	0.45	-0.32	0.47	0.10	0.27	0.05	0.88
Back skinfold / Kožni nabor leđa	0.12	0.20	0.45	0.18	0.26	0.04	0.10	0.59
Triceps skinfold / Kožni nabor nadlaktice	-0.18	0.11	-0.42	0.11	-0.15	0.16	0.21	0.38
R	0.61				0.65			
R^2	0.38				0.42			
P	0.08				0.05			

Legend: *r - Pearson correlation coefficient; p - level of statistical significance for r; Beta - regression coefficient; pbeta - level of significance of the regression coefficient; R - multiple correlation coefficient; R2 - coefficient of determination; P - significance of multiple correlation coefficient*

Legenda: *r - Pirsonov koeficijent korelacije; p - nivo statističke značajnosti za r; Beta – regresioni koeficijent; pbeta - nivo značajnosti regresionog koeficijenta; R - koeficijent multiple korelacije; R^2 - koeficijent determinacije; P - značajnost koeficijenta multiple korelacije*

When looking at the results from Table 6, it can be concluded that the system of predictor variables in girls in the given sample of participants had a statistically significant effect on the criterion variable TGMD-2, while it cannot be said for boys, where the predictor system of anthropometric variables was not statistically significant. The multiple correlation coefficient was R = 0.65 for girls and R = 0.61 for boys. The percentage of common variation between the system of predictor variables and the examined criterion was slightly higher in girls, 42%, than in boys, 38%. Based on the standardized Beta re-

Kada se pogledaju rezultati iz Tabele 6 može se konstatovati da je sistem prediktorskih varijabli kod devojčica na datom uzorku ispitanika, imao statistički značajan uticaj na kriterijsku varijblu *TGMD-2,* dok se to ne može konstatovati za dečake, gde prediktorski sistem antropometrijskih varijabli nije bio statistički značajan. Koeficijent multiple korelacije je kod devojčica iznosio R=0,65, a kod dečaka R=0,61. Procenat zajedničkog varijabiliteta između sistema prediktorskih varijabli i ispitivanog kriterijuma je bio nešto veći kod devojčica, 42%, nego kod dečaka, 38%. Na osnovu standardizovanog re-

gression coefficient, it can be concluded that none of the predictor variables from the mentioned set had a statistically significant effect on the criterion variable TGMD-2 in both groups of examinees.

Discussion

In accordance with the goals of the research and the hypotheses set, this research analysed the morphological characteristics and motor abilities of children, aged 6 and 7, of both genders from Belgrade from the aspect of differences and relations.

The results of the research indicate that boys have slightly higher average values of measures for the transverse dimensionality of the skeleton and subcutaneous adipose tissue. While girls have higher values of measures that assess the longitudinal dimensionality of the skeleton and in part the volume and mass of the body. Differences in the manifestation of physical development in the analyzed subsamples are the result of the specifics of the overall maturation process, the amount of motor activity, the status of the muscular, bone-joint and most importantly endocrine system (Jakšić, 2016). Based on the calculated values of the body mass index, i.e., nutritional status for both genders, which was (BMI=16.49±1.93kg/m2) for boys, and (BMI=15.67±1.72 kg/m2) for girls, it can be concluded that children are of normal nutritional status, and that girls had a slightly lower values of body mass index, which explicitly reflected higher average values of subcutaneous adipose tissue in boys as well as higher average values of longitudinal dimensionality of the skeleton in girls. Nowadays, body mass index serves for a quick but approximate assessment of nutritional status. It is important from the aspect of prevention and taking appropriate measures in childhood and adult obesity, but not in assessing morphological characteristics and structure (WHO, 2000). Therefore, it is best used along with the assessment of anthropometric measures, in order to further help in defining them. Thus, there are no significant changes in subsamples when it comes to growth and development. It can be concluded that during this period it happens evenly for both genders, and that girls are slightly lighter but with lower average values of subcutaneous fat, which indicates the fact that they will enter the phase of intensive growth faster since they have less subcutaneous mass, and that their length measures are somewhat larger. A similar study conducted by (Pelemiš, Mandić, Momčilović, Momčilović, & Srdić, 2021) which indicates that the percentage of malnourished girls in Serbia is slightly higher than the percent-

gresionih koeficijenta Beta, može se zaključiti da nijedna prediktorska varijabla iz navedenog skupa nema statistički značajan uticaj na kriterijsku varijablu *TGMD-2* kod obe grupe ispitanika.

Diskusija

U skladu sa ciljevima istraživanja, u ovom istraživanju analiziran je prostor morfoloških karakteristika i motoričkih sposobnosti dece, starosti 6 i 7 godina različitog pola iz Beograda sa aspekta razlika i relacija.

Rezultati istraživanja ukazuju da su dečaci nešto većih prosečnih vrednosti mera za procenu transverzalne dimenzionalnosti skeleta, te potkožnog masnog tkiva, dok devojčice prednjače u merama za procenu longitudinalne dimenzionalnosti skeleta i jednim delom volumenu i masi tela. Različitosti u ispoljavanju telesnog razvoja kod analiziranih subuzorka, posledica su specifičnosti ukupnog sazrevanja, količine kretnih aktivnosti, stanja mišićnog, koštano–zglobnog i po najviše endokrinog sistema (Jakšić, 2016). Na osnovu izračunatih vrednosti indeksa telesne mase tj. stanja uhranjenosti za oba pola koji je za dečake iznosio (ITM=16,49±1,93kg/m^2), a za devojčice (ITM=15,67±1,72kg/m^2) uočava se da su deca normalnog stanja uhranjenosti, te da su devojčice sa nešto manjih vrednostima indeksa telesne mase, što se eksplicitno odrazilo na veće prosečne vrednosti potkožnog masnog tkiva kod dečaka kao i veće prosečne vrednosti longitudinalne dimenzionalnosti skeleta kod devojčica. Danas indeks telesne mase služi za brzu, ali okvirnu procenu stanja uhranjenosti, njegova upotreba je značajna sa stanovišta prevencije i preduzimanja odgovarajućih mera kod gojaznosti dece i odraslih, ali ne i kod procene morfoloških karakteristika i strukture (WHO, 2000). Stoga ga je najbolje koristiti uz procenu antropometrijskih mera, kako bi dodatno pomogao u definisanju. Dakle, nema značajnih promena u subuzorcima kada je reč o rastu i razvoju. Može se konstatovati da on u ovom periodu teče ravnomerno za oba pola, te da su devojčice za nijansu lakše ali sa manjim prosečnim vrednostima potkožne masti u organizmu, što ukazuje na činjenicu da će brže ući u fazu intenzivnog rasta s obzirom da imaju manje potkožnih masti, te da su im dužinske mere nešto veće. Slično spovedeno istraživanje od strane (Pelemiš, Mandić, Momčilović, Momčilović, & Srdić, 2021) koje ukazuje da je procenat pothranjenih devojčica u Srbiji nešto veći od procenta dečaka, normalno uhranjenih takođe neznatno veći, rizično

age of boys, the percentage of normally fed girls is also slightly higher, at-risk of obesity is twice as lower and obese almost the same. Therefore, the findings obtained in the mentioned study are in line with our results obtained when it comes to the nutritional status, and the fact that girls enter the pre-adolescent phase earlier as well as the phase of intensive growth. Even earlier research by Stupar, Popović, & Peka (2014) in preschool children in the territory of Vojvodina showed that 8.62% of boys and 9.78% of girls were obese. The growth and development of preschool children is largely conditioned by genetic predispositions, especially when it comes to the longitudinal dimensions of the skeleton, which does not mean that the same cannot be said for nutrition, socio-economic status and physical activity that can affect growth and development. of the same (De Privitellio, Caput-Jogunica, Gulan, & Boschi, 2007). Some researchers, with their experimental programs, managed to positively influence the morphological characteristics of preschool children. These facts are supported by research that had an additional program of physical activities in which, compared to groups that did not have a physical exercise program, showed a reduction in body fat and volume and body weight (Kinkela, & Marić, 2013; Bocca, Corpeleijn, Van den Heuvel, Stolk, & Sauer, 2014). The tendency of earlier involvement of children in programmed physical activities inevitably leads to modification in terms of more useful effect on the youngest in the broadest sense (Dobrila, Sporiš, & Hraski, 2003).

Therefore, there is no doubt that programmed physical activity is successful in transforming anthropological status in preschool children. When looking at the results of the test for the assessment of biotic motor knowledge "The Test of Gross Motor Development" (TGMD-2), it is concluded that the boys achieved better average values in most parts of this test. It can be concluded that by working on improving all types of coordination, which are integral parts of assessment in this motor test, children solve more complex motor problems better, use their potentials more rationally and economically and thus enable their other motor abilities to be maximized. Therefore, in preschool age, with the development of coordination, all other types of motor abilities also develop indirectly. Kamenov (1997) points out that with physical activity, children overcome negative emotional states and satisfy their needs. Children are encouraged through physical activity, even shy children, and mistakes in their behavior are eliminated. According to most experts in the field of child psychoanalysis, physical activity is a type of therapy that serves as a vent for unpleasant feelings,

gojaznih upola manji i gojaznih gotovo isti. Dakle, nalazi dobijeni u pomenutoj studiji u skadu su sa našim dobijenim rezultatima kada je u pitanju stanje uhranjenosti, te ulazak devojčica ranije u predpubertetsku fazu i fazu intenzivnog rasta. Još ranija istraživanja Stupara, Popovića i Peke (2014) na predškolskoj deci na teritoriji Vojvodine su pokazala da je 8,62 % dečaka i 9,78 % devojčica bilo gojazno. Rast i razvoj dece predškolskog uzrasta u velikoj meri je uslovljen genetskim predispozicijama naročito kada je u pitanju longitudinalna dimenzionalnost skeleta, što ne znači da se to takođe ne može reći za ishranu, socijalno-ekonomski status i fizičku aktivnost kojima se može delovati na rast i razvoj istih (De Privitellio, Caput-Jogunica, Gulan, & Boschi, 2007). Pojedini istraživači svojim eksperimentalnim programima uspevali su pozitivno da utiču na morfološke karateristike predškolske dece. Ove činjenice potkrepljuju istraživanja koja su imala dodatni program fizičkih aktivnosti u kojima u odnosu na grupe koje nisu imale program fizičkog vežbanja dolazi do redukcije telesnih masti i volumena i mase tela (Bocca, Corpeleijn, Van den Heuvel, Stolk, & Sauer, 2014; Kinkela, & Marić, 2013). Tendencija sve ranijeg uključivanja dece u programirane fizičke aktivnosti neminovno dovodi do modifikacije u smislu utilitarnijeg delovanja na najmlađe u najširem smislu (Dobrila, Sporiš, & Hraski, 2003).

Dakle nema sumnje da je programirana fizička aktivnost uspešna u transformaciji antropološkog statusa u predškolskom uzrastu. Kada se sagledaju rezultati testa za procenu biotičkih motoričkih znanja The Test of Gross Motor Development" (TGMD-2), konstatuje se da su dečaci ostvarili bolje prosečne vrednosti u većini delova ovog testa. Može se zaključiti da radom na poboljšanju svih vidova koordinacije, koji su sastavni delovi procene u ovom motoričkom testu, deca bolje rešavaju složenije motoričke probleme, racionalnije i ekonomičnije koriste svoje potencijale i time omogućavaju da se ostale njihove motoričke sposobnosti maksimalno ispolje. Zbog toga se u predškolskom uzrasnom dobu, sa razvojem koordinacije indirektno razvijaju i svi drugi vidovi motoričkih sposobnosti. Kamenov (1997), ističe da u fizičkoj aktivnosti deca prevazilaze negativna emocionalna stanja, te nalazi zadovoljstvo svojih potreba. Deca se kroz fizičku aktivnost podstiču, čak i stidljiva deca, te se u njihovom ponašanju otklanjaju greške. Prema mišljenjima većine stručnjaka iz oblasti dečije psihoanalitike, fizičke aktivnosti su vid terapije koja

the ability to dissipate their accumulated aggression in the most painless way and to express and release their repressed emotions (Stupar, 2016). Research (Bala, Hošek, & Momirović, 2002) and this indicates that children who are not physically active can express their behavior through a kind of aberrant behavior. It is pointed out that there are few activities that "can influence such a large number of characteristics, traits and abilities with professionally guided physical education and training or sports and recreational exercise" (Findak, 2016).

When it comes to correlation, the system of predictor variables in girls had a statistically significant effect on the criterion variable TGMD-2, while this cannot be stated for boys. The values of Pearson correlation coefficient in girls indicated a mathematically negative and logically positive correlation between the predictor variable for assessing body volume and weight - *Body weight*. This correlation was statistically significant which implies that the heavier the girls, the better their scores in the criterion variable for assessing whole body coordination. The variable for the assessment of subcutaneous adipose back tissue, *back skinfold* had a mathematically positive, but logically negative statistically significant correlation with the criterion variable *TGMD-2,* so it can be stated that if the girls had more subcutaneous fat, the worse their results were. The same is the case with the variable *Body Weight*. This linearity of the results indicates that the percentage of body fat reduces the ability of girls to achieve better results in the coordination test, which is controlled by the movement structuring system. The remaining percentage can be attributed to some other characteristics and abilities of the anthropological status of the participants that were not part of this predictor system (motivation, conative characteristics, cognitive abilities), because they can have a great impact on the results in this test, especially in preschool children (Bala, Jaksic, & Popovic, 2009). In boys, a certain correlation between predictor variables and the criterion was also observed, but since the predictor system was not statistically significantly related to the criterion, it can be assumed that this happened by chance, and further interpretation would be just speculation.

Conclusion

this kind of a research should only be a guideline for further monitoring and research of the motor and morphological characteristics of preschool children. It should also be noted that it would be good to use these types of motor tests with preschool children where the child is re-

služi kao ventil za neprijatna osećanja, mogućnost da istroši svoju nagomilanu agresiju na najbezbolniji način kao i da se ispolji i oslobodi svojih potisnutih emocije (Stupar, 2016). Istraživanja (Bala, Hošek i Momirović, 2002) ukazuja da deca koja nisu fizički aktivna svoje ponašanje mogu da ispolje kroz vid aberantnog ponašanja. Ističe se da je malo aktivnosti koje „mogu profesionalno vođenim fizičkim vaspitanjem i treningom ili sportsko-rekreativnim vežbanjem uticati na tako veliki broj karakteristika, osobina i sposobnosti" (Findak, 2016).

Kada je povezanost u pitanju, sistem prediktorskih varijabli kod devojčica imao je statistički značajan uticaj na kriterijsku varijblu *TGMD-2,* dok se to ne može konstatovati za dečake. Vrednosti Pirsonovog koeficijenta korelacije kod devojčica ukazale su na matematički negativnu, a logički pozitivnu povezanost prediktorske varijable za procenu volumena i mase tela - *Telesna težina*. Ta povezanost je bila statistički značajna što implicira na to da što su devojčice bile teže, rezultati su im bili bolji u kriterijskoj varijabli za procenu koordinacije celog tela. Varijabla za procenu potkožnog masnog tkiva na leđima, *Kožni nabor leđa* je imala matematički pozitivnu, ali logički negatinu statistički značajnu povezanost sa kriterijskom varijablom *TGMD-2* pa se može konstatovati, da što su devojčice posedovale više potkožne masti, rezultati su im bili lošiji. Isti slučaj je i sa varijablom *Telesna težina.* Ovakva linearnost rezultata ukazuje da procenat telesne masti u telu umanjuje sposobnost devojčica u ostvarivanju boljih rezultata u testu za procenu kordinacije koji je pod kontrolom sistema za strukturiranje kretanja. Preostali procenat se može pripisati nekim drugim karakteristikama i sposobnostima antropološkog statusa ispitanika koje nisu bile deo ovoga prediktorskog sistema (motivacija, konativne karakteristike, kognitivne sposobnosti,), jer one mogu da imaju veliki uticaj na rezultate u ovom testu, pogotovo na uzrastu dece predškolskog uzrasta (Bala, Jakšić, Popović, 2009). Kod dečaka je takođe uočena određena povezanost prediktorskih varijabli sa kriterijumom, ali s obzirom da prediktorski sistem nije bio statistički značajno povezan sa kriterijumom, može se pretpostaviti da se to desilo slučajno, te bi dalja interpretacija bila samo nagađanje.

Zaključak

Ovakvo istraživanje treba da bude samo smernica u daljem praćenju i istraživanju motoričkog i morfološkog prostora dece predškolskog uzrasta. Takođe treba napomenuti da bi bilo dobro sa decom predškolskog uzrasta koristiti ovakve vidove motoričkih testova u kojima se

peatedly challenged with different situations, which, on the one hand, have a positive effect on eye accommodation, and on the other hand, improve the speed of alternative hand movements, explosiveness, and a good part of the movement structuring mechanism. This is important because not every ability can be viewed as one and the same, because children react with all their being in preschool age, and that reaction depends on many factors. It is these factors that should be part of the predictor system. Recommendations for further research could be to examine and monitor the development of general motor factor, which is very common in preschool children, and to analyse its connection with its morphological characteristics, and examine possible relations between these, which would explain the connections of certain parts of morpho-motor status of preschool children.

Announcemet

We announce that the authors have equally contributed to this paper.

Conflict of interests

There is no conflict of interests among the authors themselves.

dete više puta konfrontira sa različitim situacijama sa jedne strane koji povoljno deluje na akomodaciju oka, a sa druge strane poboljšava se i brzina alternativnih pokreta ruku, eksplozivnost, te dobar deo mehanizma za strukturiranje kretanja. To je bitno zbog toga što se ne može svaka sposobnost posmatrati kao jedna, jer deca reaguju svim svojim bićem u predškolskom uzrastu, a ta reakcija zavisi od mnoštva faktora. Upravo ti faktori trebali bi biti deo prediktorskog sistema. Preporuke za naredna istraživanja bi se mogle ogledati kroz ispitivanje i praćenje razvoja generalnog motoričkog faktora koji je veoma zastupljen kod predškolske dece, a njega suprotstaviti njihovim morfološkim karakteristikama, te ispitati eventualne relacije, koje bi objasnile povezanosti određenih delova morfo-motoričkog statusa predškolske dece.

Izjava

Izjavljujemo da su autori podjednako doprineli radu.

Konflikt interesa

Između autora ne postoji interesni konflikt.

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Differences in the Space of Motor Abilities Athletes Students and Non-Athletes

Razlike u prostoru motoričkih sposobnosti učenica koje se bave sportom i nesportašica

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Abstract: *The main goal of this research is to determine the partial quantitative differences in the motor abilities of students aged 13 - 15 years, athletes and non-athletes. For the realization of this research, a sample of 170 students was treated, of which 70 regularly attend physical education classes and engage in other physical activities (athletes) and 100 students who do not engage in any sport except regular physical education classes (non-athletes). In research we used 16 variables to assess basic motor skills that cover the study area well. To determine the partial quantitative differences at the univariate level between the respondents in motor skills, analysis of T-test results for small independent samples was applied.*

In order to determine the differences between the examined groups, multivariate analysis of variance (MANOVA) and univariate analysis of variance (ANOVA) was applied. Based on the obtained results, it can be concluded that the partial statistically significant quantitative differences between respondents in motor skills, as well as differences between the groups of students.

Key words: *students, differences, variables, athletes, motor skills*

Sažetak: *Osnovni cilj ovog istraživanja je utvrđivanje parcijalnih kvantitativnih razlika u motoričkim sposobnostima učenica uzrasta od 13 - 15 godina, koje se bave sportom i nesportašica. Za realizaciju ovog istraživanja tretiran je uzorak od 170 učenica od kojih 70 redovno posjećuju nastavu fizičkog vaspitanja i bave se drugom fizičkim aktivnostima (sportašice) i 100 učenica koji se ne bave nikakvim sportom izuzev redovne nastave fizičkog vaspitanja (nesportašice).*

U istraživanju je primijenjeno 16 varijabli za procjenu bazičnih motoričkih sposobnosti koje dobro pokrivaju istraživani prostor.

Za utvrđivanje parcijalnih kvantitativnih razlika na univarijatnom nivou između ispitanica u motoričkim sposobnostima primijenjena je analiza rezultata T-testa za male nezavisne uzorke.

U cilju utvrđivanja razlika među ispitivanim grupama primijenjena je multivarijatna analiza varijanse (MANOVA) i univarijatna analiza varijanse (ANOVA).

Na osnovu dobivenih rezultata istraživanja može se konstatovati da su utvrđene statistički značajne parcijalne kvantitativne razlike između ispitanica u motoričkim sposobnostima, kao i razlike između ispitivanih grupa učenica.

Ključne riječi: *učenice, razlike, varijable, sportašice, motorika*

Introduction

Motor abilities are those human abilities that participate in solving motor tasks and condition successful movement (Malacko & Rađo, 2004). Approaches to studying and learning about motor skills have developed throughout history and at that time they intertwined and complemented each other. So today, in addition to the so-called. theoretical or speculative, differentiated two approaches,

Uvod

Motoričkim sposobnostima nazivaju se one sposobnosti čovjeka koje učestvuju u rješavanju motoričkih zadataka i uslovljavaju uspješno kretanje (Malacko i Rađo, 2004.). Pristupi izučavanja i saznavanja motoričkih sposobnosti razvijali su se kroz istoriju i u tom vremenu su se među sobom uzajamno preplitali i dopunjavali. Tako da su se danas, pored tzv. teorijskog ili spekulativnog,

structural or factorial and classification or taxonomic.

The factor approach contributed to the formulation of the so-called structural models, noting that any valid interpretation of the results was almost impossible without functional hypotheses, so that the attempt to synthesize the obtained results was most often performed within the functional structuralist modeling of regulatory processes, on which the effect in motor activities depends.

The motor program is formed in the central nervous system and contains stored muscle commands with all the details needed to perform the movement (Horga, 1993). Such programs allow direct connection of the exact movement with a specific signal, without the inclusion of intermediate phases. Namely, the effectiveness of motor reactions is defined by motor information, which with the level of characteristics and abilities acts interactively, but differently in different stages of progress. In the initial phase of performing a motor program, cognitive functions (Adams, 1971; Gentile, 1972; Mikić, 1995) and higher-order motor factors (Metikoš et al., 2003), and especially the general coordination factor, are strongly included. During the improvement of the structure of the motor program, the influence of the mentioned factors gradually decreases, and the dimensions of the lower order from different segments of the anthropological space to a greater extent directly affect the success of the acquired motor knowledge. All anthropological potentials of a person can be optimally exploited only in the automation period.

Program contents that are applied in sports such as volleyball, strongly influence the development of anthropological characteristics and the quality of technical and tactical knowledge of volleyball players, and are often the decisive factor for achieving the end result in this sport. It can be assumed that such significant influences can be achieved in primary school students who do not play sports, which would be of theoretical and practical value for physical education, because it would provide significant information about the dimensions of anthropological space that most affect the results. efficiency of program contents of physical education teaching in volleyball in primary school students. This could give more space in physical education classes (in the implementation of teaching units in the field of volleyball) for a particularly emphasized development of dimensions that have greater predictive value. The result in volleyball is influenced by various factors: motor skills (strength, speed, endurance, flexibility, coordination and precision), psychological characteristics (cognitive, conative, sociological), motivational structure, training methods, various external factors (playground, referees, equipment, audience, etc.). Within these teaching

izdiferencirala dva pristupa, strukturalni ili faktorski i klasifikacijski ili taksonomski.

Faktorski pristup je doprinio formulisanju tzv. strukturalnih modela, s napomenom, da je bilo kakva valjana interpretacija rezultata bila gotovo nemoguća bez funkcionalnih hipoteza, tako da se i pokušaj sinteze dobivenih rezultata najčešće izvodio u okviru funkcionalnog strukturalističnog modeliranja reglulacijskih procesa, od kojih ovisi učinak u motoričkim aktivnostima.

Motorički program formira se u centralnom nervnom sistemu i sadrži spremljene mišićne naredbe sa svim detaljima potrebnim da se izvede pokret (*Horga, 1993*). Takvi programi omogućuju neposredno povezivanje točnog pokreta sa određenim signalom, bez uključivanja posrednih faza. Naime, djelotvornost motoričkih reakcija definisana je motoričkom informisanošću, koja sa nivoom osobina i sposobnosti djeluje interaktivno, ali različito u različitim fazama napredovanja. U početnoj fazi izvođenja nekog motoričkog programa snažno se uključuju kognitivne funkcije (*Adams, 1971; Gentile, 1972; Mikić, 1995*) i motorički faktori višeg reda (*Metikoš i sar., 2003*), a posebno generalni faktor koordinacije. Tokom usavršavanja strukture motoričkog programa uticaj spomenutih faktora postupno se smanjuje, a dimenzije nižeg reda iz različitih segmenata antropološkog prostora u većoj mjeri direktno utiču na uspješnost stečenih motoričkih znanja. Sve antropološke potencijale osobe moguće je optimalno eksploatisati tek u automatizacijskom periodu.

Programski sadržaji koji se primjenjuju u sportovima kao što je odbojka, snažno utiču na razvoj antropoloških obilježja i kvalitet tehničko-taktičkih znanja odbojkašica, a često su i odlučujući faktor za postizanje krajnjeg rezultata u ovom sportu. Može se pretpostaviti da ovakvi značajni uticaji mogu da se postignu i kod učenica osnovnih škola koji se ne bave sportom, što bi bilo od teorijske i praktične vrijednosti za nastavu tjelesnog odgoja, jer bi se dobile značajne informacije o dimenzijama antropološkog prostora koje najviše utiču na rezultatsku efikasnost programskih sadržaja nastave tjelesnog odgoja iz odbojke kod učenice osnovnih škola. Time bi se na časovima tjelesnog odgoja moglo dati više prostora (pri realizaciji nastavnih jedinica iz oblasti odbojke) za posebno naglašeni razvoj dimenzija koje imaju veću prediktivnu vrijednost. Na rezultat u odbojci utiču razni faktori: motoričke sposobnosti (snaga, brzina, izdržljivost, fleksibilnost, koordinacija i preciznost), psihološke osobine (kognitivni, konativni, sociološki), motivaciona struktura, metode obuke i treninga, razni spoljašnji faktori (igralište, sudije, oprema, publika itd.). U okviru ovih

and training problems, a number of researchers (Zaciorski, 1975; Bangsboo, 1994; Toumi et al., 2004; Mikić, 2000; Turner et al., 2003; Rakovac & Heimar, 2003; Čoh, 2004;) indicate that the effects of the realized changes in the training work for the development of motor skills with children and youth can be expected only under the condition of establishing optimal relationships in the development of appropriate abilities and characteristics and motor skills. The extent to which physical education classes and sports training contribute to the transformation of motor skills and morphological characteristics is a problem that has interested a large number of researchers, but about which we still have scarce information.

Method of Work

Sample of respondents

For the realization of this research, the sample of respondents consisted of 170 respondents - high school students from Banja Luka, aged 13 to 15 years. Based on the research criteria, regarding the conditionality of playing sports, the entire sample was divided into two subsamples, 70 students who regularly attend physical education classes and engage in other sports activities (athletes) and 100 students who do not do any sports and regularly attend classes physical education (non-athletes).

Sample variables

To assess basic - motor abilities, 16 variables were applied that cover the investigated area relatively well. Testing was performed according to the instructions of Mikić et al., (1999).

Sample of variables for assessment of basic - motor abilities

Mechanism for synergistic regulation and regulation of tone:

1. Hand taping (MBFTAP)
2. Taping the foot (MBFTAN)
3. Tilt - twist - touch (MBFPZD)
4. Bench forward (MFLPRK)
5. Flamingo - balance test (MFLFLA)
6. Bend twist (MFLISK)

Mechanism for regulating excitation intensity

7. Long jump from place (MFESDM)
8. High jump (MFESLM)
9. Throwing the ball from lying down (MFEBML)
10. Running at 20m (MFE20V)

Movement structuring mechanism

11. Envelope Test (running in a rectangle) (MAGTUP)

nastavnih i trenažnih problema veći broj istraživača *(Zaciorski, 1975; Bangsboo, 1994*; *Toumi i sar.,2004; Mikić, 2000; Turner i sar.,2003; Rakovac & Heimar, 2003; Čoh, 2004;*) ukazuje da se efekti ostvarenih promjena u trenažnom radu za razvoj motoričke sposobnosti sa djecom i omladinom, mogu očekivati samo pod uslovom uspostavljanja optimalnih odnosa u razvoju odgovarajućih sposobnosti i osobina i motoričkih znanja. U kojoj mjeri nastava tjelesnog odgoja i sportski trening doprinose transformaciji motoričkih sposobnosti i morfoloških karakteristika, je problem koji je zainteresirao veći broj istraživača, ali o kojem još uvijek imamo oskudne informacije.

Metod rada

Uzorak ispitanika

Za realiziranje ovog istraživanja uzorak ispitanika činilo je 170 ispitanica - učenica srednjih škola iz Banja Luke, uzrasta od 13 do 15 godina. Polazeći od kriterija istraživanja, po pitanju uslovljenosti bavljenja sportom, cjelokupan uzorak je podijeljen na dva subuzorka, 70 učenica koje redovno posjećuju nastavu fizičkog vaspitanja i bave se drugom sportskom aktivnosti (sportašice) i 100 učenica koji se ne bave nikakvim sportom, a redovno posjećuju nastavu fizičkog vaspitanja (nesportašice).

Uzorak varijabli

Za procjenu bazično - motoričkih sposobnosti primijenjeno je 16 varijabli koje relativno dobro pokrivaju istraživani prostor. Testiranje je vršeno prema uputama Mikić i sar., (1999).

Uzorak varijabli za procjenu bazično - motoričkih sposobnosti

Mehanizam za sinergijsko reguliranje i reguliranje tonusa

1. Taping rukom (MBFTAP)
2. Taping nogom (MBFTAN)
3. Pretklon – zasuk – dodir (MBFPZD)
4. Pretklon na klupici (MFLPRK)
5. Flamingo - test ravnoteže (MFLFLA)
6. Iskret s palicom (MFLISK)

Mehanizam za reguliranje intenziteta ekscitacije

7. Skok u dalj iz mjesta (MFESDM)
8. Skok u vis iz mjesta (MFESLM)
9. Bacanje lopte iz ležanja (MFEBML)
10. Trčanje na 20m (MFE20V)

Mehanizam za strukturiranje kretnji

11. Koverta Test (trčanje u pravokutniku) (MAGTUP)

12. Steps to the side (MAGKUS)
13. Slalom with three balls (MKTSRL)

Mechanism for regulating the duration of excitation

14. Lifting the hull in 30 sec. (MRCDTS)
15. Knee push-ups (MSASKL)
16. Lying torso shelter (MRCZTL)

Data processing methods

The data in this study were processed using software systems for univariate and multivariate data analysis. The analyzes were processed in the programs: Exell for Windows, Statistica 6.0 for Windows and the program SPSS 15.0 for Windows with the following programs:

- **Data Management**, to create a database,
- **Basic Statistic**, to determine the basic parameters of the distribution of variables,
- **Tables and Banners**, for graphical display of distributions,

Basic central and dispersion parameters were calculated for all applications of the variable. Testing hypotheses that a variable is normally distributed was tested on the basis of the Skewness coefficient and the Kurtosis coefficient and the Kolmogorov Smirnov test. To determine the partial quantitative differences at the univariate level between the two subsamples, the analysis of T-test results for small independent samples was applied. In order to determine the differences between the examined groups, multivariate analysis of variance and univariate analysis of variance (MANOVA and ANOVA) were applied. In order to determine which subcategories of respondents are statistically different from each other, a post-hoc (LSD - least significant difference test) test was applied in the variables in which statistics had already been determined.

Results and Discussion

Basic statistical parameters of basic motor variables for a sample of a non-athlete. Data related to descriptive statistical parameters of basic motor tests in non - athlete subjects (N = 100) are shown in Table 1.

12. Koraci u stranu (MAGKUS)
13. Slalom rukama sa tri lopte (MKTSRL)

Mehanizam za reguliranje trajanja ekscitacije

14. Dizanje trupa za 30 sec. (MRCDTS)
15. Sklekovi s koljena (MSASKL)
16. Zakloni trupom u ležanju (MRCZTL)

Metode obrade podataka

Podaci u ovom istraživanju obrađeni su pomoću programskih sistema za univarijatnu i multivarijatnu analizu podataka. Analize su obrađene u programima: Exell for Windows, Statistica 6.0 for Windows i programom SPSS 15.0 for Windows sa slijedećim programima:

- **Data Management,** za kreiranje baze podataka,
- **Basic Statistic,** za određivanje osnovnih parametara distribucije varijabli,
- **Tables and Banners,** za grafički prikaz distribucija,

Za sve primijenje varijable izračunati su osnovni centralni i disperzioni parametri. Testiranje hipoteza da je neka varijabla normalno distribuirana ispitivana je na osnovu koeficijenta zakrivljenosti - (Skewness) i koeficijenta izduženosti - (Kurtosis) i Kolmogorov Smirnov testa. Za utvrđivanje parcijalnih kvantitativnih razlika na univarijatnom nivou između dva subuzorka primijenjena je analiza rezultata T-testa za male nezavisne uzorke. U cilju utvrđivanja razlika među ispitivanim grupama primijenjena je multivarijatna analiza varijanse i univarijantna analiza varijanse (MANOVA i ANOVA). Da bi se utvrdilo koje subkategorije ispitanica su međusobno statistički različite, u varijablama u kojima je već utvrđena statistika značajna razlika, primijenjen je post-hoc (LSD - least significant difference test) test.

Rezultati i diskusija

Osnovni statistički parametri varijabli bazične motorike za uzorak nesportašice. Podaci koji se odnose na deskriptivne statističke parametre testova bazične motorike kod ispitanica nesportašice (N = 100) prikazani su u tabeli 1.

Table 1. *Descriptive statistical parameters of applied motor variables in a sample of non-athlete respondents*

Tabela 1. *Deskriptivni statistički parametri primjenjenih motoričkih varijabli kod uzorka ispitanica nesportašice*

	Valid N	Mean	Min	Max	Std.Dev.	Skew	Kurt	max D	P
MBFTAP	100	35.78	22.00	53.00	6.27	0.46	0.50	0.10	p > .20
MBFTAN	100	23.99	17.00	35.00	3.18	0.80	1.66	0.13	p < ,10
MBFPZD	100	8.07	4.00	13.00	1.88	-0.08	0.04	0.13	p < ,10
MFLPRK	100	24.70	11.50	39.00	6.74	0.02	-0.61	0.07	p > .20
MFLFLA	100	4.86	0.00	12.00	3.08	0.47	-0.39	0.11	p < ,20
MFLISK	100	75.73	41.00	108.00	13.93	0.06	-0.41	0.08	p > .20
MFESDM	100	140.79	106.00	185.00	17.80	0.30	-0.48	0.08	p > .20
MFESLM	100	237.42	216.00	253.00	8.44	-0.31	-0.27	0.07	p > .20
MFEBML	100	7.17	5.00	10.80	1.08	0.38	0.25	0.06	p > .20
MFE20V	100	4.48	3.89	5.69	0.37	0.64	0.11	0.09	p > .20
MAGTUP	100	17.81	14.75	26.09	1.77	1.27	4.11	0.06	p > .20
MAGKUS	100	20.11	16.14	24.44	1.73	-0.10	-0.04	0.08	p > .20
MKTSRL	100	21.21	16.19	26.25	2.09	-0.08	0.08	0.07	p > .20
MRCDTS	100	16.60	6.00	26.00	3.71	-0.22	0.17	0.08	p > .20
MSASKL	100	19.88	4.00	42.00	6.19	0.41	1.70	0.11	p < .20
MRCZTL	100	22.97	6.00	40.00	6.99	-0.02	-0.53	0.09	p > .20

Legend: ***N*** *- number of respondents,* ***Mean*** *- arithmetic mean,* ***Min*** *- minimum value,* ***Max*** *- maximum value,* ***Std. Dev.*** *- standard deviation,* ***Skew*** *- symmetry coefficient,* ***Kurt*** *- elongation coefficient,* ***max D*** *- Kolmogorov Smirnov test,* ***P*** *- statistical significance*

Legenda: ***N –*** *broj ispitanika,* ***Mean –*** *aritmetička sredina,* ***Min –*** *minimalna vrijednost,* ***Max –*** *maksimalna vrijednost,* ***Std.Dev. –*** *standardna devijacija,* ***Skew*** *– koeficijent simetričnosti,* ***Kurt*** *– koeficijent izduženosti,* ***max D*** *- Kolmogorov Smirnov test,* ***P*** *– statistička značajnost*

Analyzing the results shown in Table 1, it can be concluded that the results obtained in this paper, when compared with some previous studies, are within the expected results. A statistically significant deviation of the asymmetry of the result values (Skew) can be observed only with the variable Envelope Test (running in a rectangle) (MAGTUP). The degree of elongation of the tip of the curve (Kurt), occurs as in the previous case only with the variable Envelope Test (running in a rectangle) (MAGTUP).

Analyzing the results obtained in relation to the normality of the distribution of results (max D), in the battery of motor tests for non-athletes, it can be concluded that there are no statistically significant deviations in any of the variables. This gives us the right to state that we have a relatively homogeneous sample of respondents with regard to these variables.

Basic statistical parameters of basic motor variables for a female athlete sample data related to descriptive statistical parameters of basic motor tests in female athletes (N = 70) are shown in Table 2.

Analizirajući rezultate prikazane u tableli 1 može se zaključiti da se dobiveni rezultati u ovom radu, kada se uporede sa nekim ranijim istraživanjima, nalaze u okvirima očekivanih rezultata. Statistički značajno odstupanje asimetričnosti vrijednosti rezultata (Skew), može se primijetiti samo kod varijable Koverta Test (trčanje u pravokutniku) (MAGTUP). Stepen izduženosti vrha krive (Kurt), javlja se kao kod prethodnog slučaja samo kod varijable Koverta Test (trčanje u pravokutniku) (MAGTUP).

Analizirajući rezultate dobivene u odnosu normalnosti raspodjele rezultata (max D), kod baterije motoričkih testova za nesportašice, može se zaključiti da ni kod jedne varijable ne postoje statistički značajna odstupanja. Ovo nam daje za pravo da možemo konstatovati što se tiče ovih varijabli da imamo relativno homogen uzorak ispitanica.

Osnovni statistički parametri varijabli bazične motorike za uzorak sportašice

Podaci koji se odnose na deskriptivne statističke parametre testova bazične motorike kod ispitanika sportašice (N = 70) su prikazani u tabeli 2.

Table 2. *Descriptive statistical parameters of applied motor variables in female athletes*

Tabela 2. *Deskriptivni statistički parametri primenjenih motoričkih varijabli kod ispitanica-sportašice*

	Valid N	Mean	Min	Max	Std.Dev.	Skew	Kurt	max D	P
MBFTAP	70	36.30	23.00	58.00	7.11	1.16	2.01	0.14	p < .15
MBFTAN	70	25.14	16.00	30.00	2.72	-0.48	0.54	0.10	p > .20
MBFPZD	70	9.09	3.00	20.00	2.24	1.45	7.54	0.14	p < ,15
MFLPRK	70	26.20	13.00	37.00	5.52	-0.11	-0.35	0.09	p > .20
MFLFLA	70	3.00	0.00	9.00	2.44	0.91	0.17	0.20	p < .01
MFLISK	70	72.44	41.00	98.00	11.90	-0.24	-0.03	0.12	p > .20
MFESDM	70	157.21	119.00	209.00	18.49	0.32	-0.13	0.05	p > .20
MFESLM	70	240.77	224.00	269.00	10.48	0.84	0.17	0.13	p < .20
MFEBML	70	7.89	5.70	11.80	1.09	0.85	1.90	0.13	p < .20
MFE20V	70	4.03	3.40	4.91	0.30	0.72	0.89	0.11	p > .20
MAGTUP	70	16.16	12.67	19.80	1.53	-0.03	-0.40	0.07	p > .20
MAGKUS	70	17.78	14.37	21.31	1.59	-0.15	-0.40	0.09	p > .20
MKTSRL	70	18.89	13.90	24.00	1.86	0.52	1.18	0.09	p > .20
MRCDTS	70	20.84	15.00	30.00	3.05	0.65	0.44	0.14	p < .15
MSASKL	70	22.37	10.00	44.00	7.78	0.83	0.29	0.15	p < .10
MRCZTL	70	34.24	14.00	53.00	9.04	-0.02	-0.69	0.12	p > .20

Legend: ***N*** *- number of respondents,* ***Mean*** *- arithmetic mean,* ***Min*** *- minimum value,* ***Max*** *- maximum value,* ***Std. Dev.*** *- standard deviation,* ***Skew*** *- symmetry coefficient,* ***Kurt*** *- elongation coefficient,* ***max D*** *- Kolmogorov Smirnov test,* ***P*** *- statistical significance*

Legenda: ***N –*** *broj ispitanika,* ***Mean –*** *aritmetička sredina,* ***Min –*** *minimalna vrijednost,* ***Max –*** *maksimalna vrijednost,* ***Std.Dev. –*** *standardna devijacija,* ***Skew*** *– koeficijent simetričnosti,* ***Kurt*** *– koeficijent izduženosti,* ***max D*** *- Kolmogorov Smirnov test,* ***P*** *– statistička značajnost*

Analyzing the results shown in Table 2, it can be concluded that the results obtained in this paper, when compared with some previous research, are within the expected results. A statistically significant deviation of the asymmetry of the result values (Skew) can be observed only with the variable Taping by hand (MBFTAP, Skew = 1.16) and Pre-tilt - twist - touch (MBFPZD, Skew = 1.45). The degree of elongation of the peak of the curve (Kurt) occurs only in the variables Tilt - twist - touch (MBFPZD, Kurt = 7.54). Analyzing the results obtained in relation to the normality of the distribution of results (max D), in the battery of motor tests for athletes, it can be concluded that only the variable Flamingo balance test (MFLFLA) has a statistically significant deviation at the level ($p < .01$). Based on the presented results, it can be concluded that we have a relatively homogeneous group of subjects in the motor space.

Analizirajući rezultate prikazane u tabeli 2, može se zaključiti da dobiveni rezultati u ovom radu, kada se uporedi sa nekim ranijim istraživanjima, nalaze se u okviru očekivanih rezultata. Statistički značajno odstupanje asimetričnosti vrijednosti rezultata (Skew), može se primijetiti samo kod varijable Taping rukom (MBFTAP, Skew = 1.16) i Pretklon – zasuk – dodir (MBFPZD, Skew = 1.45). Stepen izduženosti vrha krive (Kurt), javlja se samo u varijable Pretklon – zasuk – dodir (MBFPZD, Kurt = 7.54). Analizirajući rezultate dobivene u odnosu normalnosti raspodjele rezultata (max D), kod baterije motoričkih testova za sportašice, može se zaključiti da statistički značajno odstupanje na nivou ($p<.01$) ima samo varijabla Flamingo test ravnoteže (MFLFLA). Na osnovu iznešenih rezultata može se zaključiti da imamo relativno homogenu grupu ispitanika u motoričkom prostoru.

Analysis of differences in arithmetic means for the assessment of motor abilities of female subjects

Table 3 shows the differences of arithmetic means in both groups of respondents (athletes and non-athletes), using the T-test for independent samples. Based on the obtained T-test results, it can be concluded that the analyzed groups of respondents differ statistically significantly in most of the applied variables: Hand taping (MBFTAP p <0.000), Foot taping (MBFTAN p <0.001), Tilt - twist - touch (MBFPZD p <0.000), Flamingo balance test (MFLFLA p <0.000), Long jump (MFESDM p <0.000), High jump (MFESLM p <0.001), Throwing the ball from lying down (MFEBML p <0.000), Running at 20m (MFE20V p <0.000), Envelope Test (running in a rectangle) (MAGTUP p <0.000), Steps to the side (MAGKUS p <0.000), Slalom with three balls (MKTSRL p <0.000), Lifting the hull in 30sec MRCDTS p <0.000), Knee push-ups (MSASKL p <0.001) and Lying torsos (MRCZTL p <0.000).

Based on the obtained results, we can conclude that there are statistically significant partial quantitative differences between the respondents in motor skills.

Using the T-test, the differences of all possible pairs and the differences of the arithmetic means were analyzed. On the other hand, such an analysis may lead to accumulation and errors, so due to these facts in the further analysis to check the accuracy of the results obtained by this analysis, a post-hoc test will be applied.

Analiza razlika aritmetičkih sredina za procjenu motoričkih sposobnosti ispitanica

U tabeli 3 prikazane su razlike aritmetičkih sredina u obje grupe ispitanica (sportašice i nesportašice), pomoću T-testa za nezavisne uzorke. Na osnovu dobivenih rezultata T-testa, može se zaključiti da se analizirane grupe ispitanica statistički značajno razlikuju u većini primijenjenih varijabli: Taping rukom (MBFTAP p< 0,000), Taping nogom (MBFTAN p< 0,001), Pretklon – zasuk – dodir (MBFPZD p< 0,000), Flamingo test ravnoteže (MFLFLA p< 0,000), Skok u dalj iz mjesta (MFESDM p< 0,000), Skok u vis iz mjesta (MFESLM p< 0,001), Bacanje lopte iz ležanja (MFEBML p< 0,000), Trčanje na 20m (MFE20V p< 0,000), Koverta Test (trčanje u pravokutniku) (MAGTUP p< 0,000), Koraci u stranu (MAGKUS p< 0,000), Slalom rukama sa tri lopte (MKTSRL p< 0,000), Dizanje trupa za 30sec (MRCDTS p< 0,000), Sklekovi s koljena (MSASKL p< 0,001) i Zakloni trupom u ležanju (MRCZTL p< 0,000).

Na osnovu dobivenih rezultata možemo konstatovati da postoje statistički značajne parcijalne kvantitativne razlike između ispitanica u motoričkim sposobnostima.

Primjenom T-testa analizirane su razlike svih mogućih parova i razlika aritmetičkih sredina. S druge strane ovakvom analizom moguće je da dođe do akumuliranja i grešaka, pa zbog ovih činjenica u daljoj analizi da bi se provjerila tačnost rezultata dobivenih ovom analizom primjenit će se i post-hok test.

Table 3. *T-test, Differences in arithmetic means of both groups of respondents (athletes and non-athletes)*

Tabela 3. *T-test, Razlike aritmetičkih sredina obje grupe ispitanica (sportašice i nesportašice)*

Group 1: G_1:1 Group 2: G_2:2										
Mean		***Mean***			***Valid N***	***Valid N***	***Std.Dev.***	***Std.Dev.***	***F-ratio***	***p***
G_1:1		***G_2:2***	***t-value***	***p***	***G_1:1***	***G_2:2***	***G_1:1***	***G_2:2***	***variancs***	***variancs***
MBFTAP	22.083	35.780	-11.120	0.000	70	100	9.785	6.268	2.437	0.000
MBFTAN	25.143	23.990	2.466	0.015	70	100	2.720	3.180	1.366	0.169
MBFPZD	9.086	8.070	3.198	0.002	70	100	2.244	1.882	1.422	0.107
MFLPRK	26.200	24.695	1.541	0.125	70	100	5.520	6.741	1.491	0.079
MFLFLA	3.000	4.860	-4.213	0.000	70	100	2.438	3.078	1.595	0.041
MFLISK	72.436	75.730	-1.610	0.109	70	100	11.895	13.930	1.372	0.164
MFESDM	157.214	140.790	5.827	0.000	70	100	18.489	17.800	1.079	0.723
MFESLM	240.771	237.420	2.304	0.022	70	100	10.480	8.445	1.540	0.049
MFEBML	7.893	7.171	4.282	0.000	70	100	1.089	1.076	1.025	0.903
MFE20V	4.030	4.481	-8.398	0.000	70	100	0.299	0.373	1.549	0.055
MAGTUP	16.158	17.811	-6.321	0.000	70	100	1.535	1.771	1.331	0.208
MAGKUS	17.781	20.107	-8.891	0.000	70	100	1.595	1.735	1.183	0.459
MKTSRL	18.886	21.212	-7.466	0.000	70	100	1.858	2.091	1.267	0.297
MRCDTS	20.843	16.600	7.888	0.000	70	100	3.049	3.706	1.478	0.086
MSASKL	22.371	19.880	2.321	0.021	70	100	7.782	6.188	1.582	0.036
MRCZTL	34.243	22.970	9.162	0.000	70	100	9.040	6.987	1.674	0.019

Differences between groups of respondents

The results shown in Table 4 refer to both groups of subjects analyzed using multivariate analysis of variance (MANOVA) in motor abilities. Based on the obtained results of Wilk's Lambda, which is .272252, and in conjunction with Rao, s's R = 25.56124 approximation and degree of freedom df1 = 16 and df2 = 153, confirm statistically significant differences Q = .00 (p-level = 0.00) of the analyzed space. It can be stated that the analysis of the results shows that there are statistically significant differences between the groups of respondents in the entire analyzed space of motor abilities.

Table 4. *MANOVA-multivariate analysis of variance and ANOVA-univariate analysis of variance in both groups of subjects in motor skills*

	Wilks' Lambda	Rao's R	df 1	df 2	p-level
1	,272252	25,56124	16	153	0,00
Mean sqr Effect	**Mean sqr Error**	**F(df1,2)**	**1,168**		**p-level**
MBFTAP	7725,35	62,4738	123,6574		,000000
MBFTAN	54,73	8,9974	6,0825		,014657
MBFPZD	42,48	4,1547	10,2247		,001656
MFLPRK	93,27	39,2903	2,3738		,125271
MFLFLA	142,45	8,0240	17,7534		,000041
MFLISK	446,86	172,4683	2,5910		,109352
MFESDM	11107,65	327,1124	33,9567		,000000
MFESLM	462,50	87,1351	5,3078		,022455
MFEBML	21,42	1,1684	18,3355		,000031
MFE20V	8,37	,1186	70,5282		,000000
MAGTUP	112,48	2,8150	39,9586		,000000
MAGKUS	222,76	2,8179	79,0522		,000000
MKTSRL	222,71	3,9953	55,7432		,000000
MRCDTS	741,25	11,9123	62,2256		,000000
MSASKL	255,59	47,4339	5,3884		,021472
MRCZTL	5232,60	62,3320	83,9471		,000000

Univariate analysis of variance (ANOVA) was used to determine which applied variables contributed the most to the already established statistically significant differences between the examined groups. Using univariate analysis of variance (ANOVA), a statistically significant difference between the subjects of both groups can be observed in fourteen (14) applied variables: Hand taping (MBFTAP p <0.000), Foot taping (MBFTAN p <0.001), Tilt-twist-touch (MBFPZD). p <0.000), Flamingo balance test (MFLFLA p <0.000), Long jump (MFESDM p <0.000), High jump (MFESLM p <0.001), Throwing the ball from lying down (MFEBML p <0.000), Running at 20m (MFE20V p <0.000), Envelope Test (running in a

Razlike između grupa ispitanica

Rezultati prikazani u tabeli 4, odnose se na obje grupe ispitanica analiziranih primjenom multivarijatne analize varijanse (MANOVA) u motoričkim sposobnostima. Na osnovu dobivenih rezultata Wilk's Lambda koja iznosi ,272252, a u sklopu sa Rao,s-ovom R=25,56124 aproksimacijom i stepenom slobode df1=16 i df2=153, potvrđuju statistički značajne razlike Q=.00 (p-level =0.00) analiziranog prostora. Može se konstatovati da analiza rezultata pokazuje da postoje statistički značajne razlike među grupama ispitanica u cijelom analiziranom prostoru motoričkih sposobnosti.

Tabela 4. *MANOVA-multivarijatna analiza varijanse i ANOVA-univarijatna analiza varijanse kod obje grupe ispitanica u motoričkim sposobnostima*

Da bi se utvrdilo koje primijenjene varijable najviše doprinose već utvrđenim statistički značajnim razlikama između ispitivanih grupa primijenjena je univarijatna analiza varijanse (ANOVA). Primjenom univarijantne analize varijanse (ANOVA) može se uočiti statistički značajna razlika među ispitanicama obje grupe u četrnaest (14) primjenjenih varijabli: Taping rukom (MBFTAP p< 0,000), Taping nogom (MBFTAN p< 0,001), Pretklon – zasuk – dodir (MBFPZD p< 0,000), Flamingo test ravnoteže (MFLFLA p< 0,000), Skok u dalj iz mjesta (MFESDM p< 0,000), Skok u vis iz mjesta (MFESLM p< 0,001), Bacanje lopte iz ležanja (MFEBML p< 0,000), Trčanje na 20m (MFE20V p< 0,000), Ko-

rectangle) (MAGTUP p <0.000), Steps to the side (MAGKUS p <0.000), Slalom with three balls (MKTSRL p <0.000), Lifting the torso in 30sec (MRCDTS p <0.000), Knee push-ups (MSASKL p <0.001) and Lying torsos (MRCZTL p <0.000). To determine whether there are statistically significant differences in each individual variable for assessments of motor abilities, a post hoc (LSD - least significant difference test) test was applied between the examined groups. Test analyzes are shown in Table 5.

Table 5. *Intergroup differences in both groups of respondents (athletes and non-athletes) LSD test; Probabilities for Post Hoc Tests*

verta Test (trčanje u pravokutniku) (MAGTUP p< 0,000), Koraci u stranu (MAGKUS p< 0,000), Slalom rukama sa tri lopte (MKTSRL p< 0,000), Dizanje trupa za 30sec (MRCDTS p< 0,000), Sklekovi s koljena (MSASKL p< 0,001) i Zakloni trupom u ležanju (MRCZTL p< 0,000). Da bi se ustvrdilo da li postoje statistički značajne razlike u svakoj pojedinačnoj varijabli za procjene motoričkih sposobnosti, između ispitivanih grupa primijenjen je post hok (LSD – least significant difference test) test. Analize testa prikazana je u tabeli 5.

Tabela 5. *Međugrupne razlika kod obje grupe ispitanica (sportašice i nesportašice)* **LSD test; Probabilities for Post Hoc Tests**

	{1}	*{2}*
MBFTAP {1}		.000000
MBFTAP {2}	,000000	
MBFTAN {1}		.014657
MBFTAN {2}	.014657	
MBFPZD {1}		.001656
MBFPZD {2}	.001656	
MFLPRK {1}		.125271
MBFPRK {2}	.125271	
MFLFLA {1}		.000041
MFLFLA {2}	.000041	
MFLISK {1}		.109352
MFLISK {2}	.109352	
MFESDM {1}		.000000
MFESDM {2}	.000000	
MFESLM {1}		.022455
MFESLM {2}	.022455	
MFEBML {1}		.000031
MFEBML {2}	.000031	
MFE20V {1}		.000000
MFE20V {2}	.000000	
MAGTUP {1}		.000000
MAGTUP {2}	.000000	
MAGKUS {1}		.000000
MAGKUS {2}	.000000	
MKTSRL {1}		.000000
MKTSRL {2}	.000000	
MRCDTS {1}		.000000
MRCDTS {2}	.000000	
MSASKL {1}		.021472
MSASKL {2}	.021472	
MRCZTL {1}		.000000
MRCZTL {2}	.000000	

The results of intergroup differences in both groups of respondents (athletes and non-athletes) (Table 5) were confirmed, in most of the applied variables. The obtained results enable the conclusion that the results obtained by

Potvrđeni su rezultati međugrupnih razlika kod obje grupe ispitanica (sportašice i nesportašice) (tabela 5.) , u većini primijenjenih varijabli. Dobiveni rezultati omogućuju konstataciju da su i ovom analizom potvđe-

T-test and univariate analysis of variance were confirmed by this analysis as well.

Conclusion

the main goal of this study was to determine the partial quantitative differences in the motor abilities of respondents aged 13 to 15 years who are engaged in sports (athletes) and non-athletes.

To determine the partial quantitative differences at the univariate level between the two subsamples, a T-test for small independent samples was applied. The results of the application of this test confirm the statistical significance of partial quantitative differences between the subjects in motor abilities.

In order to determine the differences between the examined groups of respondents, multivariate analysis of variance (MANOVA) and univariate analysis of variance (ANOVA) were applied.

By applying multivariate analysis of variance (MANOVA) it can be concluded that there are inter examined ama statistically significant differences in the entire analyzed space motor skills. The application of univariate analysis of variance (ANOVA) was performed in order to determine which of the applied motor variables contribute the most to statistically significant differences between the examined groups of subjects. It can be stated that statistically significant differences were found among the examinees, in both groups in fourteen (14) variables of motor abilities.

Among other things, physical education has the task of positively influencing development of anthropological dimensions and students' physical development in general, which certainly affects improving student health. If the teaching is optimally programmed and intensified in line with the real needs and abilities of students, the effects will be more significant in improvement treated anthropological dimensions.

Based on their abilities, student athletes will have better grades in physical education classes, very good physical condition ensures optimal conditions for proper growth and development of the body, greater aerobic capacity reduces the risks of today's civilizational diseases such as diabetes, atherosclerosis, hypertension, etc. Non-athletes due to low level of fitness abilities often avoid physical activity, which further "sinks" into a sedentary lifestyle which is associated with hypokinesia and depression. Physically inactive people form a risk group from a health and economic point of view. There are a small number of those who after high school assimilate an active lifestyle for the purpose of preventing psycho-physi-

ni rezultati dobiveni T-testom i univarijatnom analizom varijanse.

Zaključak

osnovni cilj ovog istraživanja bio je utvrđivanje parcijalnih kvantitativnih razlika u motoričkim sposobnostima ispitanica uzrasta od 13 do 15 godina koje se bave sportom (sportašice) i nesportašice.

Za utvrđivanje parcijalnih kvantitativnih razlika na univarijatnom nivou između dva subuzorka primjenjen je T-test za male nezavisne uzorke. Rezultati primjene ovog testa nam potvrđuju statističku značajnost parcijalnih kvantitativnih razlika između ispitanica u motoričkim sposobnostima.

U cilju utvrđivanja razlika među ispitivanim grupama ispitanica primjenjene su multivarijatna analiza varijanse (MANOVA) i univarijantne analize varijanse (ANOVA).

Primjenom multivarijatne analize varijense (MANOVA) može se zaključiti da postoje među ispitivanim ama statistički značajne razlike u cijelom analiziranom prostoru motoričkih sposobnosti. Primjena univarijatne analize varijanse (ANOVA) provedena je u cilju da se utvrdi koje od primjenjenih motoričkih varijabli najviše doprinose statistički značajnim razlikama između ispitivanih grupa ispitanica. Može se konstatovati da su utvrđene statistički značajne razlike među ispitanicama, u obje grupe u četrnaest (14) varijabli motoričkih sposobnosti.

Nastava fizičkog vaspitanja između ostalog ima i zadatak da pozitivno utiče na razvoj antropoloških dimenzija i uopšte tjelesni razvoj učenika, što svakako utiče na poboljšanje zdravlja učenika. Ukoliko se nastava optimalno programira i intenzifikuje u skladu sa realnim potrebama i mogućnostima učenika, efekti će biti značajniji u poboljšanju tretiranih antropoloških dimenzija.

Učenici sportisti na osnovu svojih sposobnosti imat će bolje ocjene u nastavi fizičkog vaspitanja, jako dobrom fizičkom kondicijom osiguravaju se optimalni uslovi za pravilan rast i razvoj tijela, većim aerobnim kapacitetima smanjuju rizike od civilizacijskih bolesti današnjice kao što su dijabetes, arteroskleroza, hipertenzija itd. Nesportisti zbog niskog nivoa kondicijskih sposobnosti često i izbjegavaju fizičku aktivnost, čime još više „tonu" u sedentarni način života koji je povezan sa hipokinezijom i depresijom. Fizički neaktivne osobe čine rizičnu grupu sa zdravstvenog i ekonomskog aspekta. Mali je broj onih osoba koji nakon srednje škole asimiliraju aktivan način života u svrhu prevencije psiho-fizičkog zdravlja. Država, roditelji i profesori mo-

cal health. State, parents and professors must take care of the younger generations who have health care all the time before difficulties caused by hypokinesia and improper diet, excessive consumption of multimedia content such as TV, the Internet, but also intoxicants such as nicotine, alcohol and drugs. Sport is our best weapon in the fight against sedentary lifestyle life, illness and various addictions, for the reason that it creates positive work habits, make participants healthier, stronger, more capable, and thus more confident, happier and emotional more stable.

raju voditi brigu o mladim naraštajima koji sve ranije imaju zdravstvene poteškoće uzrokovane hipokinezijom i nepravilnom ishranom, prekomjernom konzumacijom multimedijalnih sadržaja poput TV-a, interneta, ali i opojnih supstanci poput nikotina, alkohola i droge. Sport nam je najbolje oružje u borbi protiv sjedilačkog načinaživota, bolesti i raznih ovisnosti, iz razloga što stvara pozitivne radne navike, čine učesnike zdravijim, snažnijim, sposobnijim, a time i samopouzdanijim, sretnijim i emocionalno stabilnijim.

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We announce that the authors have equally contributed to this paper.

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There is no conflict of interests among the authors themselves.

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Socio-Demographic Variables, Perfectionism, Anxiety and Somatization as Predictors of School Success Among Cadet and Junior Volleyball Players

Sociodemografske varijable, perfekcionizam, anksioznost i somatizacija kao prediktori školskog uspeha odbojkaša kadeta i juniora

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Abstract: *The aim of this research was to examine to which extent the predictor socio-demographic variables (gender, child's age, parents' education), personal traits (adaptive perfectionism and maladaptive perfectionism) and psychological adjustment (exam anxiety and somatization) contribute to school success among cadet and junior volleyball players of both genders. The sample included (N=122) participants of both genders, age 18 to 20, from Valjevo. The Multidimensional Perfectionism Scale, Exam Anxiety Scale and Youth Self-Report were used. Cronbach's alpha coefficient showed high internal consistency of the applied measuring instruments, which means that they can be recommended for studying sports population in Serbia. Data were processed using descriptive statistics, Pearson's correlation coefficient and hierarchical regression analysis. The results of the Pearson's correlation coefficient reveal low statistical significance of the interaction between the majority of the measuring variables. The findings of the regression model, with 29% variance, indicate to statistically relevant and independent contribution of gender and maladaptive perfectionism in explaining school success, which leads to the suggestion that future studies include some other variables such as family as potential predictor. The results of this research are in accordance with earlier studies on relations between adaptive and maladaptive perfectionism, somatization, and school success (as criterion) among athletes during adolescence.*

Key words*: volleyball, cadets, juniors, regression model.*

Sažetak: *Cilj ovog istraživanja bio je da se ispita u kom stepenu prediktorske sociodemografske varijable (pol i uzrast deteta, obrazovanje roditelja), individualne karakteristike (adaptivni i neadaptivni perfekcionizam) i psihološka adaptacija (ispitna anksioznost i somatizacija) doprinose objašnjenju školskog uspeha kod odbojkaša kadeta i juniora. Uzorak ispitanika obuhvatio je (N =122) ispitanika, uzrasta 18 do 20 godina iz Valjeva. Primenjena je Multidimenzionalna skala perfekcionizma, Skala ispitne anksioznosti i Skala somatizacije – YSR. Krombahovi alfa koeficijenti ukazali su na veliku internu konzistenciju primenjenih instrumenata, te se mogu preporučiti i za ispitivanje srpske sportske populacije. Podaci su obrađeni deskriptivnom statističkom metodom, Pirsonovom korelacijom i hijerarhijskom regresionom analizom. Rezultati Pirsonovih koeficijenta korelacije upućuju na niske statistički značajne interakcije između većine merenih varijabli. Nalazi regresionog modela, uz 29% varijanse, signaliziraju na statistički značajan i samostalan doprinos adaptivnog i neadaptivnog perfekcionizma u objašnjenju školskog uspeha ispitanika, te je preporuka da se u budućim istraživanjima ispitaju neke druge varijable, npr. porodica kao potencijalni prediktor. Rezultati sprovedenog istraživanja u skladu su sa ranijim studijama relacija adaptivnog i neadaptivnog perfekcionizama, somatizacije i školskog uspeha (kao kriterijuma) kod sportista **u** adolescenciji.*

Ključne reči: *odbojka, kadeti, juniori, regresioni model.*

Introduction

A great number of individual and social factors affect athletes' school success. Socio-demographic characteris-

Uvod

Na školski uspeh sportista u obrazovnom procesu, utiče veliki broj individualnih i socijalnih faktora. U psihološkim istraživanjima školskog uspeha značajno me-

tics, individual, and social factors hold significant place in psychological researches on school success. Studies regarding athletic achievements of preadolescents and adolescents usually take into account individual predictor variables: intelligence, personality dimensions, and social variables: parents' education (Dagnew, 2017). Researches (Houck et al., 2019) revealed that personal traits such as athlete's gender and age have a significant function in school success, noting that female athletes have better school success than male athletes.

Perfectionism implies multidimensional construct which is characterized by high individual standards, being overconcerned about personal mistakes, self-doubt regarding performance, exaggerated discipline and organization (Curran & Hill, 2019). The authors believe that these variables contribute the development of neurotic (maladaptive perfectionism), while personal standards represent the basis for the development of the normal (adaptive perfectionism). With adaptive perfectionism, achieving success using personal skills and capabilities leads to the increase and confirmation of self-respect, while maladaptive perfectionism, characterized by constant questioning of personal effort, dissatisfaction and self-doubt, is the result of negative self-assessment and the need for external validation. Such athletes are extremely self-critical which makes them susceptible to differential psychological problems (Stoeber et al., 2021). This way of achieving perfectionism enables the prediction of athletes' behavior during training and competing. HYPERLINK "https://www.sciencedirect.com/science/article/abs/pii/S1469029201000188"Haase, Prapavessis & Owens (2021) claim that, during early adolescence, athletes develop perfectionism under the influence of personal and external latent dimensions, while the differences in the levels of manifesting certain factors have the influence on isolating certain characteristics of perfectionism. The study (Mallinson-Howard et al., 2018) proves that maladaptive perfectionism interacts with unsatisfactory school success, while the dimensions of adaptive perfectionism are linked to better school success. Young athletes, who quite openly display perfectionism, more often experience the feelings of anxiety, panic and despondency regarding school responsibilities (Freire et al., 2020). Preadolescent and adolescent athletes are characterized by the increased changes of the points of functioning (somatic, intellectual and socio-emotional aspects). That is why there is an increased danger of developing emotional and behavioral difficulties which can also be in correlation with school success (Cowden, Crust, Jackman & Duckett, 2019). Some ath-

sto pripada sociodemografskim karakteristikama ličnim i socijalnim faktorima sportista. U studijama o sportskim postignućima predadolescenata i adolescenata obično se kod individualnih prediktivnih varijabli ispituje, inteligencija i dimenzije ličnosti, a od socijalnih varijabli obrazovanje roditelja (Dagnew, 2017). Istraživanja (Houck et al, 2019) pokazuju da lične karakteristike, npr. pol i uzrast sportista, imaju značajnu funkciju u školskom uspehu ispitanika, pri čemu sportistkinje realizuju bolji školski uspeh u poređenju sa sportistima.

Perfekcionizam podrazumeva multidimenzionalan konstrukt koji karakterišu visoko individualni standardi, preterana zabrinutosti zbog ličnih grešaka, sumnja u sopstveno izvođenje i prenaglašena disciplina i organizacija (Curran & Hill, 2019). Ovi autori smatraju da pomenute varijable doprinose razvoju neurotskog (neadaptivnog perfekcionizma), dok lični standardi predstavljaju osnovu za razvoj poželjnog (adaptivnog perfekcionizma). Kod adaptivnog perfekcionizma pri ostvarivanju uspeha sopstvenim sposobnostima i veštinama dolazi do povećanja i potvrđivanja samopoštovanja, dok se neadaptivni perfekcionizam ispoljava u konstantnom preispitivanju ličnog naprezanja, nezadovoljstvu i sumnji u sopstvene sposobnosti, što izvire i iz negativnog samoocenjivanja i potrebe za eksternalnim odobravanjem. Takve sportiste odlikuje naglašena samokritičnost, što ih čini povredljivim za različite mentalne poteškoće (Stoeber i sar., 2021). Ovakvo ostvarivanje perfekcionizma omogućava predikciju ponašanja sportista u trenažnom i takmičarskom kontekstu. Otud, Haase, Prapavessis & Owens (2021) tvrde da se perfekcionizam kod sportista u ranoj adolescenciji razvija pod uticajem individualnih i spoljašnjih latentnih dimenzija, dok razlike u nivou manifestovanja pojedinih faktora uslovljavaju izolovanje pojedinih karakteristika perfekcionizma. Studija (Mallinson-Howard et al., 2018) dokazuje da je neadaptivni perfekcionizam u interakciji sa lošijim školskim uspehom, dok se dimenzije adaptivnog perfekcionizma povezuju sa boljim školskim uspehom. Mladi sportisti, koji upadljivo manifestuju perfekcionizam, češće su anksiozni zbog školskih obaveza i imaju osećaj panike i snuždenosti (Freire et al., 2020). Sportiste predadolescente i adolescente karakterišu pojačane promene u diferenciranim gledištima funkcionisanja (somatskom, intelektualnom i socioemocionalnom aspektu). Zato postoji povećana opasnost za pojavu emocionalnih i ponašajnih teškoća, koje mogu biti u korelaciji i sa školskim uspehom (Cowden i sar., 2019). U sportskoj sredini kod nekih sportista ispoljava se i anksioznost, te se prilikom postizanja pobede

letes experience anxiety in sports environment and after winning they can have automatic negative thoughts focused on the fear of failure. Athletes who express increased anxiety instead of focusing on the task often use maladaptive strategy of focusing on feelings. On the other hand, athletes who focus on the task believe that they can stay on top of the situation and that they have the capabilities necessary for dealing with possible problems (Hill, Mallinson-Howard & Jowett, 2018), and therefore can more successfully deal with the stress. Based on this, negative correlation between anxiety and school success of athletes is expected (Jensen et al., 2018). Athletes who visibly worry about potential mistakes believe that their fathers and mothers are too critical and that is why they experience higher level of anxiety.

In school, some students experience exam anxiety, which means that during the exam they can experience automatic negative thinking oriented towards the fear of getting low marks, disappointing parents, and fear of failure in general. Students who experience elevated exam anxiety apply maladaptive strategy and focus on feelings instead of focusing on the task. On the other hand, students who focus on the task believe that they can stay on top of the situation because they have the capabilities necessary for dealing with possible problems (Burić, Sorić i Penezić, 2011), and are therefore more efficient in dealing with stress during the exam. Based on this, negative correlation between anxiety and school success is manifested (Steinmayr, McElvany & Wirthwein, 2016). Athletes who are visibly concerned about potential mistakes experience higher levels of anxiety.

Somatization is a common method of dealing with stress during puberty and early adolescence, and it entails the way of manifesting mental difficulties where tension and anxiety are expressed during stressful situations in the form of somatic symptoms (Khallad & Jabr, 2016). Considering that stress triggers physical symptoms and manifestation of mental difficulties, it is also the consequence of unsatisfactory school success (Rahat & İlhan, T. (2016). Students spend significant part of their day in school, and apart from academic, that includes social stress generated by demanding parents and peer conflict (MacDonald, Rizzone & Vengal, 2020). School stressors often create somatic difficulties, and because of the frequent absence from school those students often do not have good school success (Stone et al., 2016).

The aim of this research was to determine the predictive values of socio-demographic characteristics (parents' education), personal traits (adaptive perfectionism and maladaptive perfectionism) and psychological adjustment

mogu manifestovati negativne automatske misli orijentisane na strah od neuspeha. Sportisti koji pokazuju povišenu anksioznost umesto orijentacije na zadatak u mnogo prilika koriste neadaptivnu strategiju orijentacije na osećanja. Naprotiv, sportisti koji se orijentišu na zadatak veruju kako mogu nadzirati situaciju i imaju neophodne sposobnosti za suočavanje s mogućim problemima (Hill, Mallinson-Howard & Jowett, 2018), pa se uspešnije suočavaju sa stresom. Otud se može očekivati negativna korelacija anksioznosti i školskog uspeha sportista (Jensen i sar., 2018). Sportisti koji su vidno zabrinuti zbog potencijalnih grešaka veruju da su njihovi očevi i majke previše kritični zbog čega i percipiraju viši nivo anksioznosti.

U školskoj sredini kod nekih učenika se ispoljava i ispitna anksioznost, zbog koje se pri polaganju ispita mogu javiti negativne automatske misli orijentisane na strah od slabe ocene, razočarenja roditelja, ili načelno strah od neuspeha. Učenici koji imaju povećanu ispitnu anksioznost umesto orijentacije na zadatak češće primenjuju neadaptivnu strategiju fokusiranja na osećanja. Naprotiv, učenici koji se usmjeravaju na zadatak veruju da mogu nadzirati ispitnu situaciju jer imaju potrebne sposobnosti za rešavanje mogućih problema (Burić, Sorić i Penezić, 2011), pa efikasnije se bore sa stresom u ispitnoj situaciji. To je i razlog zašto se manifestuje negativna korelacija ispitne anksioznosti i školskog uspeha (Steinmayr, McElvany & Wirthwein, 2016). Sportisti koji su vidno zabrinuti zbog potencijalnih grešaka percipiraju viši nivo ispitne anksioznosti.

Somatizacija je uobičajen metod suočavanja sa stresom u pubertetu i ranoj adolescenciji, te podrazumeva način manifestovanja mentalnih poteškoća, gde se tenzija i anksioznost ispoljavaju u stresnim situacijama u obliku somatskih simptoma (Khallad & Jabr, 2016). S obizirom na to da je stres okidač pojave fizičkih simptoma i zaokret manifestovanja fizičkih poteškoća, on je i posledica slabog školskog postignuća (Rahat & İlhan, T. (2016). Učenici provode značajan deo dana u školi koja im, osim akademskih, uslovljava i socijalne stresore generisane preteranim nalozima očeva i majki i sukobima sa vršnjacima (MacDonald, Rizzone & Vengal, 2020). Školski stresori mnogo puta proizvode somatske teškoće, a zbog čestih izostanaka sa nastave oni najčešće imaju slabije školsko postignuće (Stone et al., 2016).

Cilj ovog istraživanja je utvrđivanje prediktivne vrednosti sociodemografskih karakteristika (obrazovanje oca i majke), ličnih dimenzija (adaptivni i neadaptivni perfekcionizam), psihološkog prilagođavanja (somati-

(somatization) in explaining school success among cadet and junior volleyball players of both genders. Based on the results of previous studies, it can be expected that parents' higher education and athletes' adaptive perfectionism lead to better school success, while maladaptive perfectionism and somatization lead to unsatisfactory school success among volleyball players.

Method of Work

Sample

The research included 122 participants of both genders, age 14 to 16 from seven volleyball clubs of Kolubara-Macva interregional league of Serbia: "VA 014" (Valjevo), "Valjevo" (Valjevo), The average age of cadets was 17,20 years of age (SD = 7,35), and the average age of juniors was 19,26 years of age (SD = 6,15). All the participants had at least two years of systematic and organized training, at least three times a week.

Instruments

The Multidimensional Perfectionism Scale (Zubčić & Vulić-Prtorić, 2008) includes 35 items which measure perfectionism using six dimensions: personal standards, concern about mistakes, parental expectations, parental criticism, self-doubt about performance, being organized. Responses range from 1 (does not correspond) to 5 (corresponds fully). Results are calculated by adding the items from certain subscales, where subscales represent latent dimensions of adaptive and maladaptive perfectionism (Erceg & Slišković, 2014). Adaptive perfectionism is positive aspirations formed from the dimensions of personal standards ("If I do not set the highest standards, I will likely end up as a lower-class person") and being organized ("I am a neat person"), while maladaptive perfectionism includes concern about mistakes, parental expectations, parental criticism, self-doubt about performance ("In my family, only perfect performance is good enough", "I never thought I could live up to my parents' expectations"). The task was for participants to determine to which extent they agree with each statement on a five point scale. Cronbach's alpha reliability coefficient ranges from .60 to .79, and the reliability of the factors adaptive and maladaptive perfectionism ranges from .82 to .83.

Exam Anxiety Scale (Vulić-Prtorić & Sorić, 2002). It includes 15 items and studies students' anxiety during exam. The scale examines the feeling of hopelessness and discomfort during exam, fear of failure

zacija) u tumačenju školskog uspeha kod odbojkaša u kadetskom i juniorskom uzrastu. U sladu sa rezultatima dosadašnjih istraživanja može se očekivati da će više obrazovanje roditelja i adaptivni perfekcionizam sportista prognozirati bolji školski uspeh, dok će neadaptivni perfekcionizam i somatizacija prognozirati slabiji školski uspeh u odbojkaškoj populaciji.

Metod rada

Uzorak

U ispitivanju je učestvovalo 122 ispitanika uzrasta od 16 do 20 godina iz dva odbojkaška kluba Međuregionalne kolubarsko–mačvanske lige Srbije: „VA 014" (Valjevo) i „Valjevo" (Valjevo). Prosečna starost kadeta iznosila je 17,20 godina (SD = 7,35), a juniora 19,26 (SD = 6,15). Svi ispitanici imali su najmanje dve godine sistematskog i organizovanog odbojkaškog treninga, u trajanju od najmanje tri puta sedmično.

Instrumenti

Multidimenzionalna skala perfekcionizma (Zubčić i Vulić-Prtorić, 2008) obuhvata 35 ajtema koji mere perfekcionizam kroz šest dimenzija: Lični standardi, Zabrinutost zbog grešaka, Roditeljska očekivanja, Roditeljska prigovaranja, Sumnja u sopstveno izvođenje, Organizovanost. Odgovori se daju na skali od 1 (*ne odnosi se na mene*) do 5 (*u potpunosti se odnosi na mene*). Rezultati se formiraju sabiranjem ajtema pojedinih subskala, od kojih subskala pripada latentnim dimenzijama višeg reda, adaptivnom i neadaptivnom perfekcionizmu (Erceg i Slišković, 2014). Adaptivni perfekcionizam, pozitivne težnje napravljene su od dimenzija lični standardi („Ako ne postavim maksimalne standarde, verovatno ću završiti kao osoba manjeg reda.") i organizovanost („Ja sam uredna osoba."), dok neadaptivni prefekcionizm podrazumeva zabrinutost zbog grešaka, roditeljska očekivanja, roditeljska prigovaranja i sumnju u sopstveno izvođenje („U mojoj porodici samo savršeno izvođenje je dovoljno dobro", Nikad nisam mislio/la da bih nogao/la zadovoljiti očekivanja svojih roditelja."). Zadatak ispitanika je da proceni koliko se slaže s pojedinom tvrdnjom na skali od 5 stupeni. Koeficijenti pouzdanosti tipa Cronbach Alpha iznose od 0,60 do 0,79, a pouzdanosti nadređenih faktora adaptivnog i neadaptivnog perfekcionizma od 0,82 do 0,83.

Skala ispitne anksioznosti (Vulić-Prtorić i Sorić, 2002). Obuhvata 15 ajtema i ispituje anksioznost učenika u ispitnoj situaciji. Skala se odnosi na osećanje bespomoćnosti i neprijatnosti u ispitnoj situaciji, strah od neuspeha tokom rešavanja zadatka koji je često posledica re-

during task solving which is often the consequential reaction of the autonomic nervous system ("When a teacher asks me something and I have to stand in front of the blackboard, I fear that I might say something wrong."). The participants give answers on a three point scale, by answering to every item by either circling "T" as affirmative or "N" as negative, and in case they cannot decide between the offered answers they can circle "?". Choosing "T" is worth 2 points, "N" is worth 0 points and "?" is worth 1 point. Theoretically, total score can range from 0 to 30, where higher score implies higher exam anxiety.

The obtained internal consistency coefficient (α =.90) of the entire scale used in this research indicates to satisfactory reliability of the scale.

Youth Self-Report – somatization (YSR Youth Self-Report; Achenbach & Rescorla, 2001). The participants are tasked with evaluating their behavior and experience on the 10 item scale which refers to the existence of physical conditions such as vertigo, fatigue and physical difficulties that have no clear medical reason, headache, nausea, dermatological problems etc. ("I feel tired without specific reason", "I suffer from vertigos"). The questionnaire consists of three levels (0 – not true, 1 – sometimes or partly true, and 2 – completely, often true) where participants assess the degree to which these items refer to them in the past six months. The score is the total of all the statement points, and higher score means increased presence of somatic symptoms. The questionnaire has a satisfactory Cronbach's alpha consistency coefficient of α .81.

Students' school success is determined by the grade point average for the previous grade. It ranges from 3 to 5, with mean value of 4,42 (SD = .69). Thirteen students achieved satisfactory performance (13.11%), 45 had very good performance (36.88%), and 59 students achieved excellent performance (50.5%).

Results

Table 1 shows the descriptive data of the measuring variables. The arithmetic means of the variables indicate that the personal traits (adaptive perfectionism) lean toward higher values, while the values of psychological adjustment (somatization) are closer to lower values. The values of standardized skewness and standardized kurtosis, where the value of skewness does not surpass the standard value of 2 and the value of kurtosis does not surpass the standard value of 7, suggest that there is no statistically significant deviation from the normal distribution of variables, which is the main condition for

akcije vegetativnog nervnog sistema („Kad me nastavnik prozove i kad moram doći pred školsku tablu, plašim se da bih mogao reći nešto pogrešno."). Ispitanici odgovaraju na trostepenoj skali Likertovog tipa, pri čemu ispitanik kod odgovara na svaki ajtem može prihvatiti zaokruživanjem slova „T", ne prihvatiti zaokruživanjem slova „N", a ako se ne može odlučiti ni za jedan od ponuđenih odgovora, ispitanik može zaokružiti znak pitanja „?". Pristajanje uz ajtem, tj. odgovaranje zaokruživanjem slova „T" dobija 2 boda, „N" 0 bodova, dok zaokruživanjem upitnika „?" dobija 1 bod. Ukupan skor čini zbir svih odgovora, pri čemu teorijski raspon rezultata varira od 0 do 30, gde viši skor ukazuje na izraženiju ispitnu anksioznost.

Dobijeni koeeficijent interne konzistencije (α =.90) na celoj skali u ovom istraživanju upućuje na zadovoljavajuću pouzdanost skale.

Skala telesnih poteškoća – somatizcije (YSR Youth Self-Report; Achenbach & Rescorla, 2001). Ispitanici imaju zadatak da procenjuju svoje ponašanje i doživljavanje na skali od 10 ajtema koji se odnose na prisutnost fizičkih stanja, kao što je vrtoglavica, umora i telesne poteškoće bez jasnih medicinskih razloga, gllavobolja, mučnina, dermatološki problemi i sl. (Osećam se premoreno, bez jasnog razloga." "Imam vrtoglavice."). Upitnik je formiran na skali od tri stepena (0 − nije tačno, 1 − ponekad ili delimično tačno i 2 – potpuno/često tačno) pri čemu ispitanici procenjuju u kojoj se meri ajtem odnosi na njih u periodu od šest meseci. Ukupan rezultat se formira kao zbir rezultata pripadajućih tvrdnji, a dobijeni veći skor ukazuje na veću prisutnost somatizacijskih simptoma. Dobijen je zadovoljavajući koeficijent pouzdanosti Cronbach α od .81.

Školski uspeh učenika određen je ocenom opšteg školskog uspeha na kraju prethodnog razreda. Raspon školskog uspeha kreće se od 3 do 5, sa srednjom vrednošću od 4,42 (SD = 0,69). Ukupno 13 učenika navodi dobar školski uspjeh (13.11%), vrlo dobar navodi 45 učenika (36,88%), a 59 učenika navodi odličan školski uspeh (50,5%).

Rezultati istraživanja

u Tabeli 1 prikazani su deskriptivni podaci merenih varijabli. Dobijene aritmetičke sredine varijabli ukazuju na to da su vrednosti lične karakteristike ispitanika (adaptivni perfekcionizam) pomerene prema višim vrednostima, dok su vrednosti nivoa psihološke adaptacije (somatizacija) ka nižim vrednostima. Vrednosti standardizovanog skjunisa (zakrivljenosti) i standardizovanog kurtozisa (zaravnjenosti), tj. tamo gde vrednosti skjunisa ne prelaze standardizovanu vrednost od 2, a vrednosti kurtozisa ne prelaze standardizovanu vrednost od 7 sugerišu da nema statistički značajnih odstupanja distribucije od normalne raspodele

applying the parametric analysis (Finney & DiStefano, 2006).

na korišćenim varijablama, što je osnovni uslov za primenu parametrijskih analiza (Finney & DiStefano, 2006).

Table 1. *Descriptive indicators for measuring variables*

Tabela 1. *Deskriptivni pokazatelji merenih varijabli*

	Min	***Max***	***AM***	***SD***	***Sk***	***Ku***
Variables / Varijabla						
Personal traits / Individualne karakteristike						
Adaptive perfectionism / Adaptivni perfekcionizam	1.48	4.96	3.59	.70	-1.88	4.66
Maladaptive perfectionism / Neadaptivni perfekcionizam	1.26	4.47	2.38	.62	-.63	-.24
Psychological adjustment / Psihološko prilogođavanje						
Exam anxiety / Ispitna anksioznost	0	29.00	17.04	7.01	.92	2.15
Somatization / Somatizacija	0	15.00	3.68	1.84	-1.59	3.17

***Annotation: Min** – minimum value; **Max** – maximum value; **AM** = arithmetic mean; **SD** = standard deviation; **Sk** = standardized skewness (asymmetry coefficient – left skewed or right skewed distribution); **Ku** = standardized kurtosis (leptokurtic distribution or platykurtic distribution). The value of standard error with Sk is .07, and with Ku is .19.*

***Napomena: Min** – minimalna vrednost; **Max** – maksimalna vrednost; **AS** = aritmetička sredina; **SD** = standardna devijacija; **Sk** = standardizovani skjunis (koeficijent asimetrije – zakrivljenosti ili iskošenosti distribucije); **Ku** = standardizovani kurtozis (koeficijent spljoštenosti ili izduženosti distribucije). Vrednost standardne greške kod pokazatelja Sk je .07, a kod Ku je .19.*

Pearson's coefficients were calculated with the aim of examining correlation of all variables (Table 2).

U cilju ispitivanja korelacija svih ispitivanih varijabli izračunati su Pirsonovi koeficijenti (Tabeli 2).

Table 2. *Bivariate correlation for measuring variables*

Tabela 2. *Bivarijantne korelacije merenih varijabli*

***Measuring instruments /* Mereni instrumenti**	***1***	***2***	***3***	***4***	***5***	***6***	***7***	***8***
1. Father's education / Obrazovanje oca		-	.37**	.18*	.05	-.15*	.01	.01
2. Mother's education / Obrazovanje majke			-	.19*	.17*	.06	.05	.05
3. School success / Školski uspeh				-	.23**	-.30**	-.26	.07
4. Adaptive perfectionism / Adaptivni perfekcionizam					-	.18*	.05	.02
5. Maladaptive perfectionism / Naadaptivni perfekcionizam						-	.32**	.42**
6. Exam anxiety / Ispitna anksioznost							-	.39**
7. Somatization / Somatizacija								-

** p < 0.01, * p < 0.05.

** p < 0.01, * p < 0.05.

Taking a look at the cells of this table, there is clearly a small, statistically significant correlation between socio-demographic variables and the examined variables. The calculated Pearson's coefficients signal towards participants' better school success. Besides, older adolescents exhibit lower level of adaptive perfectionism, while parents' higher education is shown to be in correlation with participants' better school success. In addition, children whose mothers are more educated have inclination towards adaptive perfectionism. Finally, participants who have better school success have a great tendency towards adaptive perfectionism, and minimal

Uvidom u matrice ćelija Tabele uočava se niska statistički značajna povezanost sociodemografskih varijabli i ispitivanih varijabli. Osim toga, stariji adolescenti navode niži stepen adaptivnog perfekcionizma, dok je više obrazovanje roditelja u korelaciji s višim školskim uspehom ispitanika. Istovremeno, deca obrazovanijih majki teže ka adaptivnom perfekcionizmu. Na kraju, ispitanici koji imaju bolji školski uspeh pokazuju veću tendenciju ka adaptivnom, a minimalnu ka neadaptivnom obliku perfekcionizma, kao i minimalne simptome anksioznosti i telesne poteškoće – somatizacije.

tendency towards maladaptive perfectionism, and they have minimal symptoms of physical difficulties – somatization.

Hierarchical regression analysis was conducted with the aim of determining the contribution of certain predictor variables in explaining adolescents' school success (Table 3). The regression equation included socio-demographic variables (parents' education), participants' personal traits (adaptive perfectionism and maladaptive perfectionism) and psychological adjustment (somatization).

U cilju utvrđivanja doprinosa pojedinih prediktorskih varijabli u tumačenju školskog uspeha adolescenata, sprovedena je hijerarhijska regresiona analiza (Tabela 3). U regresionu jednačinu uključene su sociodemografske varijable (obrazovanje roditelja), individualne karakteristike ispitanika (adaptivni i neadaptivni perfekcionizam) i psihološko prilagođavanje (somatizacija).

Table 3. *Prediction of school success based on adaptive and maladaptive perfectionism, and somatization*

Tabela 3. *Predikcija školskog uspeha na osnovu adaptivnog i neadaptivnog perfekcionizma, i somatizacije*

***School success* / Školski uspeh**			
***1. step: socio-demographic* / korak: Sociodemografske karakteristike**	***1. step* / korak** ***β***	***2. step* / korak** ***β***	***3. step* / korak** ***β***
Father's education / Obrazovanje oca	.20**	.16*	.14*
Mother's education / Obrazovanje majke	.08	.11	.06
***2. step: Personal traits* / korak: Individualne karakteristike**			
Adaptive perfectionism / Adaptivni perfekcionizam	.31*	.17*	
Maladaptive perfectionism / Neadaptivni perfekcionizam	-.30**	-.25**	
***3. step: Psychological adjustment* / korak: Psihološko prilagođavanje**			
Exam anxiety / Ispitna anksioznost			.27**
Somatization / Somatizacija			.10
R^2	.15*	.23**	.29*
$Rkor^2$	.13*	.20**	.21**
ΔR^2		.08	.05

Legend: *β – standard partial regression coefficient; R^2 – coefficient of multiple determination, total percentage of all predictors of the variance criterion model; $Rkor^2$ – corrected total contribution to the explained variance; ΔR^2 – the change of value of the coefficient of multiple determination (contribution of the individual group of predictors to the explained variance by introducing the new block of predictor variables); ** $p < 0.01$, * $p < 0.05$.*

Legenda: *β – standardni parcijalni regresioni koeficijent; R^2 – koeficijent multiple determinacije ukupan procenat svih prediktora objašnjenoj varijansi kriterijuma modela; $Rkor^2$ – korigovani ukupni doprinos objašnjenoj varijansi; ΔR^2 – promena vrednosti koeficijenta multiple determinacije (doprinos pojedine grupe prediktora objašnjenoj varijansi uvoiđenjem novog bloka prediktorskih varijabli); ** $p < 0.01$, * $p < 0.05$.*

In the first step of the regression model, all predictor variables, except mother's education, showed statistical significance with 15% of the explained variance of school success, while second step that included the predictor perfectionism increased the percentage of the explained variance by 8%. Statistical significance of the adaptive perfectionism is β = 21, and maladaptive perfectionism is β = -.30. The obtained predictor parameters most likely suggest that adolescents who have more expressed adaptive perfectionism have better school success, while the adolescents who express maladaptive perfectionism do not have good school success. The obtained standardized beta coefficient

U prvom koraku regresionog modela sve prediktorske varijable, izuzev obrazovanja majke, pokazale su statističku značajnost uz 15% objašnjene varijanse školskog uspeha, dok se u drugom koraku uključivanjem skupa prediktora perfekcionizma procenat objašnjenog varijabiliteta povećao za 8%. Statistička značajnost adaptivnog perfekcionizma iznosi (β = .31), a neadaptivnog perfekcionizma (β =.30) školskog uspeha. Dobijeni prediktivni parametri verovatno ukazuju na to da adolescenti izrazitijeg adaptivnog perfekcionizma **i** neadaptivnog perfekcionizma manifestuju bolji školski uspeh. Dobijeni standardni beta koeficijent u multiploj regresiji signifikantno

in multiple regression significantly and with 8% increase contributes in explaining the variance of criterion variable. Exam anxiety, functioning as psychological adjustment, is statistically significant negative predictor of school success (β = .27). In the third and final step, the indicator of somatization on the Youth Self-Report did not show statistical significance. The examined groups of predictor variables explained in total 29% of criterion variability.

Discussion

This research had the aim to examine which socio-demographic characteristic and problems in adaptation can be predictors of school success during adolescence. The interactions obtained in this research confirm the initial hypothesis and show that there are relevant relations between socio-demographic characteristic and personal traits, and school success among cadet and junior volleyball players. However, applying the hierarchical regression analysis on certain socio-demographic and personal variables, it is found that only some of them give relevant contribution, specifically that maladaptive perfectionism contribute school success of volleyball players.

Analyzing the effect of gender in this research, it is established that female volleyball players have better school success that male volleyball players. These findings match the research (Erbe, 2020) where better school success of female athletes is explained by the difference in motivation, social support, commitment, persistence, etc. Female athletes are usually more persistent, they ask for help (Ryan et., 2009), they have more self-control (Carvalho, 2016) and are more active during training (Vecchione, Alessandri & Marsicano, 2014). Apart from school success and dimensions, perfectionism is a significant predictor of school success during puberty and adolescence, where adaptive perfectionism is a relevant positive predictor, and maladaptive perfectionism is a relevant negative predictor of school success among volleyball players. In addition, the authors Nounopoulos, Ashby & Gilman (2006) state that adaptive perfectionism is a positive predictive parameter, while maladaptive perfectionism is a negative predictive parameter of school success. Adaptive perfectionism correlates to positive academic indicators such as excellent school success, satisfaction with achieved success, quality academics habits (Reyes-Hernández et al., 2021), while maladaptive perfectionism is linked to bad school success, exam anxiety and bad mood (Rice, Richardson & Ray, 2016).

Positive relationship in the correlation matrix of fathers, mothers and adolescents education, and somatization is an unexpected finding. Therefore, volleyball players can regard these behaviors as pressure, especially when parents' plans differ from theirs.

i dodatno za 8% doprinose objašnjenju varijanse kriterijumske varijable. Ispitna anksioznost u funkciji psihološke adaptacije je statistički značajan negativan prediktor školskog uspeha (β = .27). U trećem, poslednjem, koraku indikator somatizacije na Skali telesnih poteškoća nije pokazao statističku značajanost. Ispitivanim skupovima prediktorskih varijabli ukupno je objašnjeno 29% varijabiliteta kriterijuma.

Diskusija

u ovom istraživanju nastojalo se ispitati koji su to sociodemografski i problemi u adaptaciji prediktivni u prognozi školske uspešnosti u adolescenciji. Dobijene interakcije u ovom istraživanju potvrđuju hipotezu istraživanja i signaliziraju na relevantne relacije ispitivanih sociodemografskih varijabli i individualnih karakteristika, i školskog uspeha odbojkaša kadeta i juniora. Ali, primenom hijerarhijske regresione analize, na pojedine sociodemografske i lične varijable, ukazuje se na relevantne doprinose samo nekih od njih, odnosno nalazi u ovom istraživanju pokazuju da školskom uspehu doprinosi neadaptivni perfekcionizam odbojkaša.

Osim školskog uspeha, i dimenzija, perfekcionizam je značajan prediktor spotskog uspeha u pubertetu i adolescenciji, pri čemu je adaptivni perfekcionizam relevantan pozitivni, a neadaptivni perfekcionizam signifikantan negativni prediktor školskog uspeha odbojkaša. Takođe i autori Nounopoulos, Ashby & Gilman (2006) smatraju da je adaptivni perfekcionizam pozitivan prediktivni parametar, a neadaptivni negativan prediktivni parametar školskog uspeha. Upravo, adaptivni perfekcionizam korelira s pozitivnim akademskim indikatorima kao što je odličan školski uspeh, zadovoljstvo realizovanim uspehom, kvalitetnim akademskim navikama (Reyes-Hernández i sar., 2021), dok je neadaptivni perfekcionizam u interakciji sa slabijim školskim uspehom, ispitnom anksioznošću i lošim raspoloženjem (Rice, Richardson & Ray, 2016).

Pozitivan odnos u korelacionoj matrici obrazovanja očeva i majki i adolescenata, i somatizacije je neočekivan nalaz. Otud, odbojkaši pomenuta ponašanja mogu percipirati kao pritisak, naročito ako se planovi roditelja razlikuju od njihovih planova. Na kraju, na temelju dobijenih nalaza u ovoj studiji zapaža se da pozitivna individualna dimenzija (sklonost neadaptivnom perfekcionizmu) doprinosi školskom uspehu predadolescenata i adolescenata. Ovakve studije su neophodne za poboljšanje kvalitete rada u obrazovnom sistemu i sportu jer mogu ponuditi praktične smernice za kreiranje obrazovnih i sportskih programa orijentisanih na poboljšanje

Finally, based on the obtained findings, it can be seen that the negative personal dimension (inclination for maladaptive perfectionism) contributes school success of preadolescents and adolescents. These kinds of studies are necessary for improving the quality of work in education and sport because they can offer practical guidelines for creating educational and sports programs oriented towards improving academic and athletic achievements of young athletes. Future studies should focus more on the role that parents' academic involvement has in child's psychosocial adjustment.

Methodological shortcomings of this research have to do with the small pertinent sample of preadolescents and adolescents which is relatively homogenous when it comes to school success, since half of the participants had excellent school success. Taking school success as arithmetic mean of the grades is largely limited due to the metric characteristics (reliability, validity and fairness). At the same time, the range of score variance on such variable leans towards higher values, which likely conditioned the lower intensity correlations with other measuring variables. Seeing how school success affects a great number of factors, future studies should examine some other individual (such as temperament and emotional regulation), social characteristics (interaction with teachers and coaches) and determinants of school and athletic success on a larger more heterogeneous sample of male and female athletes.

Conclusion

keeping in mind the importance of school success in our society, this study examined how predictor parameters of parents' education, adaptive perfectionism, maladaptive perfectionism, exam anxiety and somatization affect the variability of school success of 122 male and female volleyball players (cadets and juniors). The findings of the hierarchical regression analysis, with 29% variance, indicate to statistically relevant and independent contribution of gender and maladaptive perfectionism of preadolescents and adolescents in predicting school success of volleyball players. At the same time, the low predictive capacity of the measuring variable somatization did not show statistical significance, which leads to caution while forming the general conclusion.

Despite the methodological shortcomings mentioned above, this study represents the first research in Serbia done on young athletes which offers the insight into the linear correlation education, adaptive and maladaptive perfectionism, exam anxiety and somatization.

Announcemet

We announce that the authors have equally contributed to this paper.

Conflict of interests

There is no conflict of interests among the authors themselves.

školskog i sportskog postignuća mladih sportista. U narednim istraživanjima treba više pažnje usmeriti ulozi aspekata akademske uključenosti roditelja u psihosocijalnu adaptaciju njihove dece.

Metodološki nedostaci sprovedenog istraživanja odnose se na prigodan i mali uzorak predadolescenata i adolescenata koji je relativno homogen u školskom uspehu pošto više od jedne polovine ispitanika u ovom uzorku ima odličan uspeh u školi. Određivanje školskog uspeha kao aritmetičke sredine zaključne ocene u velikoj meri limitirano je metrijskim karakteristikama (pouzdanost, validnost i osetljivost). Istovremeno je raspon variranja skorova na ovako operacionaliziranoj varijabli pomeren ka višim vrednostima, što je verovatno uslovilo korelacije s nižim intenzitetom sa ostalim merenim varijablama. Budući da na školski uspeh učenika utiče veliki broj faktora, u narednim je istraživanjima treba ispitati i neke druge individualne (npr. temperament i emocionalnu regulaciju), socijalne (interakcije sa nastavnicima i trenerima) i determinante školskog i sportskog uspeha na većem i heterogenijem uzorku sportista oba pola.

Zaključci

imajući u vidu značaj školskog postignuća u našem društvu, u ovoj studiji ispitano je kako prediktorski parametri obrazovanja oca i obrazovanja majke, adaptivni perfekcionizam i neadaptivni prefekcionizam, i ispitna anksioznost i somatizacija utiču na varijabilitet školskog uspeha kod 122 odbojkaša (u kadetskom i juniorskom uzrastu). Finalni nalazi hijerarhijske regresione analize uz 29% varijabiliteta ukazuju na relevantan i samostalan doprinos adaptivnog i neadaptivnog perfekcionizma predadolescenata i adolescenata u predikciji školskog uspeha u odbojkaškoj populaciji. Istovremeno, niska prediktivna snaga merene varijable somatizacije nije pokazala statističku značajanost, što ukazuje na opreznost prilikom generalizovanja zaključaka.

Uprkos navedenim metodološkim nedostacima, ova studija predstavlja prvo istraživanje u Srbiji koje nudi uvid u linearnu povezanost deteta, obrazovanja njihovih roditelja, kao i adaptivnog i neadaptivnog perfekcionizma, ispitne anksioznosti i somatizacije kod mladih sportista.

Izjava

Izjavljujemo da su autori podjednako doprineli radu.

Konflikt interesa

Između autora ne postoji interesni konflikt.

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The Effect of the Training Process on the Stability and Mobility of the Locomotor System

Uticaj trenažnog procesa na stabilnost i mobilnost lokomotornog aparata

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Abstract: *The assessment of the locomotor system functionality is of great importance for both athletes and those not doing any kind of sport. It is assumed that a structured physical activity has a number of positive effects to the locomotor system. The study included 31 samples that are active athletes and 25 samples not involved in any kind of training process. The aim of the study was to evaluate the effect of the training process on the functional stability and mobility of the locomotor system. The results indicate that there is a significant statistical difference in four analyzed variables: hurdle step (χ2=7,52; p=0,02), active straight leg raise (χ2=9,65; p=0,01), trunk stability push up (χ2=9,81; p=0,01) and rotatory trunk stability (χ2=11,63; p=0,00) in favor of the athlete group.*
Key words*: functional movement, mobility, stability, locomotor system.*

Sažetak: *Procena funkcionalnosti lokomotornog aparata je od velike važnosti kako kod sportista tako i kod onih koji se sportom ne bave. Pretpostavlja se da programirana fizička aktivnost ostvaruje niz pozitivnih adaptacija na lokomotorni sistem. Istraživanjem je bio obuhvaćen 31 ispitanik koji se aktivno bave sportom i 25 ispitanika koji nisu u trenažnom procesu. Cilj studije je bio da se sagleda uticaj trenažnog sadržaja na funkcionalnu stabilnost i mobilnost kretnog aparata. Rezultati ukazuju da postoji statistički značajna razlika u četiri analizirane varijable: Prekorak preko prepone (χ^2=7,52; p=0,02), Aktivno prednoženje (χ^2=9,65; p=0,01), Stabilnost trupa u skleku (χ^2=9,81; p=0,01) i Rotaciona stabilnost trupa (χ^2=11,63; p=0,00) u korist grupe sportista.*
Ključne reči: *funkcionalnost pokreta, mobilnost, stabilnost, lokomotorni aparat.*

Introduction

Functional movement is defined as the ability to maintain the correct relationship between mobility and stability through the kinetic chain in performing movement patterns with precision and efficiency (Iskrić, 2017). Any insufficiency of the skeletal and joint system can be viewed as a mismatch between endogenous and exogenous forces, which act on the body and thus disrupt the functionality of the locomotor apparatus (Mahdieh et al., 2020).

The appearance of muscle asymmetries can be caused by poor postural adaptations which in turn are caused by bad habits (in relation with standing, sitting, kneeling and other postures) which can later lead to pain in muscles

Uvod

Funkcionalno kretanje je definisano kao sposobnost održavanja pravilnog odnosa između mobilnosti i stabilnosti kroz kinetički lanac u vršenju kretnih obrazaca sa preciznošću i efikasnošću (Iskrić, 2017). Bilo koja insuficijencija koštano zglobnog sistema može da se posmatra kao nesklad između endogenih i egzogenih sila, koje deluju na organizam i time narušava funkcionalnost lokomotornog aparata (Mahdieh i sar., 2020).

Pojava mišićnih asimetrija može da bude uzrokovana lošim posturalnim adaptacijama koje su opet uzrokovane lošim navikama (stajanja, sedenje, klečanje i drugi položaji) koje kasnije mogu da dovedu do bolne

(Mackinnon and Novak, 2002). Long-term sedentary activities lead to changes in postural status, changes in the position of the head, thoracic and lumbar spine (Claus et al., 2016). A well balanced, aligned and functional relationship of muscle groups can affect postural stability (Kong Y et al., 2013) and muscle efficiency. Muscle imbalance is formed when the agonist muscle produces a much stronger force than its antagonist or when one or the other is shortened or elongated beyond their physiological limits (Norris, 2000). Therefore, if there is no clear synergy between agonists and antagonists accompanied by an unbalanced joint position, impaired function of the entire locomotor system can occur (Milić, 2020). Only the synchronized synergistic action of the muscles ensures the tonal balance, which is the basis for the stability of the functional units of the lumbar part. Muscles are the drivers of the human body, and are one of the most important elements of the locomotor system. They are responsible for all movements performed by the human body (except the movements of autonomous systems in the body). Favoring one or more muscle structures over another leads to muscle imbalance and their mutual dysfunction (Wilke et al., 1995; Cresswell et al., 1994). Muscle imbalance, can affect certain changes in the level of motor impulse generation. The research of Nosko et al., (2016) indicates higher bioelectric activity of the convex side of the body in disturbed posture in the frontal plane. Study (Milić et al., 2015) emphasized the connection between muscle disharmony and the manifestation of strength in children with impaired posture.

Functional Movement Screen - FMS is a set of tests that combines sports and medicine, and quantifies certain parameters of mobility and functionality of the locomotor system (Nicolozakes et al., 2018). These tests are used in many sports. Very often, FMS assessment is defined as an indicator of the quality of movement (Dorrel et al., 2018), which is important for athletes and the population of people who do not engage in sports, because it indicates the condition of the locomotor system, primarily muscle condition. Functional mobility testing consists of seven tests that require a harmonious relationship between mobility and balance. FMS identifies functional limits and movement asymmetries, which are responsible for reduced motor performance of athletes, but also for the general condition of recreational athletes (Cook et al., 2010). It can also be used for muscular asymmetries of the bone-and-joint apparatus, but not in the prediction of injuries (Dinç & Arslan, 2020). This group of tests provides information on the structure of movement, i.e. they are divided into stability and mobility tests. Tests that are often conducted to assess strength and range of motion are not relevant for

muskulature (Mackinnon i Novak, 2002). Dugotrajne sedentarne aktivnosti dovode do promena u posturalnom statusu, promeni položaja glave, torakalne i lumbalne kičme (Claus i sar., 2016). Izbalansiran, skladan i funkcionalni odnos mišićnih grupa može da utiče na posturalnu stabilnost (Kong Y i sar, 2013) i mišićnu efikasnost. Mišićni disbalans se formira kada mišić agonista produkuje znatno snažniju silu nego njegov antagonista ili kada su jedan ili drugi skraćeni, tj. izduženi preko svojih fizioloških granica (Norris, 2000). Zbog toga, ukoliko nema jasne sinergije između agonista i antagonista praćene necentriranim zglobnim položajem može da dođe do narušene funkcije celog lokomotornog aparata (Milić, 2020). Samo u sinhronizovanom sinergičkom dejstvu mišića, obezbeđena je tonusna ravnoteža koja je osnov za stabilnost funkcionalnih jedinica lumbalnog dela. Mišići su pokretači ljudskog tela, te su jedan od najbitnijih elementa lokomotornog sistema. Odgovorni su za sve pokrete koje izvodi ljudski organizam (osim pokreta autonomnih sistema u organizmu). Favorizovanje jedne ili više mišićnih struktura u odnosu na drugu, vodi u mišićni disbalans i njihovu međusobnu disfunkcionalnost (Wilke i sar., 1995; Cresswell i sar., 1994). Mišićni disbalans, može da utiče na određene promene u nivou generisanja motornih impulsa. Istraživanje Nosko i sar., (2016) ukazuje na veću bioelektričnu aktivnost konveksne strane tela kod narušene posture u frontalnoj ravni. Istraživanje (Milić i sar.,2015) naglašava povezanost mišićnog nesklada i manifestacije snage kod dece sa narušenom posturom.

Functional Movement Screen – Funkcionalni skrining pokreta- FMS) je sklop testova koji objedinjuje sport i medicinu, a kvantifikuje određene parametre mobilnosti i funkcionalnosti lokomotornog aparata (Nicolozakes i sar., 2018). Testovi se koriste u mnogim sportskim disciplinama. Vrlo često se FMS procena definiše kao pokazatelj kvaliteta pokreta (Dorrel i sar., 2018) koja je bitna za sportiste i populaciju ljudi koja se sportom ne bavi, jer ukazuje na stanje lokomotornog aparata, pre svega stanje mišića. Testiranje funkcionalne pokretljivosti se sastoji od sedam testova koji zahtevaju skladan odnos pokretljivosti i ravnoteže. FMS identifikuje funkcionalne limite i kretne asimetrije, koji su odgovorni za umanjene motoričke performanse sportista, ali i za opšte stanje rekreativaca (Cook i sar., 2010), ali i za mišićne asimetrije koštano zglobnog aparata, dok se ne može koristiti u predikciji nastajanja povreda (Dinç, & Arslan, 2020). Ova grupa testova pruža informacije o strukturi pokreta odnosno podeljeni su na testove stabilnosti i mobilnosti. Testovi koji se često sprovode za procenu snage

assessing neuromuscular damage through certain motor structures, so preference is given to FMS (Malnar et al., 2007; Kiesel et al., 2011; Mikić et al., 2016; Mokha et al., 2016; Pfeifer et al., 2019). Some researchers measured joint mobility and compared these measures with the results of FMS (Chimera et al., 2017) and pointed out the advantages of FMS tests. They are easier to perform and require a shorter testing time. They can always be applied to the population of athletes and non-athletes.

The aim of the study is to determine the differences in the functionality and mobility of the locomotor system of active athletes and those who are not in the training process.

Method

the methodological research procedure was of the transversal type. When it comes to the nature of scientific research, we used the empirical method, and regarding the goal of research, we used applied method, while regarding the knowledge of the problem, we used the confirmatory method. Regarding the degree of control, we applied the field method. Data were collected using standardized motor field tests. An appropriate statistical approach was applied for data analysis, and the obtained data were interpreted using the bibliographic-speculative method.

Assessment of functional mobility was performed on a total sample of 56 subjects (AGE=22.58±2.41 years). Of these, 31 respondents were active athletes from the College of Vocational Studies for the Education of Preschool Teachers and Sports Trainers in Subotica (AGE=21.88±1.43 years), while the control group also consisted of students from the College of Vocational Studies for the Education of Preschool Teachers and Sports Trainers in Subotica who are not actively involved in sports (N=25 AGE=23.97±2.93 years). Athletes who were considered for research purposes were characterized as healthy individuals capable of training and competition. The scope of training on a weekly basis included 12 to 15 hours per week.

A battery of functional mobility tests (FMS) was used for the research. This battery included the following tests: *Deep Squat, Hurdle Step, Lunge, Shoulder Mobility, Active Straight Leg Raise, Trunk Stability Push-up and Rotary Stability* (Cook., 2010) on the basis of which the overall score of the FMS test is formed. FMS battery of tests is a simple and quantitative method of assessing the functionality and mobility of movements. A battery of joint functional stability tests is a system composed of a series of simple tests with a simple rating system with a degree of reliability (0.95) that has been confirmed in previous research (Cuchna et al., 2016). Each of the individual tests is quantified with a score

i obima pokreta nisu relevantni za procenu nervno-muskularnih oštećenja kroz određene kretne strukture, zato se prednost daje FMS-u (Malnar i sar., 2007; Kiesel i sr., 2011; Mikić i sar., 2016; Mokha i sar., 2016; Pfeifer i sar., 2019). Neki istraživači su merili pokretljivost zglobova i te mere poredili sa rezultatima FMS-a (Chimera i sar., 2017) i ukazali su na prednosti FMS testova. Lakši su za izvođenje i potrebno je kraće vreme testiranja. Mogu se uvek primeniti na populaciji sportista i nesportista.

Cilj studije je da se utvrde razlike u funkcionalnosti i mobilnosti lokomotornog aparata aktivnih sportista i kod onih koji nisu pod trenažnim procesom.

Metod rada

metodski postupak istraživanja je bio transverzalnog tipa. Prema prirodi naučnih istraživanja koristio se empirijski metod, a prema cilju preduzimanja aplikativna metoda, dok je prema poznavanju problema bila korištena konfirmativna metoda. U odnosu na stepen kontrole primenjivao se terenski metod. Podaci su bili prikupljeni primenom standardizovanih motoričkih terenskih testova. Za analizu podataka primenjen je odgovarajući statistički postupak, a dobijeni podaci su interpretirani korišćenjem bibliografsko – spekulativne metode.

Procena funkcionalne pokretljivosti je bila izvršena na ukupnom uzorku od 56 ispitanika muškog pola (GOD=22,58±2,41 godinu). Od toga 31 ispitanik je bio aktivan sportista sa Visoke škole strukovnih studija za obrazovanje vaspitača i trenera iz Subotice (GOD=21,88±1,43 godinu), dok su kontrolnu grupu činili takođe studenti Visoke škole strukovnih studija za vaspitače i trenere iz Subotice koji se ne bave aktivno sportom (N=25 GOD=23,97±2,93 godinu). Sportisti koji su bili uzeti u obzir za potrebe istraživanja, okarakterisani su kao zdrave osobe sposobne za trening i takmičenje. Obim treninga na nedeljnom nivou iznosio je od 12 do 15 časova nedeljno.

Za potrebe istraživanja bila je primenjena baterija testova funkcionalne pokretljivosti (FMS). Baterija je podrazumevala primenu sledećih testova: *Duboki čučanj, Prekorak preko prepone, Iskorak, Pokretljivost ramenog pojasa, Aktivno prednoženje, Stabilnost trupa u skleku i Rotaciona stabilnost* (Cook., 2010), na osnovu kojih se formira ukupna ocena FMS testa. FMS baterija testova jednostavna i kvantitativna metoda procene funkcionalnosti i mobilnosti pokreta. Baterija testova funkcionalne stabilnosti zglobova je sistem sačinjen od serije jednostavnih testova sa jednostavnim sistemom ocenjivanja sa stepenom pouzdanosti (0.95) koja je potvrđena u ranijim istraživanjima (Cuchna i sar., 2016). Svaki od pojedinač-

from 0 to 3. A score of 0 is given if pain occurs during performance. Score 1, if the trainee cannot perform the movement pattern even with compensations, score 2 is given if the trainee can perform the movement but has poorer mechanics and compensatory patterns during the movement, score 3 is given if the trainee can perform the movement in accordance with adopted criteria (Cook, et al., 2006). Combined result was obtained by summing all values (Cook et al., 2006) - Total FMS test score.

For all parameters (variables), frequencies and percentage values are shown in relation to the subsample to which they belong. For the variable Total FMS Test Score, descriptive statistics were calculated, namely arithmetic mean (AS), standard deviation (S), coefficient of variation (KV). The normality of the distribution was checked by the Shapiro Wilk test for small samples. In order to establish the differences in the variables, a nonparametric statistical method, chi square test, was applied, with a level of statistical significance of $p \leq 0.05$. The Mann-Whitney test was used to determine the difference between the groups in the variable Total FMS Test Score, since a deviation from the normal distribution was observed for the mentioned variable.

Results

When we apply the nonparametric method, chi square test, it can be stated that there is a statistically significant difference in the four analyzed variables: *Hurdle Step* (χ^2=7,52; p=0,02), *Active Straight Leg Raise* (χ^2=9,65; p=0,01), *Trunk Stability Push-up* (χ^2=9,81; p=0,01) and *Rotary Trunk Stability* (χ^2=11,63; p=0,00) in favor of the athletes group. In the last-mentioned variable, the athletes group had a higher percentage of respondents with a score of 2 (90.3%) compared to the respondents from the control group (64.0%). By observing the results in the variable *Hurdle Step*, it can be seen that athletes had a much higher incidence of score 3 (41.9%) compared to the control group of respondents (12.0%). In the second variable, *Active Straight Leg Raise*, athletes group had a significantly higher percentage of respondents with a score of 3 (61.3% versus 20.0% in the control group). Also, in variables *Trunk Stability Push-up* (74.2% vs. 20.0%) and *Rotary Trunk Stability* (9.7% vs. 4.0%) there was a higher percentage of respondents in the group of athletes with a score of 3 compared to the control. It should be noted that in the athletes group there were no respondents who could not perform the movement pattern even with compensations (score 1) in the variables *Deep Squat, Trunk Stability Push-up* and *Rotary Trunk Stability.*

nih testova se kvantifikuje ocenom od 0 do 3. Ocena 0 se daje ukoliko se javi bol u toku izvođenja. Ocena 1, ukoliko vežbač ne može da izvede obrazac pokreta ni sa kompenzacijama, ocena 2 se dobija ukoliko vežbač može da izvede pokret, ali ima lošiju mehaniku i kompenzatorne obrasce tokom izvođenja pokreta, ocena 3 je ukoliko vežbač može da izvede pokret u skladu sa uspostavljenim kriterijumima (Cook, i sar., 2006). Kompozitni rezultat se dobija sabiranjem svih vrednosti (Cook i sar., 2006) - ukupan rezultat FMS testa.

Za sve parametre (varijable) prikazane su frekvencije i procentualne vrednosti u odnosu na subuzorak kojem pripadaju. Za varijablu Ukupan skor FMS testa izračunati su deskriptivni statistici, aritmetička sredina (AS), standardna devijacija (S), koeficijent varijacije (KV). Normalnost distribucije je proverena Šapiro Vilk testom za male uzorke. Kako bi se ustanovile razlike u varijablama, primenjena je neparametrijska statistička metoda „hi"-kvadrat test, sa nivoom statističke značajnosti od $p \leq 0,05$. Za utvrđivanje razlike između grupa u varijabli Ukupan skor FMS testa, korišćen je Men Vitnijev test s obzirom na to da je utvrđeno odstupanje od normalne distribucije kod navedene varijable.

Rezultati

primenjujući neparametrijsku metodu „hi"-kvadrat test, može se konstatovati da postoji statistički značajna razlika u četiri analizirane varijable: *Prekorak preko prepone* (χ^2=7,52; p=0,02), *Aktivno prednoženje* (χ^2=9,65; p=0,01), *Stabilnost trupa u skleku* (χ^2=9,81; p=0,01) i *Rotaciona stabilnost trupa* (χ^2=11,63; p=0,00) u korist grupe sportista. U poslednjoj navedenoj varijabli, grupa sportista je imala veći procenat ispitanika sa ocenom 2 (90,3%) u odnosu na ispitanike kontrolne grupe (64,0%).

Posmatrajući rezultate u varijabli *Prekorak preko prepone*, može se uvideti da su sportisti imali mnogo veću zastupljenost ocena 3 (41,9%) u odnosu na kontrolnu grupu ispitanika (12,0%). U drugoj varijabli, *Aktivno prednoženje*, sportisti su imali znatno veći procenat ispitanika sa ocenom 3 (61,3% prema 20,0% kod kontrolne grupe). Takođe i u varijablama *Stabilnost trupa u skleku* (74,2% prema 20,0%) i *Rotaciona stabilnost trupa* (9,7% prema 4,0%) bio je veći procenat ispitanika grupe sportista sa ocenom 3 u odnosu na kontrolnu. Treba istaći da kod grupe sportista nije bilo ispitanika koji nisu mogli da izvedu obrazac pokreta ni sa kompenzacijama (ocena 1) u varijablama *Duboki čučanj, Stabilnost trupa u skleku* i *Rotaciona stabilnost trupa.* U varijabli *Rotaciona stabilnost trupa* kod

In the variable *Rotary Trunk Stability* in the athletes group, there is a higher prevalence of score 2 (90.3%), which indicated that the respondents can perform the movement, but have slightly poorer movement mechanics and compensatory patterns when performing the movement. A similar conclusion can be drawn for the control group respondents in the variable *Hurdle Step* (score 2, 72% of respondents).

Table 1. *Functional mobility status differences in respondents from different groups*

Variable / **Varijable**	***Group /*** **Grupa**	***Score 1***	***Score 2***	***Score 3***	***χ2***	***p***	***df***
Deep Squat / Duboki čučanj	A	0	17 (54.8%)	14 (45.2%)	2.72	0.26	2
	C	1 (4.0%)	17 (68.0%)	7 (28.0%)			
Hurdle Step / Prekorak preko prepone	A	1 (7.1%)	17 (54.8%)	13 (41.9%)	7.52	0.02	2
	C	4 (16.0%)	18 (72.0%)	3 (12.0%)			
Lunge / Iskorak	A	1 (3.2%)	18 (58.1%)	12 (38.7%)	1.40	0.50	2
	C	2 (8.0%)	11 (44.0%)	12 (48.0%)			
Shoulder Mobility / Pokretljivost ramenog pojasa	A	2 (6.5%)	13 (41.9%)	16 (51.6%)	7.85	0.02	2
	C	4 (16.0%)	17 (68.0%)	4 (16.0%)			
Active Straight Leg Raise / Aktivno prednoženje	A	2 (6.4%)	10 (32.3%)	9 (61.3%)	9.65	0.01	2
	C	3 (12.0%)	17 (68.0%)	5 (20.0%)			
Trunk Stability Push-up / Stabilnost trupa u skleku	A	0 (0%)	8 (25.8%)	23 (74.2%)	9.81	0.01	2
	C	5 (20%)	10 (40.0%)	10 (20.0%)			
Rotary Trunk Stability / Rotaciona stabilnost trupa	A	0 (0%)	28 (90.3%)	3 (9.7%)	11.76	0.00	2
	C	8 (32.0%)	16 (64.0%)	1 (4.0%)			

Legend: *S - athletes; K - control group; χ^2 - value of chi-square test; p - level of statistical significance of chi square test; df - degrees of freedom*

Based on the obtained results for the variable *TOTAL FMS TEST SCORE* in Table 2, it can be stated that the average results of the respondents engaged in sports are higher (17.00 points), compared to the average results of the control group (14.56 points). Based on the coefficient of variation, the homogeneity of the athlete group of respondents and the relative homogeneity of the control group of respondents in the analyzed variable for the assessment of functional mobility can be stated.

Based on the values of the Shapiro Wilk test (Table 2), the normality of the distribution of results in the subsample of respondents from the control group (ShWp = 0.31) can be ascertained. A statistically significant deviation from the normal distribution was observed in respondents who are engaged in sports (ShWp=0.04).

grupe sportista, uviđa se veća zastupljenost ocene 2 (90,3%), što je ukazivalo da ispitanici mogu da izvedu pokret, ali da poseduje nešto lošiju mehaniku pokreta i kompenzatorne obrasce prilikom izvođenja pokreta. Sličan zaključak se može izvući za ispitanike kontrolne grupe u varijabli *Prekorak preko prepone* (ocena 2, 72% ispitanika).

Tabela 1. *Razlike u stanju funkcionalne pokretljivosti ispitanika različitih grupa*

Legenda: *S - sportisti; K - kontrolna grupa; χ^2 –vrednost hi-kvadrat testa; p – nivo statističke značajnosti hi kvadrat testa; df - stepeni slobode*

Na osnovu dobijenih vrednosti rezultata, varijable *UKUPAN SKOR U FMS testa* u Tabeli 2, može se konstatovati da su viši prosečni rezultati kod ispitanika koji se bave sportom (17,00 poena), u odnosu na prosečne rezultate kontrolne grupe (14,56 poena). Na osnovu koeficijenta varijacije može se konstatovati homogenost ispitanika sportista i relativna homogenost kod kontrolne grupe ispitanika u analiziranoj varijabli za procenu funkcionalne pokretljivosti.

Na osnovu vrednosti Šapiro Vilk testa (Tabela 2) može se konstatovati normalnost distribucije rezultata kod subuzorka ispitanika kontrolne grupe (ŠVp=0,31). Statistički značajno odstupanje od normalne distribucije je uočeno kod ispitanika koji se bave sportom (Švp=0,04).

Table 2. *Differences between groups in the final score of the functional test TOTAL FMS TEST SCORE*

Tabela 2. *Razlike između grupa u konačnoj oceni funkcionalnog testa UKUPAN SKOR FMS*

Variable / Varijabla	*Athletes* / Sportisti (N=31)			*Control* / Kontrolna (N=25)		
	AM±S / AS±S	*CV* / KV	*ShWp* / ŠVp	*AM±S* / AS±S	*CV* / KV	*ShWp* / ŠVp
TOTAL FMS TEST SCORE / UKUPAN SKOR FMS TESTA	17.00±1.71	10.06	0.04	14.56±2.63	18.06	0.31

Legend: *AM - arithmetic mean; S - standard deviation; CV - coefficient of variation; ShWp - significance level of Shapiro Wilk test*

Legenda: *AS - aritmetička sredina; S - standardna devijacija; KV - koeficijent varijacije; ŠVp - nivo značajnosti Shapiro Wilk testa*

The analysis of Table 3 shows the existence of a statistically significant difference between athletes and the control group (non-athletes) in the variable Total FMS Test Score, with higher values of the arithmetic mean of ranking found in the athletes group (p=0.00).

Analizom Tabele 3 primećuju se postojanje statistički značajne razlike između sportista i kontrolne grupe (nesportista) u varijabli Ukupan skor FMS testa, pri čemu su veće vrednosti aritmetičke sredine ranga konstatovane kod grupe sportista (p=0,00).

Table 3. *Differences between groups*

Tabela 3. *Razlike između grupa*

Variable / Varijabla	*Group* / Grupa	*M*	*U*	*p*
TOTAL FMS TEST SCORE / UKUPAN SKOR FMS TESTA	*Athletes* / Sportisti	35.42	173.00	0.00
	Control / Kontrolna	19.92		

Legend: *M - arithmetic mean of ranking; U - value of the Mann-Whitney U test; p - level of statistical significance*

Legenda: *M - aritmetička sredina ranga; U - vrednost Men-Vitnijev U testa; p - nivo statističke značajnosti*

Discussion

The aim of the study was to determine the differences in the functionality and mobility of the locomotor system between the group of athletes and those who are not in the training process. Based on the obtained values of the results of the variable TOTAL FMS TEST SCORE, it can be stated that the average score is higher among the respondents who are engaged in sports (17.00 points), compared to the average score of the control group (14.56 points). Research (Booden et al., 2013; Duncan et al., 2012: Klusemann et al., 2012) also suggests a connection between programmed training and movement functionality, where greater mobility in athletes can be explained by both greater muscle strain and better tone of muscles caused by systematic daily specialized training activities. Better motor control of movement in a group of athletes manifested through these tests, can be explained by the greater role of fusimotors (excitation of striated muscles leads to simultaneous and increased activity of sensory fibers of the neuromuscular spindle, because it is thought to occur as a result of intrafusal fibers contraction). In intentional, targeted, precisely defined movements, as was

Diskusija

cilj studije je bio da se utvrde razlike u funkcionalnosti i mobilnosti lokomotornog aparata kod grupe sportista i onih koje nisu u trenažnom procesu. Na osnovu dobijenih vrednosti rezultata varijable UKUPAN SKOR U FMS, može se konstatovati da su viši prosečni rezultati kod ispitanika koji se bave sportom (17,00 poena), u odnosu na prosečne rezultate kontrolne grupe (14,56 poena). Istraživanja (Booden i sar., 2013; Duncan i sar., 2012: Klusemann i sar., 2012) takođe ukazuju na povezanost programiranog treninga i funkcionalnosti pokreta, pri čemu se veća mobilnost pokreta kod sportista može objasniti i većim mišićnim naprezanjima i boljim tonusom muskulature prouzrokovane sistematskim trenažnim svakodnevnim aktivnostima usmerenog tipa. Bolja motorna kontrola pokreta kod grupe sportista manifestovana kroz navedene testove, može se objasniti i većom ulogom fuzimotora (pri ekscitaciji poprečnoprugastih mišića dolazi do istovremene i pojačane aktivnost senzornih vlakana neuromišićnog vretena, jer se smatra da ona nastaje kao posledica kontrahovanja intrafuznih vlakana). Kod

the case with performing FMS tests, fusimotor activity does not precede, but only follows, comes after the alpha motor activity, but with a slight delay (Galeano et al., 2000). The appearance of a minimal time difference occurs probably due to the lower pulse rate through the gamma fibers, but the existence of alpha-gamma coactivation can be confirmed. It can be assumed that fusimotor innervations in a group of people in the training process prevent the relaxation of intrafusal fibers during extrafusal contraction and provide better motor control of movement. If they fail to activate in the right time, the neuromuscular spindles as motion sensors would remain inactive. Better intramuscular coordination of movements in respondents engaged in sports led to better scores in the analyzed variables. It should be emphasized that muscle strength is determined by intramuscular coordination. In order to manifest maximum muscle strength, they must be activated in an appropriate way. The more complex the movement, the greater the activity of the muscle fibers as well as their mutual cooperation. Individuals who are in the training process can better coordinate the activation of fibers in individual muscles, which is a consequence of good nerve adaptation.

Better independent innervation, in people engaged in sports, two types of intrafusal fibers, provided a more adequate static and dynamic response when performing the movement in relation to the group of non-athletes.

Large differences are observed in the variables where trunk stability was crucial for a high FMS score. The results obtained in this way can be observed from the point of activation of certain muscle groups in the athletes population. Namely, when moving the arms, legs or trunk, local stabilizers of the lumbar region of the spine are activated before activating the global muscles, and the most important are: m.transversus abdominis, mm.multifidus, diaphragm and pelvic floor muscles. These intrinsic stabilizers, in coordination with intra-abdominal pressure, enable dynamic stability of the spinal column, act at the "subconscious" level of the "feed-forward mechanism" and precede any conscious and intentional movement (Frank et al., 2013). Statistically significant difference in the variable *Hurdle Step* can be observed through the fact that athletes have better motor control (Kahle et al., 2009). Control of the lower and upper extremities may be more "affected" by neuromuscular control of the nucleus i.e. trunk (Brumitt et al., 2016), which may be one of the reasons why athletes achieved better results in the Hurdle Step test.

On the other hand, differences in the variable *Active Straight Leg Raise* can be explained through aspects of

namernih, ciljanih, tačno definisanih pokreta, kao što je bio slučaj sa izvođenjem FMS testova, fuzimotorna aktivnost ne prethodi, nego ona samo sledi, nadovezuje se na alfa motornu aktivnost, ali sa malim neznatnim zakašnjenjem (Galeano i sar., 2000). Pojava minimalne vremenska razlike pojavljuje se verovatno zbog manje brzine impulsa kroz gama vlakna, ali se može prihvatiti postojanje alfa-gama koaktivacije. Za pretpostaviti je da fuzimotorne inervacije kod grupe ljudi u trenažnom procesu sprečavaju relaksacije intrafuznih vlakana u toku ekstrafuzne kontrakcije i obezbeđuju bolju motornu kontrolu pokreta. Ako se oni ne bi uključili na vreme, neuromišićna vretena kao senzori pokreta ostali bi van aktivnosti. Bolja intramuskularna koordinacija pokreta kod ispitanika koji se bave sportom, dovela je do boljih ocena u analiziranim varijablama. Treba posebno naglasiti da mišićnu silu određuje intramuskularna koordinacija. Da bi se ispoljila maksimalna sila mišića, oni se moraju na odgovarajući način aktivirati. Što je pokret složeniji, potrebna je i veća aktivnost mišićnih vlakana kao i njihova međusobna saradnja. Lica koja su u trenažnom procesu, mogu bolje da usklađuju aktiviranje vlakana u pojedinačnim mišićima, što je posledica dobre nervne adaptacije.

Bolja nezavisna inervacija, kod ljudi koji se bave sportom, dva tipa intrafuznih vlakana, obezbedila je adekvatniji statički i dinamički odgovor prilikom izvođenja pokreta u odnosu na grupu nesportista.

Velike razlike se uočavaju u varijablama gde je stabilnost trupa bila presudna za visoko FMS skor. Ovako dobijeni rezultati se mogu posmatrati iz ugla aktivacije određenih grupa mišića kod populacije sportista. Naime, kod pokreta ruku, nogu ili trupa, pre aktiviranja globalnih mišića, uključuju se lokalni stabilizatori lumbalne regije kičmenog stuba, kao najvažniji: m.transversus abdominis, mm.multifidus, dijafragma i mišići karličnog dna. Ovi intrinzični stabilizatori u koordinaciji s intraabdominalnim pritiskom omogućuju dinamičku stabilnost kičmenog stuba, deluju na nivou „podsvesnog" putem „feed-forward mehanizma" i prethode svakom svesnom i namernom pokretu (Frank i sar., 2013). Statistički značajna razlika u varijabli *prekorak preko prepone* se može posmatrati kroz činjenicu da sportisti imaju bolju motornu kontrolu (Kahle i sar., 2009). Kontrola donjih i gornjih ekstremiteta može biti „pogođenija" nervno mišićnom kontrolom jezgra odnosno trupa (Brumitt I sar., 2016), što i može biti jedan od razloga iz kog su sportisti postizali bolje rezultate u testu prekorak preko prepone.

Sa druge strane varijabla *Aktivno prednoženje* se

muscle and tendon elasticity. They play a significant role in increasing mechanical work during movement. If the active muscle or tendon lengthens, elastic energy accumulates within such biological structures. It is used to increase the results in the concentric phase of the eccentric-concentric cycle. It can be assumed that the higher level of flexibility in the group of athletes led to a difference in the manifested results in the mentioned variable.

Based on the obtained research results, it can be concluded that the programmed training process contributes to better stability of movement, flexibility and dynamic mobility. Changes occur through continuous training, neuromuscular adaptation, systematically guided activities, focused exercises and proper load dosing. Among other things, this testing served as an excellent control of the status of motor abilities and thus functional abilities in active athletes and respondents who are not engaged in sports.

Announcemet

We announce that the authors have equally contributed to this paper.

Conflict of interests

There is no conflict of interests among the authors themselves.

može i objasniti sa aspekta elastičnosti mišića i tetiva. Ona ima značajnu ulogu u povećanju mehaničkog rada tokom pokreta. Ako se aktivni mišić ili tetiva izduže, unutar takvih bioloških struktura akumulira se elastična energija. Ona se iskorištava za povećavanje rezultata u koncentričnoj fazi ekscentrično-koncentričnog ciklusa. Za pretpostaviti je da je viši nivo fleksibilnosti kod grupe sportista doveo do razlike u rezultatima u navedenoj varijabli.

Na osnovu dobijenih rezultata istraživanja, može se zaključiti da programirani trenažni proces doprinosi boljoj stabilnosti pokreta, fleksibilnosti i dinamičkoj pokretljivosti. Promene nastaju zahvaljujući kontinuiranom treningu, nervno mišićnoj adaptaciji, sistematski vođenim aktivnostima, usmerenim vežbama i pravilnim doziranjem opterećenja. Ovo testiranje je između ostalog poslužilo kao odlična kontrola stanja motoričkih sposobnosti propraćenih funkcionalnim mogućnostima kod aktivnih sportista i ispitanika koji se ne bave sportom.

Izjava

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Valorization of a Questionnaire Intended for Measuring the Quality of Dance Club Services

Valorizacija upitnika namijenjenog mjerenju kvaliteta usluga plesnog kluba

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Abstract: *Empirical transversal study was conducted with the aim of checking the validity of the questionnaire for measuring the quality of services in a dance club. The research sample consisted of a total of 194 respondents, users of the services of the Dance Club "Gemma" Banja Luka (active members). Subsampling was performed through two research areas: (1) in relation to gender (M = 31; F = 163) and (2) in relation to the user experience-length of training in the club (up to 1 year; from 1 to 3 years; from 3 to 7 years; more than 7 years). As a research instrument, a modified questionnaire SQKC (Service Quality of Karate Club) was used to assess the quality of services in the karate club, which in this case was used as a scale for individual assessment of the quality of sports services in the dance club and consists of 15 indicators of sports services. Respondents expressed their assessment by rounding off the numbers on a five-point Likert-type scale. The results obtained by surveying the respondents show that the club provides high quality services (average score 4.16). Discriminant analysis found that user experience and gender did not affect the perception of the quality of sports services. When identifying the internal agreement of the scale used, it was determined that the scale has good internal agreement (Cronbach's Alpha =, 932), which indicates its good metric characteristics. The questionnaire used should also be checked at other dance clubs, and the good metric characteristics of the SQDC (Service Quality of Dance Club) questionnaire are expected to prove reliable.*
Keywords: *dance club, SQDC questionnaire, quality of services.*

Apstrakt: *Empirijsko transferzalno istraživanje je provedeno sa ciljem provjere validnosti upitnika za mjerenje kvaliteta usluga u plesnom klubu. Istraživački uzorak sačinjavalo je ukupno 194 ispitanika, korisnika usluga Plesnog kluba „Gemma" Banja Luka (aktivni članovi). Subuzorkovanje je izvršeno kroz dva istraživačka prostora: (1) u odnosu na pol (M=31; Ž=163) i (2) u odnosu na korisnički staž-dužinu treniranja u klubu (do 1 godine; od 1 do 3 godine; od 3 do 7 godina; više od 7 godina). Kao istraživački instrument primijenjen je modifikovani upitnik SQKC (Service Quality of Karate Club) za procjenu kvaliteta usluga u karate klubu, koji je u ovom slučaju primijenjen kao skala za individualnu procjenu kvaliteta sportskih usluga u plesnom klubu i sastoji od 15 indikatora kvaliteta sportskih usluga. Ispitanici su svoju procjenu iskazivali zaokruživanjem brojeva na petostepenoj skali Likertovog tipa. Rezultati dobijeni anketiranjem ispitanika pokazuju da klub pruža usluge visokog kvaliteta (prosječna ocjena 4,16). Dskriminativnom analizom je utvrđeno da korisnički staž i pol nisu uticali na doživljaj kvaliteta sportskih usluga. Prilikom identifikacije unutrašnje saglasnosti korištene skale, utvrđeno je da skala ima dobru unutrašnju saglasnost (Cronbach's Alpha = ,932), što ukazuje na njene dobre metrijske karakteristike. Korišteni upitnik potrebno je provjeriti i na drugim plesnim klubovima, pri čemu se očekuje da dobre metrijske karakteristike SQDC (Service Quality of Dance Club) upitnika se pokažu pouzdanim.*
Ključne riječi: *plesni klub, SQDC upitnik, kvalitet usluga.*

Introduction

Sports dance belongs to a group of (sports) activities that contain aesthetically designed and choreographically defined acyclic movement structures and are mainly

Uvod

Sportski ples pripada grupi (sportskih) aktivnosti koje sadrže estetski oblikovane i koreografski definisane aciklične kretne strukture i uglavnom se izvode u spe-

performed in specific dynamically-changing conditions (Milanović, 2013). In addition to the basic kinesiological phenomena (movement, dynamics, coordination, fitness, etc.), the artistic component of its expression (music, choreography, sensibility, the player's focus on the "dance story", flow, etc.) is especially represented. Although attitudes are still present today as to whether sport dance is, in essence, primarily an art or an equal sport discipline (Zagorc, 2000), it is indisputable that this form of physical engagement of people of all ages occupies a significant place in active and purposeful leisure times.

Modern forms of sports and recreational content incorporate various forms and types of sports activities, among which the contents of sports dance are appearing more and more intensively. Competitive sports dance belongs to a relatively new / young sports branch, so the management processes in this activity are still insufficiently studied. On the other hand, the development of sports dance, which brings with it an increasing number of students of dance schools (clubs), as well as the number of active competitors, imposes the need for more intensive study of various organizational aspects of its existence (Srdić & Lolić, 2011).

Dance clubs are constituted as a specific organizational system with an appropriate structure. It, in essence, refers to its physical elements and information connections, and in practice it predominantly refers to two segments: organizational subsystems / blocks and operational activities (most responsible for the realization of set goals, given that through them the flow of people - users of services and human resources of the club itself). As today's dance clubs, in the formal-legal sense, are predominantly organized as associations (non-profit organizations), the theoretical position that the success of non-profit organizations depends on the fact how effectively and efficiently they meet the needs of their users can be applied to them. That is, to what extent do they have the organizational capacity that is able to deliver an effective service to the "sports and service market" (Nešić, Dačić & Srdić, 2014).

The issue of adequate identification of perception in the relationship "quality service - customer satisfaction" is very complex, subtle and delicate, so it is often conditioned by different views / attitudes of users and their understanding (understanding) of quality. So it has to be taken into account during various evaluation activities by the dance club management. For the creation and distribution of services, it is necessary that the club management has in mind the concept and essence of the service environment, which includes various elements of

cifičnim dinamično-promjenljivim uslovima (Milanović, 2013). Pored osnovnih kinezioloških fenomena (kretanje, dinamika, koordinacija, kondicija, i sl.) posebno je zastupljena umjetnička komponenta njegove ekspresije (muzika, koreografija, senzibilitet, fokusiranost igrača na "plesnu priču", flow, itd.). Mada su danas još uvek prisutni stavovi oko toga da li je sportski ples, u suštini, prvenstveno umjetnost ili ravnopravna sportska disciplina (Zagorc, 2000), nesporno je da ovaj oblik fizičkog angažovanja osoba svih životnih dobi zauzima značajno mjesto u aktivnom i svrsishodnom proveđenju slobodnog vremena.

Savremeni oblici sportsko-rekreativnih sadržaja u sebe inkorporiraju različite oblike i vrste sportskih aktivnosti, među kojima se sve intenzivnije pojavljuju i sadržaji sportskog plesa. Takmičarski sportski ples spada u relativno novu/mladu sportsku granu, tako da se menadžmentski procesi u ovoj aktivnosti još uvek nedovoljno proučavaju. Sa druge strane razvoj sportskog plesa, koji sa sobom nosi i sve veći broj polaznika plesnih škola (klubova), kao i broj aktivnih takmičara, nameću potrebu intenzivnijeg proučavanja različitih organizacijskih aspekata njegove egzistencije (Srdić & Lolić, 2011)

Plesni klubovi su konstitusani kao specifičan organizacijski sistem sa odgovarajućom strukturom. Ona se, u suštini, odnosi na njegove fizičke elemente i informacione veze, a u praksi se to dominantno odnosi na dva segmenta: organizacijske podsisteme/blokove i operativne aktivnosti (najodgovornije za realizaciju postavljenih ciljeva, s obzirom na to da se kroz njih vrši protok ljudi - korisnika usluga i ljudskih resursa samog kluba). Kako su današnji plesni klubovi, u formalno-pravnom smislu, dominantno organizovani kao udruženja (neprofitne organizacije), na njih se sasvim aplikativno može odnositi teorijsko stanovište da uspeh neprofitnih organizacija upravo zavisi od činjenice koliko efektivno i efikasno zadovoljavaju potrebe svojih korisnika. Odnosno, u kojoj mjeri raspolažu organizacionim kapacitetima koji su u stanju da „sportsko-uslužnom tržištu" isporuče efektivnu uslugu (Nešić, Dačić & Srdić, 2014).

Problematika adekvatne identifikacije percepcije na relaciji „kvalitetna usluga – zadovoljstvo korisnika" jeste veoma kompleksna, suptilna i delikatna, tako da je često uslovljena različitim pogledima/stavovima korisnika i njihovog shvatanja (poimanja) kvaliteta. Tako da se ono mora uzeti u obzir prilikom različitih aktivnosti evaluacije od strane menadžmenta plesnog kluba. Za kreiranje i distribuciju usluga neophodno je da menadžment kluba ima u vidu pojam i suštinu uslužnog ambijenta, koji obuhvata različite elemente fizičkog okruženja i atmosferu u

the physical environment and the atmosphere in which the service is performed, because it can significantly affect the service process and consumer perception (user / consumer) (Gronroos, 2002; Perić et al., 2017). Modern marketing approaches to the management of non-profit sector organizations very clearly determine the view that their success largely depends on how effectively and efficiently they meet the needs of immediate users (Kaplan, 2001). Considering that dance clubs are in most cases organizationally non-profit oriented, we can speak of a very significant applicability of the stated point of view. Especially in the context of management's commitment to a responsible attitude towards clients (service users), but also towards donors, public sources of funding, etc. Thus, the management structures of the dance club are constantly looking for an answer to the question - to what extent do they have the organizational capacity that is able to deliver an effective service to the sports market and target groups.

Difficulties in defining the concept of quality in the service activities of sports (non-profit) organizations are primarily related to the dilemma of what should be measured - the quality of the service itself or the experience of service users (Cairns, Harris, Hutchison & Tricker, 2004, Perić et al., 2017). One of the methodological problems is also related to the doubt in the objectivity of quality assessment. Most authors believe that the basic focus of service quality must be on the user (Monroe & Krishnan, 1983; according to: Ivanović & Antić, 2011). Creating users' perceptions of the quality of services is largely conditioned by internal factors of the club's organization, but also by relationships with other related stakeholders (Campbell, 2002, Ivanović, 2011).

Many difficulties arise from this relationship, which is why the measurement of delivered services is a very sensitive problem (Cairns, et al., 2004; Perić et al., 2017). Although various quality assessment instruments have been constructed in research practice so far, which significantly alleviate the problem of measuring quality management performance (this primarily refers to the Servqual model and its modification Servperf) (Parasuraman, Zeithaml & Berry, 1988; Cronin & Taylor, 1992), such instruments have not been tested or standardized in research related to dance clubs. That is, so far no quality measuring instrument has been validated that could relatively objectively measure the perception of the quality of dance services. What can be the starting point for this research is the SQKC scale, which was constructed and valorized as an instrument for measuring the satisfaction of users of karate club services (Perić et al., 2017).

kojoj se usluga obavlja, jer se time može znatno uticati na sam proces pružanja usluge, kao i na percepciju potrošača (korisnika/konzumenta) (Gronroos, 2002; Perić i sar., 2017). Savremeni marketinški pristupi upravljanju organizacijama neprofitnog sektora, veoma jasno determinišu stanovište da njihov uspjeh najvećim dijelom zavisi od činjenice koliko efektivno i efikasno zadovoljavaju potrebe neposrednih korisnika (Kaplan, 2001). Obzirom da su i plesni klubovi u većini slučajeva organizaciono neprofitno orijentisani može se govoriti o veoma značajnoj aplikativnosti navedenog stanovišta. Naročito u kontekstu menadžmentskog opredjeljenja ka odgovornom odnosu prema klijentima (korisnicima usluga), ali i prema donatorima, javnim izvorima finansiranja, itd. Dakle, upravljačke strukture plesnog kluba su u stalnom traganju za odgovorom na pitanje - u kojoj mjeri raspolažu organizacionim kapacitetima koji su u stanju da sportskom tržištu i ciljnim grupama isporuče efektivnu uslugu.

Poteškoće u definisanju pojma kvaliteta u uslužnim djelatnostima sportskih (neprofitnih) organizacija prvenstveno su vezane za dilemu šta treba da se mjeri - kvalitet same usluge ili doživljaj korisnika usluge (Cairns, Harris, Hutchison & Tricker, 2004, Perić i sar., 2017). Takođe je jedan od metodoloških problema vezan i za sumnju u objektivnost procjene kvaliteta. Većina autora smatra da osnovni fokus kvaliteta usluga mora biti usmjeren na korisnika (Monroe & Krishnan, 1983; prema: Ivanović & Antić, 2011). Kreiranje doživljaja korisnika o kvalitetu usluga najvećim delom je uslovljeno unutrašnjim faktorima organizacije kluba, ali i odnosima sa drugim povezanim stejkholderima (Campbell, 2002, Ivanović, 2011). Iz tog odnosa proističe mnogo teškoća zbog čega mjerenje isporučenih usluga predstavlja veoma osjetljiv problem (Cairns, et al., 2004; Perić i sar., 2017). Mada su u istraživačkoj praksi do sada konstruisani različiti instrumenati za procjenu kvaliteta, koji znatno olakšavaju problem mjerenja performansi menadžmenta kvaliteta (to se u prvom redu odnosi na Servqual model i njegovu modifikaciju Servperf) (Parasuraman, Zeithaml & Berry, 1988; Cronin & Taylor, 1992), ovakvi insgtrumenti nisu provjeravani, niti standardizovani u istraživanjima vezanih za plesne klubove. Odnosno, do sada nije validiran niti jedan kvalitetan mjerni instrument kojim bi se relativno objektivno mogla mjeriti percepcija kvaliteta usluga u plesu. Ono što može biti polazna osnova za ovo istraživanje jeste skala SQKC koja je konstruisana i valorizovana kao instrument za mjerenje zadovoljstva korisnika usluga karate kluba (Perić i sar., 2017).

Method

This empirical research of transversal character was realized in the Dance Club "Gemma" Banja Luka. The research sample consisted of a total of 194 respondents, users of club services (active members). Subsampling was performed through two research spaces: (1) in ondos by gender (M = 31; F = 163) and (2) in relation to the user experience-length of training in the club (up to 1 year; from 1 to 3 years; 3 to 7 years; more than 7 years).

A modified SQKC questionnaire was used as a research instrument, which was constructed to examine the user perception of the quality of sports services in a karate club (Perić et al., 2017). The applied instrument is constructed as a scale for individual assessment / perception of the quality of sports services in the club and consists of 18 items / indicators of the quality of sports services. The final version, a modified questionnaire for this occasion, was preceded by several pilot studies. After checking the metrics, a total of 15 items were retained, where respondents expressed their assessment by choosing one of five positions on the Likert-type scale (grade 1 represents the lowest and grade 5 the highest intensity of perception of the quality of dance club services). In this sense, this scale can be called as - the quality of services of a dance club (*Service Quality of a Dance Club*).

Questionnaire / scale metrics in our study were tested using two procedures: (1) checking its internal compliance (*Scale Reliability Analysis based on the Cronbach's alpha coefficient*) and (2) factor analysis (*Principal Components Analysis*) with the hair method rotation (*Direct Oblimin*). The choice of the mentioned statistical procedures was conditioned, first of all, by the character of the research and the treated research instrument. Therefore, the PCA approach was imposed as a logical choice of the data analysis method, whose orientation towards the validation of a relatively new assessment scale (within the second sports-service environment). Also, the generally recommended aspects of checking each scale type instrument (Pallant, 2009) direct in this case the choice of a statistical procedure for determining reliability on a specific sample towards the application of Scale Reliability Analysis based on the Cronbach's alpha coefficient.

The application of the SQDC questionnaire in practice is shown on the example of the Dance Club "Gemma" from Banja Luka. Based on the answers to 15 items of the questionnaire, the average scalar value was calculated for each respondent, which was used as a numerical data for assessing the quality of delivered sports services. From these scalar averages, descriptive statistical parameters were calculated for different subsamples. The sig-

Metod

Ovo empirijsko istraživanje transferzalnog karaktera realizovano je u Plesnom klubu „Gemma" Banja Luka. Istraživački uzorak sačinjavalo je ukupno 194 ispitanika, korisnika usluga kluba (aktivni članovi). Subuzorkovanje je izvršeno kroz dva istrživačka prostora: (1) u ondosu na pol (M=31; Ž=163) i (2) u odnosu na korisnički staž-dužinu treniranja u klubu (do 1 godine; od 1 do 3 godine; od 3 do 7 godina; više od 7 godina).

Kao istraživački instrument primijenjen je modifikovani upitnik SQKC, koji je konstruisan za ispitivanje korisničke percepcije kvaliteta sportskih usluga u karate klubu (Perić i sar., 2017). Primijenjeni instrument konstruisan je kao skala za inidividualnu procjenu/percepciju kvaliteta sportskih usluga u klubu i sastoji od 18 ajetma/indikatora kvaliteta sportskih usluga. Konačnoj verziji, za ovu priliku modifikovanog upitnika, prethodilo je nekoliko probnih istraživanja. Nakon provjere metrike zadržano je ukupno 15 ajtema, gdje su ispitanici svoju procjenu iskazivali izborom jedne od pet pozicija na skali Likertovog tipa (ocjena 1 predstavlja najniži, a ocjena 5 najviši intenzitet percepcije kvaliteta usluga plesnog kluba). U tom smislu ova skala se može imenovati kao - skala kvaliteta usluga plesnog kluba (***S**ervice **Q**uality of a **D**ance **C**lub*).

Metrika upitnika/skale u našem istraživanju testirana je primjenom dva postupka: (1) provjerom njene unutrašnje saglasnosti (*Scale Reliability Analysis* koja je zasnovana na Kronbahovom alfa koeficijentu) i (2) faktorskom analizom (analiza glavnih komponenti – *Principal Components Analysis*) sa metodom kose rotacije (*Direct Oblimin*). Izbor navedenih statističkih procedura bio je uslovljen, u prvom redu, karakterom istraživanja i tretiranim istraživačkim instrumentom. Stoga se kao logičan odabir metode analize podataka, čije je usmjerenje ka validaciji relativno nove skale procjene (u okviru drugog sportsko-uslužnog okruženja) nametnuo PCA pristup. Takođe i opšte preporučeni aspekti provjere svakog instrumenta tipa skale (Pallant, 2009) usmjeravaju u ovom slučaju izbor statističke procedure za utvrđivanje pouzdanosti na konkretnom uzorku ka primjeni *Scale Reliability Analysis* zasnovane na Kronbahovom alfa koeficijentu.

Primjena SQDC upitnika u praksi prikazana je na primjeru Plesnog kluba „Gemma" iz Banja Luke. Na osnovu odgovora na 15 ajtema upitnika, za svakog ispitanika je izračunata prosječna skalarna vrednost koja je korištena kao numerički podatak za procjenu kvaliteta isporučenih sportskih usluga. Iz ovih skalarnih proseka izračunati su deskriptivni statistički parametri za različite

nificance of differences between arithmetic means was tested using Univariate Analysis of Variance and One Way ANOVA.

All statistical inferences were made at a significance level of 0.05 (*Sig*. <, 05).

The results

In order to check the validity of the questionnaire, 15 items of the scale were subjected to principal components analysis (PCA). Previously, the procedure of assessing the suitability of data for factor analysis was realized, and the review of the correlation matrix recorded a statistically sufficiently large number of coefficients of 0.3 and more. *Kaiser-Meyer-Olkin Measure of Sampling Adequacy* (KMO) was 0.904, which significantly exceeds the recommended value of 0.6 (Kaiser, 1970, 1974). *Bartlett's test of sphericity* (Bartlett, 1954) also reached statistical significance, which together indicate the factorability of the correlation matrix and the justification for the application of factor analysis.

Analysis of the main components obtained after Oblimin rotation revealed the presence of three components with characteristic roots (*Eiegenvalues*) over one, which explain 51.40%, 9.39%, and 7.35% of the variance. However, the obtained fracture diagram (Scree plot) showed the existence of a clear fracture point already behind the first component (Figure 1). Based on Kattel's criterion (1966), it was decided to keep only one component, which is in line with the recommended procedures for interpreting the results of factor analysis (Pallant, 2009). This was supported by the results of a parallel analysis with one component whose characteristic values exceed the corresponding threshold values obtained using an equally large matrix of random numbers (15 variables x 142 subjects). This single component explained a significant and statistically acceptable part of the total variance (51.40%). All 15 variables gave significant factor weight to the only extracted component (Table 3) which proved that the applied scale has a high validity and that it can be applied as an independent scale for assessing the quality of service systems in a dance club. The hierarchical structure of the Component Matrix shows that the extracted factor is most dominantly saturated by items related to the positive experiences of services provided by this dance club, especially: club program content (especially educational and development programs), quality of information availability to service users (especially when it is about the program contents and activities of the club), the quality of professional work (realization of the program), etc. The results collected by surveying users showed that the selected club provides sports,

subuzorke. Značajnost razlika između aritmetičkih sredina testirana je primjenom univarijantne analize varijanse (*Analysis of Variance and One Way ANOVA*).

Sva statistička zaključivanja sprovedena su na nivou značajnosti od 0,05 (*Sig*. < ,05).

Rezultati

U cilju provjere validnost upitnika, 15 ajtema skale podvrgnuto je analizi glavnih komponenti (PCA). Prethodno je realizovan postupak ocjene prikladnosti podataka za faktorsku analizu, a pregledom korelacione matrice evidentiran je statistički dovoljno veliki broj koeficijenata vrijednosti 0,3 i više. Kajzer – Majerov pokazatelj adekvatnosti uzorka (*Kaiser-Meyer-Olkin Measure of Sampling Adequacy - KMO*) bio je 0,904 što znatno premašuje preporučenu vrijednost 0,6 (Kaiser, 1970, 1974). Bartletov test sferičnosti (*Bartlett's test of sphericity*) (Bartlett, 1954) takođe je dostigao statističku značajnost, što se zajedno ukazuje na faktorabilnost korelacione matrice i opravdanost primjene faktorske analize.

Analiza glavnih komponenti dobijenih nakon Oblimin rotacije, otkrila je prisustvo tri komponente sa karakterističnim korjenovima (*Eiegenvalues*) preko jedan, koje objašnjavaju 51,40%, 9,39%, i 7,35% varijanse. Međutim, dobijeni dijagram preloma (Scree plot) je pokazao postojanje jasne tačke prijeloma već iza prve komponente (Slika 1). Na osnovu Kattel-ovog kriterijuma (1966) odlučeno je da se zadrži samo jedna komponenta, što je u skladu i sa preporučenim procedurama tumačenja rezultata faktorske analize (Pallant, 2009). To su podržali i rezultati paralelne analize sa jednom komponentom čije karakteristične vrijednosti premašuju odgovarajuće vrijednosti praga dobijene pomoću jednako velike matrice slučajnih brojeva (15 varijabli x 142 ispitanika). To jednofaktorsko rešenje (*Single component*) objasnilo je značajan i statistički prihvatljiv dio ukupne varijanse (51,40%). Svih 15 varijabli dalo je značajnu faktorsku težinu jedinoj ekstrahovanoj komponenti (Tabela 3) čime je dokazano da primijenjena skala ima visoku validnost i da se može primjenjivati kao samostalna skala za procjenu kvaliteta sistema usluga u plesnom klubu. Hijerarhijska struktura komponentne matrice (*Component Matrix*) pokazuje da ekstrahovani faktor najdominantnije saturiraju ajtemi koji se odnose na pozitivne doživljaje usluga koje pruža ovaj plesni klub, a naročito: programske sadržaje kluba (posebno edukativne i razvojne programe), kvalitet dostupnosti informacija korisnicima usluga (posebno kada je riječ o programskim sadržajima i aktivnostima kluba), kvalitet stručnog rada (realizacija programa), itd. Rezultati prikupljeni anketiranjem korisnika pokazali su

dance and recreational services of high quality. On a scale of 1 to 5, the overall average score of the complete sample exceeded the value of four (4.16), and in some indicators it reached the value of 4.68 (Table 1).

The results of the discriminant analysis showed that the experience of the quality of sports services in the selected dance club was not influenced by any of the two analyzed characteristics of the respondents - user experience and gender (Table 2).

da izabrani klub pruža sportsko-plesne i rekreativne usluge visokog kvaliteta. Na skali od 1 do 5, ukupna prosječna ocjena kompletnog uzorka premašila je vrijednost četiri (4,16), a u pojedinim indikatorima dostigla je i vrijednost 4,68 (Tabela 1).

Rezultati diskriminativne analize su pokazali da na doživljaj kvaliteta sportskih usluga u izabranom plesnom klubu nije uticao ni jedan od dva analizirana obilježja ispitanika – korisnički staž i pol (Tabela 2).

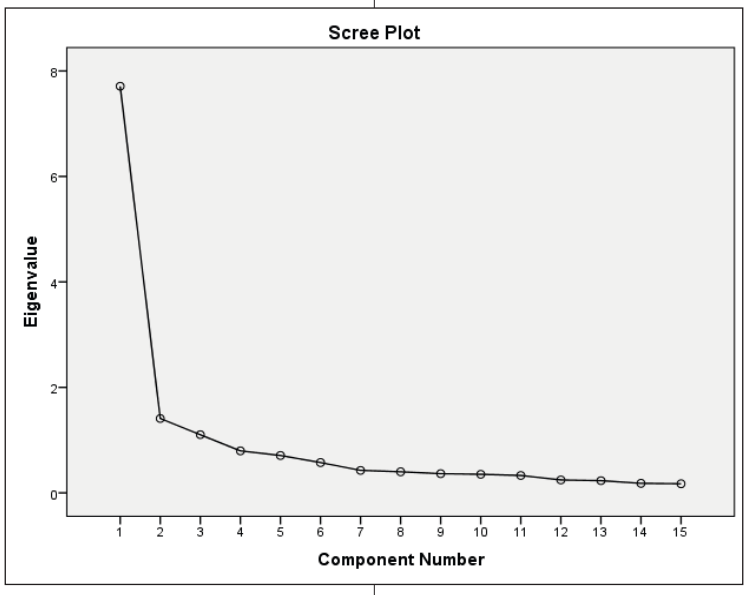

Figure 1 *- Screeplot for dance club service rating scale indicators*

Slika 1 *– Dijagram prijeloma (Screeplot) za indikatore skale procjene usluga plesnog kluba*

Table 1: *Elements of internal compliance of the dance club service quality assessment scale*

Tabela 1: *Elementi unutrašnje saglasnosti skale procjene kvaliteta usluga plesnog kluba*

No. / **RB**	***Quality indicator /*** **Indikator kvaliteta**	***Scalar average /*** **Skalarni prosjek**	***Communalities /*** **Komunaliteti**	***Factor /*** **Faktor**
1	*Quality of professional work (training) by the club coach /* Kvalitet stručnog rada (vođenje treninga) od strane trenera kluba	4.65	.559	.748
2	*The expertise of the coaches working at the club /* Stručnost trenera koji rade u klubu	4.68	.491	.700
3	*The atmosphere that prevails during training /* Atmosfera koja vlada tokom treninga	4.56	.490	.700
4	*The attitude of the club's coaches towards the athletes /* Odnos trenera kluba prema vježbačima	4.65	.534	.731
5	*General quality of all services provided by the club /* Generalni kvalitet svih usluga koje pruža klub	3.98	.539	.734
6	*A space where club services are provided /* Prostor u kome se pružaju usluge kluba	3.94	.426	.653
7	*Hygiene in rooms and exercise rooms /* Higijena u prostorijama i prostorima za vježbanje	4.04	.460	.678
8	*Availability of professional information related to the provision of services in the club /* Dostupnost stručnih informacija vezanih za pružanje usluga u klubu	4.35	.592	.770

9	*Offer content and programs that the club provides to its users /* Ponuda sadržaja i programa koje klub pruža svojim korisnicima	4.30	.574	.758
10	*Subjective feeling during the stay and use of the club's services /* Subjektivni osećaj prilikom boravka i korišćenja usluga kluba	4.31	.554	.745
11	*Educational programs organized by the club /* Edukativni programi koje organizuje klub	4.05	.646	.804
12	*The quality of the competition organized by the club /* Kvalitet takmičenja koje organizuje klub	4.12	.486	.697
13	*The quality of sports camps organized by the club /* Kvalitet sportskih kampova koje organizuje klub	3.49	.403	.635
14	*Availability of information on club activities and programs /* Dostupnost informacija o aktivnostima i programima kluba	4.21	.608	.780
15	*Club marketing activities /* Marketinške aktivnosti kluba	3.84	.348	.590
Scalar value (scale as a whole) / Skalarna vrijednost (skala u cjelini):		4.16		
Sample adequacy ratio (CMO)= .904 Pokazatelj adekvatnosti uzorka (KMO) = ,904	*Bartlett's test of sphericity = 1341.697* Bartletov test sferičnosti = 1341,697	*Sig.= .000 /* Sig.= ,000		

Table 2: *Discriminant analysis of different subsamples*

Tabela 2: *Diskriminativna analiza različitih subuzoraka*

***Membership in the club /* Članski staž u klubu**	***Pol***	***Mean***	***Std. Deviation***	***N***
up to 1 year / do 1 godine	M	4.16	.429	5
	Ž	4.41	.479	39
	∑	4.38	.476	44
from 1 to 3 years / od 1 do 3 godine	M	4.05	.880	9
	Ž	4.20	.690	39
	∑	4.17	.721	48
from 3 to 7 godina / od 3 do 7 godina	M	4.14	.756	7
	Ž	4.07	.705	41
	∑	4.08	.704	48
over 7 years / preko 7 godina	M	4.12	.702	6
	Ž	3.95	.809	28
	∑	3.98	.784	34
Total sample / Cijeli uzorak:	M	4.11	.704	27
	Ž	4.17	.684	147
	∑	4.16	.686	174

Univariate Analysis of Variance for Subsamples: F =1.055; Sig. = .483
Univariate Analysis of Variance for Gender: F =.159; Sig. = .714 /
Univariate Analysis of Variance for Subsamples: F =1,055; Sig. = ,483
Univariate Analysis of Variance for Gender: F =,159; Sig. = ,714

In the continuation of the verification of the metric characteristics of the applied scale, and on the basis of the determined factor validity, the identification of its internal compliance was approached. The obtained results show that the scale as a whole has good internal agreement, which is indicated by the Cronbach's Alpha coefficient (*Cronbach's Alpha = ,932*), which is significantly higher than the recommended theoretical value of 0.7 (De Vellis, 2003) (Table 3), that it has good metric characteristics.

U nastavku provjere metrijskih karakteristika primijenjene skale, a na osnovu utvrđene faktorske validnosti, pristupilo se identifikaciji njene unutrašnje saglasnosti. Dobijeni rezultati pokazuju da skala u cjelini ima dobru unutrašnju saglasnost, na šta ukazuje Kronbahov koeficijent alfa (*Cronbach's Alpha* = ,932) koji je značajno veći od preporučene teorijske vrijednosti 0,7 (De Vellis, 2003) (Tabela 3), odnosno da posjeduje dobre metrijske karakteristike.

Table 3: *Elements of internal compliance of the dance club service quality assessment scale*

Tabela 3: *Elementi unutrašnje saglasnosti skale procjene kvaliteta usluga plesnog kluba*

No. / **Br. pitanja**	***Quality indicator /*** **Indikator kvaliteta**	***Scalar average /*** **Skalarni prosjek**	***Influence of item removal on alpha coefficient /*** **Uticaj uklanjanja stavke na alfa koeficijent**
1	*Quality of professional work (training) by the club coach /* Kvalitet stručnog rada (vođenje treninga) od strane trenera kluba	4.65	.920
2	*The expertise of the coaches working at the club /* Stručnost trenera koji rade u klubu	4.68	.921
3	*The atmosphere that prevails during training /* Atmosfera koja vlada tokom treninga	4.56	.920
4	*The attitude of the club's coaches towards the athletes /* Odnos trenera kluba prema vježbačima	4.65	.920
5	*General quality of all services provided by the club /* Generalni kvalitet svih usluga koje pruža klub	3.98	.918
6	*A space where club services are provided /* Prostor u kome se pružaju usluge kluba	3.94	.921
7	*Hygiene in rooms and exercise rooms /* Higijena u prostorijama i prostorima za vježbanje	4.04	.920
8	*Availability of professional information related to the provision of services in the club /* Dostupnost stručnih informacija vezanih za pružanje usluga u klubu	4.35	.917
9	*Offer content and programs that the club provides to its users /* Ponuda sadržaja i programa koje klub pruža svojim korisnicima	4.30	.918
10	*Subjective feeling during the stay and use of the club's services /* Subjektivni osećaj prilikom boravka i korišćenja usluga kluba	4.31	.918
11	*Educational programs organized by the club /* Edukativni programi koje organizuje klub	4.05	.916
12	*The quality of the competition organized by the club /* Kvalitet takmičenja koje organizuje klub	4.12	.919
13	*The quality of sports camps organized by the club /* Kvalitet sportskih kampova koje organizuje klub	3.49	.924
14	*Availability of information on club activities and programs /* Dostupnost informacija o aktivnostima i programima kluba	4.21	.916
15	*Club marketing activities /* Marketinške aktivnosti kluba	3.84	.923
Cronbach's alpha coefficient / Kronbahov alfa koeficijent:			**.932**

Discussion

Identifying the existence of an interaction between service quality and customer satisfaction is a very important factor that can be crucial for modeling the work and management activities of a dance club. Therefore, it is a very sensitive management issue that is primarily conditioned by the level of individual perception of users, as well as a specific experience of quality through a positive or negative feeling after using the service (Evans & Lindsey, 2010). Some sports clubs apply different concepts of quality management and apply different models to measure the quality of services (Packiathan & Kyungro, 2000; Kelley & Turley, 2001; Tsitskari, Tsiotras & Tsiotras, 2006; Lee, Duck Kim, Ko, & Sagas, 2011; Perić et al., 2017), which can be considered applicable both in the context of the work and assessment of the quality of dance club services.

Diskusija

Identifikacija postojanja međusobne interakcije između kvaliteta usluge i zadovoljstva korisnika predstavlja vrlo značajan činilac koji može biti od ključne važnosti za modelovanje rada i upravljačkih aktivnosti plesnog kluba. Zbog toga i predstavlja veoma osjetljivo menadžmentsko pitanje koje je, u prvom redu, uslovljeno nivoom individualne percepcije korisnika, kao i specifičnim doživljajem kvaliteta kroz pozitivan ili negativan osjećaj nakon korištenja usluge (Evans & Lindsey, 2010). Pojedini sportski klubovi primjenjuju različite koncepte upravljanja kvalitetom i primjenjuju različite modele za mjerenje kvaliteta usluga (Packiathan & Kyungro, 2000; Kelley & Turley, 2001; Tsitskari, Tsiotras & Tsiotras, 2006; Lee, Duck Kim, Ko, & Sagas, 2011; Perić i sar., 2017), što se može smatrati aplikativnim i u kontekstu rada i procjene kvaliteta usluga plesnih klubova.

Almost no dance club in Bosnia and Herzegovina has so far defined its strategic management orientation towards the application of quality management, which includes activities to measure the quality of services. This significantly reduces opportunities to improve management efficiency, internal organization and market competitiveness. This issue is particularly pronounced when it comes to the representation of the identification of the satisfaction of immediate users. The importance of quality management is indicated by the experience of applying customer satisfaction measurement in some sports and sports-recreational organizations (Currie & Ipson, 2002; Jae Ko & Pastore, 2004; Carr & De Michele, 2010). Especially interesting are the recent experiences of non-profit sports clubs in the field of martial arts (Dačić, 2014; Nešić, Dačić & Srdić, 2014; Perić et al., 2017), which can be a good "guide line" for dance clubs in Republika Srpska.

In previous research conducted in some sports and recreational clubs, the elements of quality assessment were mainly related to material conditions (size of the building, architectural and construction quality, space and exercise equipment, location accessibility, etc.). Much less research attention was paid to the quality of the content (type and scope of activities, technology of professional work, educational concept, educational component, etc.).

Positive experiences from karate were used in constructing the instrument used in this study. The instrument (survey type and scalar orientation) was dominated by indicator representation, both tangible and intangible aspects of quality. Although it was expected that the factor analysis would single out these two components of quality, the analyzes showed that the quality of the dance club's work is much better treated as a unique space. By establishing a one-factor structure, maximum parsimony was achieved and the validity of the SQDC questionnaire was confirmed, which is a good recommendation for its application in the immediate practice of dance clubs. The good metrics of this instrument were contributed by the high internal agreement of the selected items, which shows that it can be used as an independent scale for assessing the quality of sports services in dance clubs.

The numerical nature of the data also contributes to the practical applicability of the instrument. Respondents evaluate certain aspects of quality with scalar values from 1 to 5, which enables the calculation of descriptive statistical parameters, as well as the application of most comparative procedures from the space of parametric statistics. Using this possibility, this study compared the average quality scores

Gotovo ni jedan plesni klub u Bosni i Hercegovini do sada još uvijek nije definisao svoju stratešku upravljačku orijentaciju ka primjeni menadžmenta kvaliteta, što podrazumijeva i aktivnosti mjerenja kvaliteta usluga. Na taj način se znatno smanjuju mogućnosti za poboljšanje efikasnosti upravljanja, unutrašnje organizacije i tržišne konkurentnosti. Ovo pitanje posebno dolazi do izražaja kada je riječ o zastupljenosti identifikacije zadovoljstva neposrednih korisnika. Na značaj menadžmenta kvaliteta ukazuju iskustva primjene mjerenja zadovoljstva korisnika u nekim sportskim i sportsko-rekreativnim organizacijama (Currie & Ipson, 2002; Jae Ko & Pastore, 2004; Carr & De Michele, 2010). Posebno su interesantna novija iskustva neprofitnih sportskih klubova iz prostora borilačkih sportova (Dačić, 2014; Nešić, Dačić & Srdić, 2014; Perić i sar., 2017), a koja mogu biti dobra „linija vodilja" i za plesne klubove u Republici Srpskoj.

U dosadašnjim istraživanjima koja su sprovođena u pojedinim sportsko-rekreativnim klubovima uglavnom su se elementi procjene kvaliteta odnosili na materijalne uslove (veličina objekta, arhitektonsko-građevinski kvalitet, prostor i sprave za vežbanje, lokacijska dostupnost i sl.). Mnogo manje istraživačke pažnje bilo je posvećeno kvalitetu sadržaja (vrsta i obim aktivnosti, tehnologija stručnog rada, edukativni koncept, vaspitna komponenta, itd.).

Prilikom konstruisanja instrumenta primijenjenog u ovoj studiji bila su korištena pozitivna iskustva iz karate sporta. U instrumentu (anketnog tipa i skalarne orijentacije) dominirala je indikatorska zastupljenost, kako materijalnih, tako i nematerijalnih aspekata kvaliteta. Mada se očekivalo da se faktorskom analizom izdvoje ove dvije komponente kvaliteta, analize su pokazale da je kvalitet rada plesnog kluba znatno bolje tretirati kao kao jedinstven prostor. Uspostavljanjem jednofaktorske strukture dostignuta je maksimalna parsimonija i potvrđena validnost upitnika SQDC, što predstavlja dobru preporuku za njegovu primjenu u neposrednoj praksi plesnih klubova. Dobroj metrici ovog instrumenta doprinijela je visoka unutrašnja saglasnost odabranih ajtema što pokazuje da se on može koristiti kao samostalna skala za procjenu kvaliteta sportskih usluga u plesnim klubovima.

Praktičnoj primjenljivosti instrumenta doprinosi i numerička priroda podataka. Ispitanici pojedine aspekte kvaliteta ocjenjuju skalarnim vrijednostima od 1 do 5 što omogućava izračunavanje deskriptivnih statističkih parametara, kao i primjenu većine komparativnih procedura iz prostora parametrijske statistike. Koristeći se tom mogućnošću, u ovom istraživanju su upoređivane prosječne ocjene kvaliteta dobijene u različitim subuzorcima (ispi-

obtained in different subsamples (subjects with different length of dance experience). This detail is of particular importance in measuring the quality of sports services because the perception of individual quality elements depends on the characteristics of different user groups. For this study, it was important to determine whether members of the dance club, with different experience of practicing sports dance, but also direct users of dance club services, have the same (or different) experience of certain aspects of quality.

The hierarchical structure of the extracted factor shows that in the process of assessing the quality of services in a dance club, users perceive the overall experience of the consumed service most intensively. Although all quality factors are valued by positive experience, the most dominant influence in the factor is reflected in: positive experience of the club's program content (especially educational and development programs), quality of information availability to service users, quality of professional work (program realization), etc. The results collected by surveying users showed that the selected club provides sports, dance and recreational services of high quality. These data are important for the management of the club as they indicate the activities that need additional attention, in order to permanently improve the quality of the dance club. By evaluating individual quality elements, service users send clear information to management about where the reserves are for improving work.

Therefore, it can be considered that the services of a dance club should be accessible to the widest layers of interested citizens, given that they meet different needs and have different effects on potential users (Nešić, 2008). Therefore, it can be considered that they should also be characterized by a determinant - "at hand" to any interested individual (Nešić, Dačić & Srdić, 2014). Of course, it is difficult to comprehensively identify and classify all types of services that a dance club can provide to its users. One of the important reasons lies in the fact that day by day new user requirements appear, as well as new models of sports and sports-recreational content in general, including in the field of sports dance. However, the current practice of sports management has shown that most service activities can be classified into four basic categories (Nešić, 2013), which can certainly be applied in relation to dance: 1) services in the user's place of residence, 2) services outside the place of residence users, 3) current and new services, and 4) other (accompanying) services related to sports dance.

Conclusion

The conducted research, which took the form of a transversal empirical study, identified the expediency of

tanici sa različitom dužinom plesačkog staža). Ovaj detalj je od posebnog značaja u mjerenju kvaliteta sportskih usluga zato što percepcija pojedinih elemenata kvaliteta zavisi od osobina različitih grupa korisnika. Za ovu studiju je, tako, bilo važno da se utvrdi da li članovi plesnog kluba, sa različitim stažom upražnjavanja sportskog plesa, ali i direktni korisnici usluga plesnog kluba, imaju isti (ili različit) doživljaj pojedinih aspekata kvaliteta.

Hijerarhijska struktura ekstrahovanog faktora pokazuje da u procesu procjene kvaliteta usluga u plesnim klubu korisnici najintenzivnije percepiraju ukupni doživljaj konzumirane usluge. Mada sve činioce kvaliteta vrednuju pozitivnim iskustvom, najdominantiji uticaj u faktoru se ogleda u: pozitivnom doživljaju programskih sadržaja kluba (posebno edukativne i razvojne programe), kvalitet dostupnosti informacija korisnicima usluga, kvalitet stručnog rada (realizacija programa), itd. Rezultati prikupljeni anketiranjem korisnika pokazali su da izabrani klub pruža sportsko-plesne i rekreativne usluge visokog kvaliteta. Ovi podaci su značajni za menadžment kluba obzirom da ukazuju aktivnosti kojima je potrebno posvetiti dodatne pažnje, kako bi se permanentno unaprijeđivao kvalitet rada plesnog kluba. Vrednovanjem pojedinih elemenata kvaliteta, korisnici usluga šalju jasne informacije menadžmentu o tome gdje su rezerve za unapređenje rada.

Dakle, može se smatrati da usluge plesnog kluba treba da odlikuje dostupnost najširim slojevima zainteresovanih građana, obzirom da zadovoljavaju različite potrebe i imaju različito dejstvo na potencijalne korisnike (Nešić, 2008). Zbog toga se može smatrati da i njih treba da karakteriše odrednica – „na dohvat ruke" svakom zainteresovanom pojedincu (Nešić, Dačić & Srdić, 2014). Naravno da je teško izvršiti sveobuhvatnu identifikaciju i klasifikaciju svih vrsta usluga koje jedan plesni klub može da pruži svojim korisnicima. Jedan od bitnih razloga leži i u činjenici da se iz dana u dan pojavljuju novi zahtjevi korisnika, kao i novi modeli sportskih i sportsko-rekreativnih sadržaja uopšte, pa tako i u oblasti sportskog plesa. Međutim, dosadašnja praksa sportskog menadžmenta je pokazala da se najveći broj uslužnih aktivnosti može svrstati u četiri osnove kategorije (Nešić, 2013), što može svakako biti aplikativno i u odnosu na ples: 1) usluge u mjestu stanovanja korisnika, 2) usluge van mjesta stanovanja korisnika, 3) aktuelne i nove usluge, i 4) ostale (prateće) usluge vezane za sportski ples.

Zaključak

Provedeno istraživanje, koje je imalo formu transverzalne empirijske studije, identifikovalo je svrsishod-

applying a questionnaire / scale intended and suitable for user assessment of the quality of services in a dance club. The applied questionnaire was a modified and adapted version of the SQKC instrument for assessing the quality of karate club services. One of the reasons for the valorization of this instrument and its application in the dance club can be found in the fact that dance clubs, just like karate organizations, predominantly belong to the non-profit sports organizations, the activity itself has the character of individual sport, age coverage of potential users is very dispersive (they can be practiced by people of all ages), it is receptive to people of both sexes and there is a specific interest of users for them. All this, as well as the fact that the SQKC questionnaire has very good metric characteristics, is suitable and easy to use for research, and is recommended for verification in other areas of non-profit sports organizations, conditioned the application of the procedure of modification and verification of metric characteristics of the questionnaire quality of dance club services, which in our research was called *Service Quality of a Dance Club* (SQDC).

Through several pilot studies, compared to the original version of the questionnaire, 15 stable items / indicators were defined that give a good metric to such a modified instrument. Using the procedure of checking the internal compliance of the SQDC scale (Scale Reliability Analysis), a high value of the Cronbach's Alpha coefficient was obtained (*Cronbach's Alpha* = .932), and factor analysis based on the analysis of principal components (*Principal Components Analysis*) with the method of oblique rotation (*Direct Oblimin*) its good validity (*KMO* = .904; Sig. = .000). The results of the applied statistical procedures showed a very high level of parsimony, which conditioned the obtaining and acceptance of a one-factor structure. The hierarchical structure has shown that the definition of the general factor of the quality of sports services is most influenced by items related to positive experiences of sports services provided by the dance club (quality of professional work, positive atmosphere, space resources, offered contents, educational programs, etc.). The presence of one (general) factor of service quality enabled the application of a unique scale for assessment, the end result of which is the average value calculated from the assessments by which the respondents evaluated certain aspects of quality. The value of the scalar averages of the evaluation of the quality of services of this dance club was not significantly influenced by the length of training - the period of use of services by users.

The application of the constructed questionnaire is shown on the example of the Dance Club "Gemma" from Banja Luka. Subsequent research is expected to test the

nost primjene jednog upitnika/skale namijenjenog i podesnog za korisničku procjenu kvaliteta usluga u plesnom klubu. Primijenjeni upitnik je bio modifikovana i prilagođena verzija SQKC instrumenta za procjenu kvaliteta usluga karate kluba. Jedan od razloga za valorizaciju baš ovog instrumenta i njegovu primjenu u plesnom klubu može se tražiti činjnici da plesni klubovi, baš kao i karate organizacije, dominantno pripadaju prostoru neprofitnih sportskih organizacija, sama aktivnost ima karakter inidivudalnog sporta, uzrasni obuhvat potencijalnih korisnika je veoma disperzivan (mogu da ih upražnjavaju osobe svih uzrasta), prijemčiv je osobama oba pola i za njih postoji specifično interesovanje korisnika. Sve ovo, kao i činjenica da SQKC upitnik ima veoma dobre metrijske karaktersitike, da je pogodan i lak za istraživačko korištenje, te da je preporučen za provjeru i u drugim oblastima neprofitnih sportskih organizacija, uslovila je primjenu postupka modifikacije i provjere metrijskih karakteristika upitnika namijenjenog korisničkoj procjeni kvaliteta usluga plesnog kluba, koji je u našem istraživanju nazvan ***S**ervice **Q**uality of a **D**ance **C**lub* (SQDC).

Kroz nekoliko probnih istraživanja, u odnosu na originalnu verziju upitnika, definisano je 15 stabilnih ajtema/indikatora koji ovako modifikovanom instrumentu daju dobru metriku. Primjenom postupka provjere unutrašnje saglasnosti SQDC sakle (*Scale Reliability Analysis*) dobijena je visoka vrijednost Kronbahovog alfa koeficijenta (*Cronbach's Alpha* = ,932), a faktorskom analizom zasnovanoj na analizi glavnih komponenti (*Principal Components Analysis*) sa metodom kose rotacije (*Direct Oblimin*) je utvrđena njena dobra validnost (*KMO* = ,904; *Sig.* = ,000). Rezultati primijenjenih statističkih procedura pokazali su veoma visok nivo parsimonije, što je uslovilo dobijanje i prihvatanje jednofaktorske strukture. Hijerarhijska struktura je pokazala da na definisanje generalnog faktora kvaliteta sportskih usluga najveći uticaj imaju ajtemi koji se odnose na pozitivne doživljaje sportskih usluga koje pruža plesni klub (kvalitet stručnog rada, pozitivna atmosfera, prostorni resursi, ponuđeni sadržaji, edukativni programi, itd.). Prisustvo jednog (generalnog) faktora kvaliteta usluga omogućilo je primjenu jedinstvene skale za procjenu čiji krajnji rezultat je prosječna vrijednost izračunata iz ocjena kojima su ispitanici vrednovali pojedine aspekte kvaliteta. Na vrijednost skalarnih proseka ocjena kvaliteta usluga ovog plesnog kluba nije značajnije uticao staž treniranja – period korištenja usluga od strane korisnika.

Primjena konstruisanog upitnika prikazana je na primjeru Plesnog kluba „Gemma" iz Banja Luke. Od narednih istraživanja se očekuje da prikazani upitnik pro-

presented questionnaire at other dance clubs, and starting from the good metric characteristics of the SQDC questionnaire obtained in this study, it is realistic to expect it to prove reliable in other similar sports dance organizations.

vjere i na drugim plesnim klubovima, a polazeći od dobrih metrijskih karakteristika SQDC upitnika dobijenih u ovoj studiji, realno je očekivati da se pokaže pouzdanim i u drugim sličnim organizacijama sportskog plesa.

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We announce that the authors have equally contributed to this paper.

Conflict of interests
There is no conflict of interests among the authors themselves.

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Izjavljujemo da su autori podjednako doprineli radu.

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Analysis of Differences of Running Perfomances of Elite European and Latin American Football Players

Analiza razlika trkačkih performansi vrhunskih evropskih i latinoameričkih nogometaša

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Abstract: *This research is aimed to determine the differences in the racing performances of elite European and Latin American footballers. The research was conducted on a sample of N = 157 top football players, aged 19 to 35, who played all 90 minutes in the first round of the group stage of the competition at the 2018 World Cup. Respondents were classified into two groups, where group I (N = 103) consisted of football teams from Europe, and group II (N = 54), consisted of teams from Latin America. The obtained data showed that 8 out of 13 variables have the characteristic of heterogeneity with a higher value of variance than the arithmetic mean. The results of the T-test showed that only 4 of 13 variables had statistically significant differences. Footballers from European national teams are on average taller than Latin American footballers by just over 3 cm. European footballers had a 4% greater (p> 0.05) total distance traveled, distance in the first and second half of the game than Latin American footballers.*

Keywords: *Football, performance, World Cup.*

Sažetak: *Ovo istraživanje imalo je za cilj da se utvrde razlike u trkačkim performansama vrhunskih evropskih i latinoameričkih nogometaša. Istraživanje je sprovedeno na uzorku od N=157 vrhunskih nogometaša, uzrasta 19 do 35 godina koji su odigrali svih 90 minuta u I kolu grupne faze takmičenja na Svjetskom nogometnom prvenstvu 2018 godine. Ispitanici su svrstani u dvije grupe, gdje su I grupu (N=103), činile nogometne reprezentacije iz Evrope, a II grupu (N=54), činile su reprezentacije iz Latinske Amerike. Dobijeni podaci nam pokazuju da 8 od ukupno 13 varijabli ima karakteristiku heterogenosti sa većom vrijednošću varijance od aritimetičke sredine. Rezultati T-testa su pokazali da je samo kod 4 od 13 varijabli došlo do statistički značajnih razlika. Nogometaši iz europskih reprezentacija u prosjeku su viši od latinoameričkih nogometaša za nešto više od 3 cm. Evropski nogometaši su imali 4 % veću (p>0,05) ukupnu pređenu udaljenost u prvom i drugom poluvremenu od latinoameričkih nogometaša.*

Ključne riječi: *Nogomet, performanse, Svjetsko prvenstvo.*

Introduction

Football is one of the most complex sports in which achieving good results depends on multiple, interrelated factors (Stølen T., Chamari K., Castagna C., Wisløff U., 2005; Bangsbo, 2008). Top players progress over the years in the amount and intensity of movement, which requires experts to determine what characterizes footballers who play at a high level (Čolakhodžić et al., 2017). Considering the total number of players in the match, as well as the dimensions of the field, it is not surprising that the activities of individual players without the ball account for an average of over 95% of the effective time in the game. Although a large number of different activities are included in the total physical work per-

Uvod

Nogomet predstavlja jedan od najsloženijih sportova u kojem postizanje dobrih rezultata ovisi o višestruko, međusobno povezanim faktorima (Stølen T., Chamari K., Castagna C., Wisløff U., 2005; Bangsbo, 2008). Vrhunski igrači godinama napreduju u količini i intenzitetu pokreta, što zahtijeva od stručnjaka da utvrde šta karakterizira nogometaše koji igraju na visokom nivou (Čolakhodžić i sar., 2017). Uzevši u obzir ukupan broj igrača na utakmici, kao i dimenzije terena, ne iznenađuje činjenica da na aktivnosti pojedinih igrača bez lopte otpada u prosjeku preko 95% efektivnog vremena u igri. Iako se u ukupan obavljeni fizički rad nogometaša ubraja

formed by football players, most of this work falls on walking and running at different paces and different directions (Moher et al., 2003; Krusturp et al., 2005). When it comes to world football styles the fact is that there are big differences around the world. The styles are usually in line with the characteristics of the players, and over the years several styles have been defined. Of importance for this work are the Latin and Central American-style on the one hand and the European style of football on the other. The Latin style of the game is very recognizable, primarily due to its oriental characteristics. It should also be noted that in this style, attacks are performed with a lot of individual activities, with a lot of dribbling and nice moves. As for the characteristics that the players have, first of all, it should be emphasized: that they control the ball extremely well, that they are great dribblers and that they are capable of performing creative actions. European football styles include: British, Northern, Continental and Italian style. The British style is characterized by a game with a smaller number of touches of the ball, passes are performed directly, very often through the opponent's defense. The players are well physically prepared, very fast with and without the ball and are phenomenally technically and tactically trained. Northern style is characterized by direct attacks, very often ending successfully. Individual players have very specific tasks in the game, which rarely or almost never improvise their activities. As for the characteristics that players possess, first of all it should be emphasized: that they are extremely aggressive, fast, as well as that they are good in the organization of the game. The continental style of play is characterized by a mixture of Latin and northern style of play, and exudes a great deal of creativity and coordination. The players are very good in the "dog" game and the collective game is very pronounced. The Italian style is the only one that represents the area of one country, and it is adorned with the caution of players who join the attack and is focused on defensive activities. The players are extremely tactically educated, very skilled and careful. Dujmović, (2000) states that many studies show that out of 90 minutes of a professional football match, the effective playing time is between 60 and 65 minutes. The other 25-30 minutes go to breaks. From the effective time of the game, only 2-3 minutes go to activities with the ball of each individual player. The rest of the time the player performs activities without the ball. Based on the above, the aim of this paper is to determine the differences between footballers coming from Europe and Latin America in the physical performance of players when the team is not in possession of the ball. This research aimed to determine the differences in the racing performance of the top footballers of the European and South American national teams at the 2018 World Cup.

veliki broj različitih aktivnosti, najveći dio tog rada otpada na hodanja i trčanja različitim tempom i različitim smjerovima (Moher i sar., 2003; Krusturp i sar., 2005). Kada su u pitanju svjetski nogometni stilovi činjenica je da postoje velike razlike širom svijeta. Stilovi su obično u skladu sa karakteristikama igrača, a tokom godina izdefinisalo se nekoliko stilova. Od važnosti za ovaj rad su latinski i centralnoamerički-stil sa jedne strane i evropski stil nogometa sa druge strane. Latinski stil igre je veoma prepoznatljiv, prije svega zbog svojih orijentalnih karakteristika. Također bi trebalo navesti da se kod ovoga stila napadi izvode sa mnogo individualnih aktivnosti, sa dosta driblinga i lijepih poteza. Što se tiče karakteristika koje posjeduju igrači, prije svega bi trebalo naglasiti: da izuzetno dobro kontrolišu loptu, da su sjajni dribleri i da su sposobni da izvode kreativne akcije. U evropske nogometne stilove spadaju: britanski, svjeverni, kontinentalni i italijanski stil. Britanski stil karakteriše igra sa manjim brojem dodira lopte, pasovi se izvode direktno, vrlo često preko protivničke odbrane. Igrači su dobro fizički pripremljeni, veoma brzi sa loptom i bez nje i da su fenomenalno tehnički i taktički obučeni. Sjeverni stil se karakteriše direktnim napadima, veoma često završavaju uspješno. Pojedinačni igrači imaju veoma specifične zadatke u igri, koji rijetko ili skoro nikako ne improvizuju svoje aktivnosti. Što se tiče karakteristika koje posjeduju igrači, prije svega bi trebalo naglasiti: da su izuzetno agresivni, brzi, kao i da su dobri u organizaciji igre. Kontinentalni stil igre karakteriše mješavina latinskog i sjevernog stila igre, a odiše velikom dozom kreativnosti i koordinacije. Igrači su veoma dobri u „pas" igri i veoma je izražena kolektivna igra. Italijanski stil je jedini koji predstavlja oblast jedne zemlje, a krase ga opreznost igrača koji se priključuju napadu i usmjeren je na odbranbene aktvnosti. Igrači su izuzetno taktički obrazovani, veoma vješti i oprezni. Dujmović, (2000) navodi kako mnoga istraživanja pokazuju da od 90 minuta utakmice profesionalnog nogometa efektivno vrijeme igre iznosi između 60 i 65 minuta. Ostalih 25-30 minuta odlazi na prekide. Od efektivnog vremena igre samo 2-3 minute odlaze na aktivnosti s loptom svakog pojedinog igrača. Ostatak vremena igrač izvodi aktivnosti bez lopte. Na osnovu prethodno navedenog, cilj ovog rada jeste da se utvrde razlike nogometaša koji dolaze iz Evrope i Latinske Amerike u fizičkim preformansama igrača kada ekipa nije u posjedu lopte. Ovo istraživanje je imalo za cilj da se utvrde razlike u trkačkim performansama vrhunskih nogometaša evropskih i južnoameričkih reprezentacija na Svjetskom nogometnom prvenstvu 2018 godine.

Methods of work

Sample of respondents

The research was conducted on a sample of N = 157 top football players, aged 19 to 35, who played all 90 minutes in the first round of the group stage of the competition at the 2018 World Cup. Respondents were classified into two groups, where the first group (N = 103) consisted of football teams from Europe, with an average age of 28.3 ± 3.7 years and an average height of 183.9 ± 6.2 cm. The representative selections that make up the first group are: Belgium, Denmark, England, Iceland, Germany, Poland, Portugal, Russia, Serbia, France, Croatia, Switzerland, Sweden and Spain, and the second group (N = 54) consisted of representative selections from Latin American mean age 28.8 ± 3.7 years and mean height 180.2 ± 5.7 cm. The national teams that make up the second group are: Costa Rica, Mexico, Panama, Argentina, Brazil, Colombia, Peru and Uruguay. Goalkeepers were not taken into the final analysis due to the specificity of their position in the team.

Variable sample

The data were taken from the official website of the World Football Association (www.fifa.com), which presents all the parameters of the team's success, as well as data on the situational efficiency of football players. The basic variables used in the paper are: AGE - age (years), AVIS - body height (cm), SEPRD - distance traveled (m), SEPRDPP- distance traveled in the first half (m), SEPRDDP - length traveled distance in the first half (m), SEPRDPL - length of distance covered in possession of the ball (m), SEPRDBPL - length of distance traveled without possession of the ball (m), SEBRSP - number of sprints (No), SEBRSPPP - number of sprints in the first half (No) , SEBRSPDP - number of sprints in the second half (No), SEBRSP- number of sprints (No), SEMAXBPP - maximum speed in the first half (km / h), SEMAXBDP - maximum speed in the second half (km / h), SEMAXB - maximum achieved speed (km / h),

Methods of data processing

The data were entered into the software package for social sciences (Statistical Package for Social Sciences - SPSS, Version 26.0) in which statistical data processing was performed. Central and dispersion parameters were calculated for all variables, all with the aim of ascertaining the basic indicators of the distribution of the normality of the results. In order to examine the differences between

Metode rada

Uzorak ispitanika

Istraživanje je sprovedeno na uzorku od N= 157 vrhunskih nogometaša, uzrasta 19 do 35 godina koji su odigrali svih 90 minuta u prvom kolu grupne faze takmičenja na Svjetskom nogometnom prvenstvu 2018 godine. Ispitanici su svrstani u dvije grupe, gdje su prvu grupu (N=103), činile nogometne reprezentacije iz Evrope, prosječne starosti 28,3 ± 3,7 godina i prosječne visine 183,9 ± 6,2 cm. Reprezentativne selekcije koje čine prvu grupu su: Belgija, Danska, Engleska, Island, Njemačka, Poljska, Portugal, Rusija, Srbija, Francuska, Hrvatska, Švicarska, Švedska i Španija, a drugu grupu (N=54), **činile su reprezentativne selekcije iz Latinske Amerike** prosječne starosti 28,8 ± 3,7 godina i prosječne visine 180,2 ± 5,7 cm. Reprezentativne selekcije koje čine drugu grupu su: Kostarika, Meksiko, Panama, Argentina, Brazil, Kolumbija, Peru i Urugvaj. Golmani nisu uzeti u konačnu analizu zbog specifičnosti pozicije koju imaju u timu.

Uzorak varijabli

Podaci su preuzeti sa oficijalne stranice Svjetske nogometne asocijacije (www.fifa.com) na kojoj su predstavljeni svi parametri uspješnosti ekipe, kao i podaci o situacionoj efikasnosti nogometaša. Osnovne varijable koje su korištene u radu su: AGE – starosna dob (godine), AVIS – tjelesna visina (cm), SEPRD – dužina pređene distance (m), SEPRDPP- dužina pređene distance u prvom poluvremenu (m), SEPRDDP - dužina pređene distance u drugom poluvremenu (m), SEPRDPL – dužina pređene distance u posjedu lopte (m), SEPRDBPL – dužina pređene distance bez posjeda lopte (m), SEBRSP – broj sprinteva (No), SEBRSPPP – broj srinteva u prvom poluvremenu (No), SEBRSPDP – broj srinteva u drugom poluvremenu (No), SEBRSP- broj sprinteva (No), SEMAXBPP – maksimalna ostvarena brzina u prvom poluvremenu (km/h), SEMAXBDP – maksimalna ostvarena brzina u drugom poluvremenu (km/h), SEMAXB – maksimalna ostvarena brzina (km/h).

Metode obrade podataka

Podaci su uneseni u softverski programski paket za društvene nauke (Statistical Package for Social Sciences − SPSS, Version 26.0) u kojem je izvršena statistička obrada podataka. Za sve varijable su izračunati centralni i disperzioni parametri, a sve sa ciljem konstatiranja osnovnih pokazatelja distribucije normaliteta rezultata. Kako bi se ispitale razlike između dva nezavisna uzorka

two independent samples of footballers coming from Europe and footballers belonging to national teams from Latin America, a T - test for independent samples was used.

Results and discussion

By looking at Table 1, which shows the descriptive parameters of European and Latin American footballers, we can see that all variables have a normal distribution of results. The values of skewnes and kurtosis belong to reference values that are lower than skew ± 1.96 and kur. ± 2.05. If we compare the column of variance with the arithmetic mean, in order to conclude whether these are homogeneous or heterogeneous results, we can conclude that 8 out of 13 variables have the characteristic of heterogeneity with a higher value of variance than the arithmetic mean. The variables that belong to the homogeneous results are: age, height of the subjects, maximum speed achieved, maximum speed in the first half and maximum speed achieved in the second half.

Table 2 talks about the differences in arithmetic means between European and Latin American footballers at the last 2018 World Cup. From the table we can conclude that only four of the thirteen variables had a statistically significant difference. The mentioned difference was observed in the following variables: height of the examinees, distance traveled, distance traveled in the first half, distance traveled in the second half. In all four mentioned variables, a statistically significant difference occurred in favor of footballers from Europe. Footballers from European national teams are on average a little more than 3 cm taller than Latin American footballers. Also, European footballers covered an average of 4% more ($p > 0.05$) distance in the first half (European footballers 5058.1 ± 492.9 m; Latin American footballers 4869.1 ± 435.7 m) and the second half 4994.0 ± 552.8 m, Latin American footballers 4806.8 ± 472.6 m). The total average distance covered is 4% higher for footballers coming from Europe than footballers from Latin America (10056.7 ± 1004.6 m vs 9661.5 ± 843.0 m). These results show us that the European national teams, and the team itself and the players in their style/way of playing pay more attention to the amount of movement and coverage of the field in all lines of the team. We can certainly look for the reason for that in the training technology and development of young players, which is represented in the leading European nations. The variables that achieved the least differences, ie that are largely similar in the examined subsamples, are: maximum sprint speed, distance traveled without possession of the ball and number of sprints. Also with these variables, the existing difference that is not statistically

nogometaša koji dolaze iz Evrope i nogometaša koji pripadaju reprezentacijama iz Latinske Amerike, korišten je T – test za nezavisne uzorke.

Rezultati i diskusija

Uvidom u tabelu 1. koja prikazuje deskriptivne parametre europskih i latinoameričkih nogometaša možemo vidjeti da sve varijable imaju normalnu distribuciju rezultata. Vrijednosti skewnesa i kurtosisa pripadaju referentnim vrijednostima koje su niže od skew ±1,96 i kur. ± 2,05. Ukoliko napravimo poređenje kolone varijanse sa aritimetičkom sredinom, kako bi došli do zaključka da li se radi o homogenim ili heterogenim rezultatima, možemo zaključiti da 8 od ukupno 13 varijabli ima karakteristiku heterogenosti sa većom vrijednošću varijance od aritimetičke sredine. Varijable koje pripadaju homogenim rezultatima su: godine starosti, visina ispitanika, maksimalna ostvarena brzina, maksimalna brzina u prvom poluvremenu i maksimalna ostvarena brzina u drugom poluvremenu.

Iz tabele 2. koja govori o razlikama aritimetičkih sredina između nogometaša Europe i Latinske Amerike na posljednjem Svjetskom prvenstvu 2018. godine, može se zaključiti da je samo kod četiri od trinaest varijabli došlo do statistički značajne razlike. Spomenuta razlika uočena je kod sljedećih varijabli: visina ispitanika, pređena udaljenost, pređena udaljenost u prvom poluvremenu, pređena udaljenost u drugom poluvremenu. Kod sve četiri spomenute varijable statistički značajna razlika se desila u korist nogometaša iz Europe. Nogometaši iz europskih reprezentacija u prosjeku su viši od latinoameričkih nogometaša za nešto više od 3 cm. Također europski nogometaši su u prosjeku prešli 4 % veću ($p>0,05$) udaljenost u prvom poluvremenu (evropski nogometaši 5058,1 ± 492,9 m; latinoamerički nogometaši 4869,1 ± 435,7 m) i drugom poluvremenu (evropski nogometaši 4994,0 ± 552,8 m) latinoamerički nogometaši 4806,8 ± 472,6 m). Ukupna prosječna pređena udaljenost je 4% veća kod nogometaša koji dolaze iz Evrope od nogometaša iz Latinske Amerike (10056,7 ± 1004,6 m vs 9661,5 ± *843,0 m*). Ovakvi rezultati nam pokazuju da evropske reprezentacije, a sami tim i igrači u svom stilu/ načinu igre veću pažnju pridaju količini kretanja i pokrivanja terena u svim linijama ekipe. Uzrok tome sigurno možemo tražiti u trenažnoj tehnologiji i razvoju mladih igrača koja je zastupljena u vodećim evropskim nacijama. Varijable koje su ostvarile najmanje razlike, odnosno koje su u velikome slične kod ispitivanih subuzoraka su: maksimalna brzina sprinta, pređena udaljenost bez posjeda lopte i broj sprinteva. Također kod ovih varijabli postojeća razlika koja

significant was realized in favor of European footballers. Such results tell us that there is no statistically significant difference in the intensity of performance and the number of performances of explosive football activities between European and Latin American national teams. If we compare the results of this study with previous research, we can see that top footballers on average cover a total distance of 9 - 12 km during the game, in the first half the distance was greater (P> 0.05) than in the second half for top class players + 0.10 vs 5.35 + 0.09 km), (Mohra et al. 2003). Hennig and Briehle (2000) in their research state that footballers have covered an average distance of 10600 m, this distance is 4% higher in the first half, compared to the second half. South American players averaged significantly less distance (p <0.05) than Premier League players (South American footballers, 8638 ± 1031 m; English Premier League 10104m), (Rienzi et al. 2000). The average distance covered in competitive competitions was 10.80 km, in the first half (5.52 km), and in the second half (5,250 km) (Bangsbo, 1991). In a study by Di Salvo et al. (2006), footballers covered an average distance of 11393 m, 5709 m in the first half and 5684 m in the second half. Barros et al. (2007) state in their research that the average mean distance was 10,012 m, the mean distance in the first half was 5,173 m, highly significantly higher (p> 0.001) than the mean value of 4,808 m, in the second half. Jozak et al. (2011) by comparing individual types of players found that the most run by defensive midfielders (10.50 km) and offensive midfielders (10.39 km), defensive midfielders (4.2 km) and attackers (4.0 km) have the highest average values of distance run when the team is in possession of the ball, and defensive midfielders (4.45 km) when the team is not in possession of the ball, while during the time the ball is out of play there is no statistically significant difference in the distance run between individual types of players. Ademović et al. (2012) researching the model of a top footballer found that midfielders (10952m), defensive players (10273m) and attackers (9093m) pass the most, midfielders and players have the greatest distance traveled when the team has possession of the ball, and when the team is not in possession of the ball. Čolakhodžić et al. (2017). found that there was no statistically significant difference between the 2010 and 2014 World Cups in relation to the amount of distance traveled, while there was a difference in the amount of distance traveled. The difference in the amount of distance covered when the team does not own the ball and when the team is in possession of the ball was in favor of the 2010 World Cup, while the maximum speed was in favor of the 2014 World Cup.

nije statistički značajna je ostvarena u korist nogometaša Europe. Takvi rezultati nam govore da nema statistički značajne razlike u intenzitetu izvođenja i broju izvođenja eksplozivnih nogometnih radnji između evropskih i latinoameričkih reprezentacija. Ako usporedimo rezultate ove studije sa dosadašnjim istraživanjima možemo vidjeti da vrhunski nogometaši u prosjeku pokrivaju ukupnu udaljenost od 9 – 12 km tokom igre, u prvom poluvremenu udaljenost je bila veća (P>0.05) nego u drugom poluvremenu za igrače vrhunske klase (5,51 + 0,10 vs 5,35 + 0,09 km), (Mohra i sar. 2003). Hennig and Briehle (2000) u svom istraživanju navode da su nogometaši prosječno prešli udaljenost od 10600 m, ova udaljenost je 4% veća u prvog poluvremena, u odnosu na drugo poluvrijeme. Južnoamerički igrači su tokom igranja utakmica prosječno prešli značajno manje udaljenosti (p<0,05) od igrača Premijer lige (južnoamerički nogometaši, 8638 ± *1031 m; engleska Premijer liga* 10104m), (Rienzi i sar. 2000[1]). Srednja udaljenost pređenih takmičarskih utakmica bila je 10,80 km, u prvom poluvremenu (5,52 km), a u drugom poluvremenu (5,250 km) (Bangsbo, 1991). U studiji Di Salvo i sar. (2006), nogometaši su prosječno prešli udaljenost 11393 m, u prvom poluvremenu 5709 m, a u drugom poluvremenu 5684 m. Barros i sar. (2007) navode u svom istraživanju da je prosječna srednja udaljenost iznosila 10.012 m, srednja udaljenost u prvom poluvremenu bila je 5.173 m, visoko značajna veća (p>0,001) od srednje vrijednosti 4.808 m, u drugom poluvremenu. Jozak i sar. (2011) su usporedbom pojedinih tipova igrača utvrdili da najviše pretrče defanzivni vezni igrači (10.50 km) i ofanzivni vezni igrači (10.39 km), defanzivni vezni igrači (4.2 km) i napadači (4.0 km) imaju najviše prosječne vrijednosti pretrčane udaljnosti kad je ekipa u posjedu lopte, a defanzivni vezni igrači (4.45 km) kad ekipa nije u posjedu lopte, dok za vrijeme kada je lopta izvan igre nema statistički značajne razlike u pretrčanoj udaljenosti između pojedinih tipova igrača. Ademović i sar. (2012) istražujući model vrhunskog nogometaša utvrdili su da najviše pređu vezni igrači (10952m), defanzivni igrači (10273m) i najmanje napadači (9093m), vezni defanzivni i igrači imaju najveće vrijednosti pređene distance kada ekipa ima posjed lopte, i kada ekipa nije u posjedu lopte. Čolakhodžića i sar. (2017). su utvrdili da nema statistički značajne razlike između Svjetskog nogometnog prvenstva 2010 i 2014. godine u odnosu na količinu prijeđene udaljenosti, dok je razlike bilo u količini pređene distance. Razlika u količini pređene distance kada je ekipa nema posjed lopte i kada je ekipa u posjedu lopte bio je u korist SP 2010 godine, dok je maksimalna ostvarena brzina bila u korist SP 2014 godine. Utvr-

Determining the structure of football through indicators of situational efficiency at the 2014 World Cup in Brazil, it was found that footballers run an average of 9396m, 4746m in the first half, and 4505m in the second half (Čolakhodžić, 2019). Running at maximum speed (sprint) occurs on average every 90 seconds of a match (Reilly and Thomas, 1976) and does not last longer than 2–4 s (Reilly and Thomas, 1976[2]; Bangsbo, 1991; O 'Donoghue, 2001). Valquer et al. (1998) prove that 96% of all sprints are shorter than 30 m, and 49% of them are shorter than 10 m. The sprint represents only 1–11% of the total distance covered during the match (Bangsbo, 1991; Reilly and Thomas, 1976) which accounts for 0.5–3% of the total duration of the match (Bangsbo, 1991; Reilly and Thomas, 1976). The attackers had the highest maximum speed at the 2010 World Cup, and the players from the midfield, Ademović et al., Had the highest number of sprints. (2012). Distances sprinted depend on the player's positon in the team, and most sprints are made up of attackers (Rienzi, 2000). During one match, each player sprints an average of 6–12 times (Helgerud et al., 2001).

đivanje strukture nogometa kroz pokazatelje situacione efiksanosti na Svjetskom nogometnom prvenstvu 2014. u Brazilu , utvrđeno je da nogometaši u prosjeku pretrče 9396m, u prvom poluvremenu 4746m, a u drugom poluvremenu 4505m (Čolakhodžić, 2019). Trčanje maksimalnom brzinom (sprint) u prosjeku se pojavljuje svakih 90 sekundi utakmice (Reilly i Thomas, 1976) i ne traje duže od 2–4 s (Reilly i Thomas, 1976; Bangsbo, 1991; O' Donoghue, 2001). Valquer i sar. (1998) dokazuju da je 96% svih sprintova kraće od 30 m, a 49% ih je kraće od 10 m. Sprint predstavlja samo 1–11% ukupno pretrčane udaljenosti za vrijeme utakmice (Bangsbo, 1991.; Reilly i Thomas, 1976) što čini 0.5–3% ukupnog trajanja utakmice (Bangsbo, 1991[4].; Reilly i Thomas, 1976). Najveću maksimalnu ostavrenu brzinu na SP 2010 godine imali su napadači, a najveći broj ostvarenih sprinteva igrači vezne linije Ademović i sar. (2012). Udaljenosti pretrčane sprintom ovise o igračevom mjestu u ekipi, a najviše sprintova čine napadači (Rienzi, 2000). Za vrijeme trajanja jedne utakmice svaki igrač sprintom trči prosječno 6–12 puta (Helgerud i sur., 2001).

Table 1. *Descriptive indicators of variables for European and Latin American football players*

Tabela 1. *Deskriptivni pokazatelji varijabli za evropske i latinoameričke nogometaše*

	***European football players* / Evropski nogometaši**			***Latino America football player* / Latinoamerički nogometaši**		
***Variables* / Varijable**	***N***	***M*/ AS**	***SD***	***N***	***M*/ AS**	***SD***
Age (years) / Godine	103	28.3	3.7	54	28.8	3.7
Body height (cm) / Visina (cm)	103	183.9	6.2	54	180.2	5.7
Distance covered (m) / Dužina pređene distance (m)	103	10056.7	1004.6	54	9661.5	843.0
Distance covered in the first half (m) / Dužina pređene distance u prvom poluvremenu (m)	103	5058.1	492.9	54	4869.1	435.7
Distance covered in the second half (m) / Dužina pređene distance u drugom poluvremenu (m)	103	4994.0	552.8	54	4806.8	472.6
Distance covered in possession of the ball (m) / Dužina pređene distance u posjedu lopte (m)	103	3845.9	885.3	54	3694.4	800.2
Distance covered without possession of the ball (m) / Dužina pređene distance bez posjeda lopte (m)	103	4093.4	933.3	54	4061.9	872.5
Number of sprints (No) / Broj sprinteva (No)	103	29.6	11.4	54	29.1	9.0
Number of sprints in the first half (No) / Broj sprinteva u prvom poluvremenu (No)	103	15.0	6.5	54	15.5	5.4
Number of sprints in the second half (No) / Broj sprinteva u drugom poluvremenu (No)	103	14.5	6.0	54	13.8	5.1
Maximum speed in the first half (km/h) / Maksimalna ostvarena brzina u drugom poluvremenu (km/h)	103	27.42	2.7	54	27.1	2.4
Maximum speed in the second half (km/h) / Maksimalna ostvarena brzina u prvom poluvremenu (km/h)	103	27.1	2.7	54	27.4	2.5
Maximum speed (km/h) / Maksimalna ostvarena brzina (km/h)	103	28.5	2.3	54	28.4	2.0

Legend: *N - number of respondents, M - mean, SD - standard deviation*

Legenda: *N – broj ispitanika, AS – aritmetička sredina, SD – standardna devijacija*

Table 2. *Analysis of differences in arithmetic means among European and Latin American football players.*

Tabela 2. *Analiza razlika aritimetičkih sredina kod nogometaša europljana i latinoamerikanaca*

Variables / Varijable	*t*	*df*	*Sig.*	*Mean Dif.*
AGE	-.704	155	.483	-.445
AVIS	3.642	155	.000	3.728
SEPRD	2.469	155	.015	395.145
SEPRDPP	2.372	155	.019	188.987
SEPRDDP	2.115	155	.036	187.168
SEPRDPL	1.052	155	.294	151.544
SEPRDBPL	.205	155	.838	31.485
SEBRSP	.253	155	.800	.455
SEBRSPPP	-.416	155	.678	-.432
SEBRSPDP	.729	155	.467	.702
SEMAXBPP	.589	155	.556	.2611
SEMAXBDP	-.824	155	.411	-.3673
SEMAXB	.091	155	.928	.0342

Legend: *t– value, df – degree of freedom, sig – significance, MD – difference of means*

Legenda: *t-vrijednost T testa, df-stepen slobode, Sig-značajnost, MD-razlika aritmetičkih sredina*

Conclusion

The obtained data show that football players from European national teams are on average slightly more than 3 cm taller than Latin American football players. European footballers had a 4% greater statistically significant difference in total distance traveled, distance in the first half and second half than Latin American footballers. There were no statistically significant differences in the other variables, which shows great similarity in the examined subsamples. These results show us that there are certain differences in the style of play and the way certain football actions are performed between European and Latin American national teams. During the game, and thus in the training technology of the selected younger age categories of the European nation, they pay more attention to the amount of movement and performance of football activities, while the quantity of explosive football activities between European and Latin American national teams is at the same level. Further research in this area should go in the direction of comparing other national teams from other continents in order to get a clearer picture of the differences or similarities of the way of playing, and thus training technologies and selection of individual continental national teams. We can also conclude that the results, for most of the examined

Zaključak

dobijeni podaci pokazuju da nogometaši iz europskih reprezentacija u prosjeku su viši od latinoameričkih nogometaša za nešto više od 3 cm. Evropski nogometaši su imali 4 % veću statistički značajnu razliku u ukupnoj pređenoj udaljenosti, udaljenost u prvom poluvremenu i drugom poluvremenu od latinoameričkih nogometaša. U drugim varijablama nije došlo do statistički značajnih razlik što pokazuje veliku sličnost kod ispitivanih subuzoraka. Ovakvi rezultati nam pokazuju da postoje određene razlike u stilu igre i načinu izvođenja određenih nogometnih radnji između evropskih i latinoameričkih reprezentacija. U toku igre, a samim tim i u trenažnoj tehnologiji selektiranih mlađih uzrasnih kategorija evropske nacije veću pažnju pridaju količini kretanja i izvođenja nogometnih radnji, dok je kvantitet izvođenja eksplozivnih nogometnih radnji između evropskih i latinoameričkih reprezentacija na istom nivou. Dalja istraživanja u ovoj oblasti trebala bi ići u smjeru komparacije ostalih reprezentacija, sa drugih kontinenata da bi se dobila jasnija slika razlika ili sličnosti načina igre, a samim tim i trenažne tehnologije i selekcije pojedinih kontinetalnih reperezentacija. Također, možemo zaključiti i da rezultati, kod većine ispitivanih

variables, support the fact that the physical requirements of the football game are increasing regardless of the area in which it is played and where the players come from.

varijabli, idu u prilog činjenici da fizički zahtjevi nogometne igre sve veći neovisno na kojem području se igra i odakle igrači dolaze.

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Short notice
Kratko saopštenje

The Changes in the Status of the Foot Arch, Motor Abilities and Morphological Characteristics Under the Influence of Training Processes of Sports School

Promene u statusu svoda stopala, motoričkim sposobnostima i morfološkim karakteristikama pod uticajem trenažnog procesa školice sporta

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Abstract: *The aim of the study was to examine the influence of training processes modeled after the School of Sport of Faculty of Pedagogy, on changes in the status of the foot arch, motor abilities and morphological characteristics of preschool and young school children. The study was of longitudinal character. The experimental training program was conducted from 1st September 2018 till 1st December 2018. The follow-up included 92 subjects in total, divided into two sub-samples: one comprised of experimental group subjects, 45, and the other, control group of 47 subjects. The analysis of the status of the foot arch was performed with a Digital Computer Podoscope. For the assessment of the motor abilities a battery of motor abilities was used, modeled after Bala, Stojanović, Stojanović, (2007). Measurement of morphological characteristics was performed with the application and adherence to the International Biological Program. Using the MANOVA and χ2 test, the results obtained after the final measurement show statistically significant changes in motor abilities, morphological characteristics, and the status of the arch of the foot in children.*

Keywords: *Postural status, motor abilities, morphological characteristics, School of Sport of Faculty of Pedagogy.*

Sažetak: *Cilj istraživanja bio je da ispita uticaj trenažnog procesa po modelu „Školice sporta“ Pedagoškog fakulteta Bijeljina na promene u statusu svoda stopala, motoričkim sposobnostima i morfološkim karakteristikama dece predškolskog i mlađeg školskog uzrasta oba pola. Istraživanje je bilo longitudinalnog karaktera. Trenažni eksperimentalni program je trajao od 1.9.2018. do 1.12.2018.godine. Praćenjem je obuhvaćeno 92 ispitanika, podeljenih u dva subuzorka, jedan koji su činili ispitanici eksperimentalne grupe, njih 45, i drugi koji su činile ispitanici kontrolne grupe, njih 47. Analiza statusa svoda stopala izvršena je digitalnim kompjuterskim podoskopom. Za procenu motoričkih sposobnosti primenjena je baterija motoričkih testova po modelu Bala, Stojanović, Stojanović, (2007). Merenje morfoloških karakteristika izvršeno je uz primenu i poštovanje Internacionalnog biološkog programa. Primenom Manove i χ^2 testa dobijeni rezultati nakon finalnog merenja pokazuju statistički značajne promene u motoričkim sposobnostima, morfološkim karakteristikama, statusu svoda stopala kod dece.*

Ključne reči: *Posturalni status, motoričke sposobnosti, morfološke karakteristike, školica sporta.*

Introduction

During the growth period there are the three critical periods in which significant fast growth takes place (at the age of 6–24 months, 5–8 years and 11–14 years). During this period of life, the children are at increased risk of de-

Uvod

Tokom perioda rasta postoje tri kritična perioda u kojima se odvija izuzetno brz rast (u uzrastu od 6–24 meseca, 5–8 godina i 11–14 godina). U toku ovog perioda života kod dece povećan je rizik od nastanka deformiteta

veloping spinal deformities, therefore the regular diagnostic examinations are vital in order to prevent and correct the deformities. In addition to the radiographic method for the detection of spinal curvature, the Moiré method, 3SPACE, Spinal Mouse, Spinal Touch, Zebris medical are also used, which analyse the spinal column with great accuracy (Jager, Kristof, Kiss, 2015). While some postural disorders are typical for the growth and development of the individual the others can be harmful with a negative impact on the quality of life. Most of the postural problems begin in childhood. Body posture depends on many factors, including age, gender, race, somatic structure of the joint-skeletal system and muscles, mental status, lifestyle, utilisation of physical activities. Muscle strength is an important aspect of physical fitness and health, and a decrease in muscle strength can cause significant functional limitations (Takken, Elst, Spermon, Helders, Prakken, van der Net, 2003). Maintaining the correct postural status also depends on the correct position of the feet and the height of the arches of the feet. The imbalance in one joint is manifested in all other joints, and due to the lowered arches of the feet the knees move towards the medial part disrupting the entire posture in a chain. Echarri, & Forriol (2003) state that at the age from 3 to 4 years the prevalence of deformity in children is up to 70%. In addition to many negative outcomes related to the health and psychosocial status of the children and youth, the weight gain is certainly responsible and associated with the negative changes in the body posture. The data from eminent institutions around the world (USDHHS, 2004) and scientists (Kelly et al., 2004; Jackson et al., 2003; Reilly et al., 2003) indicate that nowadays the children are less mobile and lead a sedentary lifestyle - the life with numerous benefits and pleasures that are available to them today through the technical and technological achievements, which has the negative consequences for their current health, but also their health in the future. The children who are 6 to 12 years old, that have better-developed motor abilities and skills, spend more time doing the physical activities and less sedentary lifestyle compared to those children who have a reduced level of developed motor abilities (Houwen, Hartman, & Visscher, 2009). In order for children to adequately develop motor abilities, they need exercise and programmed guidance by professionals (Robinson, & Goodway, 2009). The American National Association for Sports and Physical Education (NASPE) promotes programmed physical exercise in early childhood, encouraging better motor development. The literature in kinesiology is more dedicated to the analysis of motor abilities through transverse measurements than to their development at the youngest

kičmenog stuba, te su redovni dijagnostički pregledi od vitalnog značaja u cilju prevencije i korekcije deformiteta. Pored radiografske metode za detekciju zakrivljenosti kičmenog stuba, koriste se još i (Moiré metoda, 3SPACE, Spinal Mouse, Spinal Touch, Zebris medical) koje sa velikom preciznošću analiziraju kičmeni stub (Jager, Kristof, Kiss, 2015). Pojedini posturalni poremećaji su tipični za rast i razvoj individue, dok neki pak drugi, mogu biti štetni i mogu negativno uticati na kvalitet života. Većina posturalnih problema počinje u detinjstvu. Držanje tela zavisi od mnogih faktora, uključujući starost, pol, rasu, somatsku strukturu koštano-zglobnog sistema i mišića, mentalni status, način života, upražnjavanje fizičkih aktivnosti. Mišična snaga je važan aspekt fizičke spremnosti i zdravstvenog stanja, a smanjenje mišićne snage može prouzrokovati značajna funkcionalna ograničenja (Takken, Elst, Spermon, Helders, Prakken, van der Net, 2003). Održavanje pravilnog posturalnog statusa zavisi i od pravilnog položaja stopala i visine svodova stopala. Neravnoteža u jednom zglobu, manifestuje se na sve druge zglobove, te usled spuštenih svodova stopala kolena se kreću ka medijalnom delu narušavajući lančano čitavu posturu. Echarri, & Forriol (2003) navode da u uzrastu od 3 do 4 godine prevalenca deformiteta kod dece iznosi do 70%. Povećana telesna masa je pored niza negativnih ishoda koji se odnose na zdravlje i psihosocijalni status dece i omladine, svakako odgovorna i povezana sa negativnim promenama u držanju tela. Podaci eminentnih institucija u svetu (USDHHS, 2004) i naučnih radnika (Kelly et al., 2004; Jackson et al., 2003; Reilly et al., 2003) navode da se današnja deca sve manje kreću, i da masovno vode sedentarni način života uz mnogobrojne pogodnosti i ugođaje koji su im danas na raspolaganju preko tehničko tehnoloških dostignuća, što ima negativne posledice po trenutno zdravlje, ali i njihovo zdravlje u perspektivi. Deca koja u uzrastu od 6 do 12 godine imaju bolje razvijene motoričke sposobnosti i veštine, više vremena provode u kretnim aktivnostima i manje upražnjavaju sedentarni način života u odnosu na onu decu koja imaju smanjen nivo razvijenosti motoričkih sposobnosti (Houwen, Hartman, & Visscher, 2009). Da bi deca adekvatno razvijala motoričke sposobnosti, potrebno im je vežbanje i programirano usmeravanje od strane stručnih lica (Robinson, & Goodway, 2009). Američka nacionalna asocijacija za sport i fizičko vaspitanje (NASPE) propagira bavljenje programiranim fizičkim vežbanjem u ranom dečijem uzrastu, podstičući bolji motorički razvoj. Literatura u kineziologiji više je posvećena analizi motoričkih sposobnosti kroz transverzalna merenja nego njihovom razvoju u najmlađem uzrastu. Zadatak

age. The task of programmed exercise in preschool and younger school age is to build a variety of motor movement structures that will enable learning and solving complex motor tasks adapted to different and specific contexts of movement (Clark, Metcalfe, 2002). Understanding motor development is complex, because over the years, kinesiologists around the world have discovered a large amount of exact information about when and in what order motor abilities appear and what affects them. Some studies emphasise that the behavior of parents and their life habits are significantly related to the habits of their children aged 5 to 10 years (Ulrich, 2004). Many countries in the world are subjected to the influence of fast and poor-quality nutrition, acquiring poor eating habits and therefore, the chronic conditions of obesity, increased skin folds, voluminousness and similar in children of school and preschool age. Of particular concern is the fact that obesity and poor eating habits are transmitted from youth to later stages of life which reflects not only on the quality of life but also the health of the individual; which later leads to chain reactions and impacts related to material costs for treating diseases which to a greater or lesser extent directly correlate with obesity. It is important to identify the risk factors related to morphological characteristics in children as a whole and, accordingly, to lead future efforts in the prevention and treatment of not only obesity but also impaired morphological status overall. The aim of this study was to examine the changes in postural status, motor abilities and morphological characteristics under the influence of training processes of the School of Sports of the Faculty of Pedagogy.

Method

The research was of a longitudinal character. The training experimental program lasted from 1st September 2018 to 1st December 2018 with two trainings of 45 minutes per week. The follow-up included 92 subjects, divided into two sub-samples, one consisting of experimental groups, 45, and the other consisting of control subjects, 47. All subjects at the time of the measurements were 6 years old (+/- 6 months) and were the students of preschool institutions "Chika Jova Zmaj" and "Kolibri" from Bijeljina. The experimental group worked according to the program of the School of Sports of the Faculty of Pedagogy, while the control group realised regular activities according to the program of the Ministry of Education and Culture of the Republic of Srpska. The analysis of the status of the arch of the foot was performed with a Digital Computer Podoscope.

programiranog vežbanja u predškolskom i mlađem školskom uzrastu je izgradnja raznovrsnih motoričkih kretnih struktura koje će omogućiti kasnije učenje i rešavanje složenih motoričkih zadataka prilagođenih različitim i specifičnim kontekstima pokreta (Clark, Metcalfe, 2002). Razumevanje motoričkog razvoja je kompleksno, jer godinama unazad kineziolozi širom sveta otkrivaju veliki broj egzaktnih informacija o tome kada i kojim redosledom se pojavljuju motoričke sposobnosti i šta sve na njih utiče. Neke studije naglašavaju da je ponašanje roditelja i njihove životne navike značajno povezano sa navikama njihove dece u uzrastu od 5 do 10 godine (Ulrich, 2004). Mnoge zemlje u svetu podležu uticaju brze i nekvalitetne ishrane, stičući loše prehrambene navike, a sa njima i hronična stanja gojaznosti, povećanih kožnih nabora, voluminoznosti i slično kod dece školskog i predškolskog uzrasta. Posebno zabrinjava činjenica da gojaznost i loše prehrambene navike iz mladosti se prenose i u kasnije faze života, što se odražava ne samo na kvalitet života ljudi, nego i zdravlje individue koje povlači lančane reakcije i uticaje koje se odnose i na materijalne troškove za lečenje bolesti koje u većoj ili manjoj meri direktno koreliraju sa gojaznošću. Značajno je identifikovati faktore rizika koji se odnose na morfološke karakteristike kod dece u celini te u skladu sa tim voditi buduće napore u prevenciji i lečenju ne samo gojaznosti nego i narušenog morfološkog statusa u celini.

Cilj ovog rada bio je ispitati promene u posturalnom statusu, motoričkim sposobnostima i morfološkim karakteristikama pod uticajem trenažnog procesa „Školice sporta" Pedagoškog fakulteta.

Metod

istraživanje je bilo longitudinalnog karaktera. Trenažni eksperimentalni program je trajao od 1.9.2018. do 1.12.2018. godine sa po dva termina od 45 minuta sedmično. Praćenjem je obuhvaćeno 92 ispitanika oba pola, podeljenih u dva subuzorka, jedan koji su činili eksperimentalne grupe, njih 45 (od toga 21 dečak i 24 devojčice), i drugi koji su činile ispitanici kontrolne grupe, njih 47 (od toga 23 devojčice i 24 dečaka). Svi ispitanici u trenutku merenja imali 6 godina (+/- 6 meseci) i bili su polaznici predškolskih ustanova „Čika Jova Zmaj" i „Kolibri" iz Bijeljine. Eksperimentalna grupa radila je po programu Školice sporta Pedagoškog fakulteta, dok je kontrolna grupa realizovala aktivnosti po programu Ministrastva prosvete i kulture Republike Srpske. Analiza statusa svoda stopala izvršena je digitalnim kompjuterskim podoskopom.

Table 1. *Global plan for the experimental program*

Tabela 1. *Globalni plan eksperimentalnog programa.*

Experimental program for the strength development / **Eksperimentalni program za razvoj snage**	***Number of treatments /*** **Broj tretmana**
1. Elements of basic sports - Gymnastics / Elementi bazičnih sportova - Gimnastika	6
2. Elements of basic sports - Athletics / Elementi bazičnih sportova - Atletika	6
3. Exercises for the development of motor skills - polygons / Vežbe za razvoj motoričkih sposobnosti - poligoni	5
4. Corrective exercise / Korektivno vežbanje	7
7. PNF - proprioceptive neuromuscular facilitation / PNF - proprioceptivna neuromuskularna facilitacija	after each treatment / posle svakog tretmana
Total treatments / **Ukupno tretmana:**	***24***

The status of the arch of the foot was analysed with a Digital Computer Podoscope, as follows:

1. No deformity
2. I degree of deformity
3. II degree of deformity
4. III degree of deformity
5. IV degree of deformity

For the assessment of the motor abilities a battery of motor abilities was used according to the model of Bala, Stojanović, Stojanović, (2007).

I To estimate the factors structuring the movement:

1) Backward field (0.1 s),

II To estimate the excitation intensity factor of motor units:

2) Standing long jump (cm),

3) Running 20 m high start (0.1 s),

III To estimate the factors of functional synergy and tone regulation:

4) Hand tapping (freq.),

5) Wide-angle seated forward bend (cm),

IV To estimate the excitation duration factor of motor units:

6) Trunk lifting while lying on the back for 60 s (frequency),

7) Flexed arm hangs (0.1 s).

The measurement of morphological characteristics was performed with the application and respect of the International Biological Program.

The following anthropometric measures were selected as a sample of measuring instruments for the purpose of this study:

I To assess the longitudinal dimensionality of the skeleton:

1) Body height,

2) Arm span,

II To assess the transverse dimensionality of the skeleton:

3) Shoulder width,

Status svoda stopala digitalnim kompjuterskim podoskopom je analiziran softverski na sledeći način:

1. Nema deformiteta
2. I stepen deformiteta
3. II stepen deformiteta
4. III stepen deformiteta
5. IV stepen deformiteta

Za procenu motoričkih sposobnosti primenjena je baterija motoričkih sposobnosti po modelu Bala, Stojanović, Stojanović, (2007).

I Za procenu faktora strukturiranja kretanja:

1) Poligon natraške (0,1 s),

II Za procenu faktora intenziteta ekscitacije motoričkih jedinica:

2) Skok udalj iz mesta (cm),

3) Trčanje 20 m iz visokog starta (0,1 s),

III Za procenu faktora funkcionalne sinergije i regulacije tonusa:

4) Taping rukom (frek.),

5) Pretklon u sedu raznožno (cm),

IV Za procenu faktora trajanja ekscitacije motoričkih jedinica:

6) Podizanje trupa za 60 s (frek.),

7) Izdržaj u zgibu podhvatom (0,1 s).

Merenje morfoloških karakteristika izvršeno je uz primenu i poštovanje Internacionalnog biološkog programa.

Kao uzorak mernih instrumenata za potrebe rada bile su izabrane sledeće antropometrijske mere:

I Za procenu longitudinalne dimenzionalnosti skeleta:

1) Telesna visina,

2) Raspon ruku,

II Za procenu tranverzalne dimenzionalnosti skeleta:

3) Širina ramena,

III Za procenu volumena i mase tela:

4) Telesna težina,

5) Srednji obim opružene nadlaktice,

III To estimate body volume and weight:
4) Body mass,
5) Medium circumference of the extended upper arm,
6) Medium circumference of the bent upper arm,
IV To estimate the subcutaneous adipose tissue:
7) Skinfold of the abdomen,
8) Skinfold of the back,
9) Skinfold of the upper arm,
V To assess body nutrition:
10) Body mass index

Statistical data processing consisted of several stages. Firstly, the basic descriptive indicators were calculated at the initial and final measurement for both analysed groups. Using Multivariate analysis of variance, the differences between the experimental and control groups at the initial and final measurements were calculated. The analysis of the status of the arch of the foot was realised by calculating the $\chi 2$ test and the contingency coefficient.

Results

In accordance with the methodology of kinesiological research the results section presents six tables where the results of the initial and final measurements in motor abilities, morphological characteristics and the status of the arch of the foot are presented.

Table 2. *Differences in the initial measurement in motor abilities between the groups of subjects*

Variables / Varijable	*Group /* Grupa	*AM /* AS	*S*	*f*	*p*
Backward field / Poligon natraške (s)	E	44.00	12.29	0.186	0.66
	C / K	42.48	10.43		
Running 20 m high start / Trčanje 20m	E	5.93	1.32	0.098	0.75
	C / K	5.83	0.61		
Flexed arm hangs / Izdržaj u zgibu	E	12.64	12.95	1.096	0.30
	C / K	9.14	6.19		
Trunk lifting while lying on the back / Podizanje trupa	E	15.23	8.04	2.901	0.09
	C / K	11.24	7.19		
Hand tapping / Taping rukom	E	44.39	6.08	2.110	0.15
	C / K	47.53	8.84		
Standing long jump / Skok u dalj	E	73.77	23.39	0.030	0.86
	C / K	74.88	15.64		
Wide-angle seated forward bend / Pretklon u sedu	E	76.19	6.93	0.007	0.93
	C / K	76.00	8.58		

F=1.521; P=0.188

Legend: *AM - arithmetic mean; S - standard deviation; F - value of multivariate Wilks F test; P - statistical significance of the multivariate Wilks F test; f - value of univariate f test; p - statistical significance of univariate f test.*

6) Srednji obim savijene nadlaktice,
IV Za procenu potkožnog masnog tkiva:
7) Kožni nabor trbuha,
8) Kožni nabor leđa,
9) Kožni nabor nadlaktice.
V Za procenu telesne uhranjenosti:
10) Indeks telesne mase

Statistička obrada podataka sastojala se iz nekoliko etapa, prvo su izračunati osnovni deskriptivni pokazatelji na inicijalnom i finalnom merenju za obe analizirane grupe. Primenom Multivarijatne analize varijanse izračunate su razlike između eksperimentalne i kontrolne grupe na inicijalnom i finalnom merenju. Analiza statusa svodova stopala realizovana je izračunavanjem χ^2 testa i koeficijenta kontigencije.

Rezultati

u skladu sa metodologijom kineziloških istraživanja, u poglavlju rezultati, prikazano je šest tabela, gde su predstavljeni rezultati inicijalnog i finalnog merenja u motoričkim sposobnostima, morfološkim karakteristikama i statusu svoda stopala.

Tabela 2. *Razlike na inicijalnom merenju u motoričkim sposobnostima između grupa ispitanika*

F=1,521; P=0,188

Legenda: *AS – aritmetička sredina; S – standardna devijacija; F – vrednost multivarijatnog Wilksovog F testa; P – statistička značajnost multivarijatnog Wilksovog F testa; f – vrednost univarijatnog f testa; p – statistička značajnost univarijatnog f testa.*

By projecting the results in Table 2 where the values are presented from the initial measurement in motor abilities between groups of subjects, we can conclude that there is a good discriminative measurement in most of the measured variables, except in the variables *Fixed arm hangs* and *Trunk lifting while lying on the back.* By comparing arithmetic means and standard deviations it is concluded that it is possible to classify three standard deviations into one arithmetic mean in all variables except in the variables *Fixed arm hangs* and *Trunk lifting while lying on the back*. Observing the values of the multivariate Wilks F test and its statistical significance (F = 1.521; P = 0.188) it is concluded that at the initial measurement there were no differences between the groups at the multivariate level. An individual analysis of each variable and univariate f test and its statistical significance shows that the differences do not exist at the univariate level in any of the analysed variables.

Projekcijom rezultata u tabeli 2. gde su prikazane vrednosti na inicijalnom merenju u motoričkim sposobnostima između grupa ispitanika, možemo zaključiti da postoji dobra diskriminativnost merenja u većini izmerenih varijabli, sem u varijablama *Izdržaj u zgibu i Podizanje trupa*. Komparacijom aritmetičkih sredina i standardnih devijacija konstatuje se da je moguće svrstati tri standardne devijacije u jednu aritmetičku sredinu u svim varijablama sem u varijabli *Izdržaj u zgibu i Podizanje trupa*. Posmatrajući vrednosti multivarijatnog Wilksovog F testa i njegove statističke značajnosti (F=1,521; P=0,188), zaključuje se da na inicijalnom merenju nisu postojale razlike između grupa na multivarijatnom nivou. Pojedinačnom analizom svake varijable i univarijatnog f testa i njegove statističke značajnosti uočava se da razlike ne postoje ni na univarijatnom nivou ni u jednoj analiziranoj varijabli.

Table 3. *Differences in the final measurement in motor abilities between groups of subjects*

Tabela 3. *Razlike na finalnom merenju u motoričkim sposobnostima između grupa ispitanika*

***Variables* / Varijable**	***Group* / Grupa**	***AM* / AS**	***S***	***f***	***p***
Backward field / Poligon natraške (s)	E	37.91	12.53	0.89	0.34
	C / K	40.36	12.12		
Running 20m high start / Trčanje 20m	E	5.66	0.66	0.00	0.94
	C / K	5.65	1.32		
Fixed arm hangs / Izdržaj u zgibu	E	8.67	8.35	0.04	0.83
	C / K	8.30	9.69		
Trunk lifting while lying on the back / Podizanje trupa	E	16.91	8.93	0.12	0.72
	C / K	14.27	9.01		
Hand tapping / Taping rukom	E	53.67	8.65	0.07	0.79
	C / K	53.18	10.10		
Standing long jump / Skok u dalj	E	97.56	23.60	7.87	0.00
	C / K	84.72	21.87		
Wide-angle seated forward bend / Pretklon u sedu	E	83.14	10.85	2.70	0.00
	C / K	79.32	12.24		

F=2.029; P=0.05

Legend: *AM - arithmetic mean; S - standard deviation; F - value of multivariate Wilks F test; P - statistical significance of the multivariate Wilks F test; f - value of univariate f test; p - statistical significance of univariate f test.*

F=2,029; P=0,05

Legenda: *AS – aritmetička sredina; S – standardna devijacija; F – vrednost multivarijatnog Wilksovog F testa; P – statistička značajnost multivarijatnog Wilksovog F testa; f – vrednost univarijatnog f testa; p – statistička značajnost univarijatnog f testa.*

In Table 3 the review of the obtained values at the final measurement shows good discriminativity of the measurement in all analysed variables, except in the variables *Fixed arm hangs* and *Trunk lifting while lying on the back*, as well as at the initial measurement. The analysis of the relationship between arithmetic means and standard deviations in all other variables is such that three standard deviations

Pregledom dobijenih vrednosti na finalnom merenju u tabeli 3. uočava se dobra diskriminativnost merenja u svim analiziranim varijablama sem u varijablama *Izdržaj u zgibu i Podizanje trupa* kao i na inicijalnom merenju. Analiza odnosa aritmetičkih sredina i standardnih devijacija u svim drugim varijablama je takva da mogu tri standardne devijacije da se svrstaju u jednu

can be classified into one arithmetic mean. The result of the multivariate Wilks F test and its statistical significance (F = 2,029; P = 0.05) shows the existence of statistically significant differences between the groups at the level of inference p <0.05, which speaks in favor of the positive effect on the experimental group by the presented model. Individual analysis and the values of the univariate f test shows that the differences were expressed in two variables, namely the variable for estimating the excitation factor of motor units *Standing long jump,* and the variable for estimating the factors of functional synergy and tone regulation *Wide-angle seated forward bend.*

aritmetičku sredinu. Rezultat multivarijatnog Wilksovog F testa i njegova statistička značajnost (F=2,029; P=0,05) prikazuju postojanje statistički značajnih razlika između grupa na nivou zaključivanja p<0,05, što govori u prilog pozitivnog uticaja koji je izvršen na eksperimentalnu grupu modelom rada Školice sporta Pedagoškog fakulteta. Pojedinačnom analizom i vrednostima univarijatnog f testa vidi se da su razlike ispoljene u dve varijable, i to varijabli za procenu faktora intenziteta ekscitacije motoričkih jedinica *Skok u dalj* i varijabli za procenu faktora funkcionalne sinergije i regulacije tonusa *Pretklon u sedu.*

Table 4. *Differences on initial measurement in morphological characteristics between the groups of subjects.*

Tabela 4. *Razlike na inicijalnom merenju u morfološkim karakteristikama između grupa ispitanika*

***Variables* / Varijable**	***Group* / Grupa**	***AM* / AS**	***S***	***f***	***p***
Body height / Telesna visina	E	121.91	3.714	1.34	0.25
	C / K	123.91	4.83		
Body mass / Telesna masa	E	23.40	4.83	0.00	0.98
	C / K	23.44	5.01		
Shoulder width / Širina ramena	E	24.64	1.68	1.32	0.26
	C / K	25.52	2.07		
Arm span / Raspon ruku	E	117.11	4.40	0.03	0.86
	C / K	116.70	7.27		
Skinfold of the abdomen / Kožni nabor trbuha	E	10.53	15.43	0.24	0.62
	C / K	7.88	5.88		
Skinfold of the back / Kožni nabor leđa	E	8.13	6.15	0.53	0.47
	C / K	10.07	6.67		
Skinfold of upper arm / Kožni nabor nadlaktice	E	9.53	3.66	0.27	0.60
	C / K	10.34	3.75		
Circumference of the bent upper arm / Obim savijene nadlaktice	E	20.43	2.41	0.40	0.53
	C / K	21.16	3.31		
Circumference of the outstretched upper arm / Obim opružene nadlaktice	E	19.68	2.50	0.63	0.43
	C / K	20.57	2.95		
Body Mass Index / Body Mass Index	E	15.63	2.33	0.16	0.69
	C / K	15.21	2.80		

F=0.246; P=0.061;

Legend: *AM - arithmetic mean; S - standard deviation; F - value of multivariate Wilks F test; P - statistical significance of the multivariate Wilks F test; f - value of univariate f test; p - statistical significance of univariate f test.*

F=0,246; P=0,061;

Legenda: *AS – aritmetička sredina; S – standardna devijacija; F – vrednost multivarijatnog Wilksovog F testa; P – statistička značajnost multivarijatnog Wilksovog F testa; f – vrednost univarijatnog f testa; p – statistička značajnost univarijatnog f testa.*

Table 4 presents the differences at the initial measurement in morphological characteristics between the groups of subjects. Review of descriptive indicators of arithmetic mean and standard deviation shows good discriminativity of measurements in all analysed variables, except in the variables for the assessment of subcutaneous adipose tissue: Skinfold of the abdomen and Skinfold of the back. Based on

U tabeli 4. prezentovane su razlike na inicijalnom merenju u morfološkim karakteristikama između grupa ispitanika. Pregledom deskriptivnih pokazatelja aritmetičke sredine i standardne devijacije uočava se dobra diskriminativnost merenja u svim analiziranim varijablama sem u varijablama za procenu potkožnog masnog tkiva: *Kožni nabor trbuha* i *Kožni nabor leđa*. Na osnovu poka-

the indicators of the multivariate Wilks F test and its statistical significance (F = 0.246; P = 0.061;) it can be concluded that at the initial measurement there were no differences between the groups in the analysed morphological characteristics. The values of the univariate f test were not statistically significant in any of the analysed variables at the initial measurement of morphological characteristics.

zatelja multivarijatnog Wilksovog F testa i njegove statističke značajnosti (F=0,246; P=0,061;), može se konstatovati da na inicijalnom merenju nisu postojale razlike između grupa u analiziranim morfološkim karakteristikama. Vrednosti univarijatnog f testa nisu bile statistički značajne ni u jednoj analiziranoj varijabli na inicijalnom merenju morfoloških karakteristika.

Table 5. *Differences on final measurement in morphological characteristics between groups of subjects*

Tabela 5. *Razlike na finalnom merenju u morfološkim karakteristikama između grupa ispitanika*

***Variables* / Varijable**	***Group* / Grupa**	***AM* / AS**	***S***	***f***	***p***
Body height / Telesna visina	E	128.53	6.01	0.041	0.84
	C / K	128.22	7.15		
Body mass / Telesna masa	E	26.50	6.32	0.987	0.32
	C / K	27.97	6.51		
Shoulder width / Širina ramena	E	25.67	1.87	1.292	0.12
	C / K	25.60	2.76		
Arm span / Raspon ruku	E	122.24	6.45	0.769	0.38
	C / K	123.73	8.05		
Skinfold of the abdomen / Kožni nabor trbuha	E	8.86	5.76	6.976	0.01
	C / K	13.78	9.64		
Skinfold of the back / Kožni nabor leđa	E	8.10	3.46	2.069	0.15
	C / K	10.67	10.08		
Skinfold of upper arm / Kožni nabor nadlaktice	E	12.11	4.57	4.251	0.04
	C / K	16.30	11.26		
Circumference of the bent upper arm / Obim savijene nadlaktice	E	20.59	2.60	0.214	0.64
	C / K	20.90	3.13		
Circumference of the outstretched upper arm / Obim opružene nadlaktice	E	19.83	2.77	0.054	0.81
	C / K	19.98	3.05		
Body Mass Index / Body Mass Index	E	15.87	2.53	2.639	0.10
	C / K	16.86	2.74		

F=4.071; P=0.000;

Legend: *AM - arithmetic mean; S - standard deviation; F - value of multivariate Wilks F test; P - statistical significance of the multivariate Wilks F test; f - value of univariate f test; p - statistical significance of univariate f test.*

F=4,071; P=0,000;

Legenda: *AS – aritmetička sredina; S – standardna devijacija; F – vrednost multivarijatnog Wilksovog F testa; P – statistička značajnost multivarijatnog Wilksovog F testa; f – vrednost univarijatnog f testa; p – statistička značajnost univarijatnog f testa.*

Based on the results in Table 5, where the differences in the final measurement in morphological characteristics between the groups of subjects are shown, we can conclude that there is good discriminative measurement in all analysed variables, except in variables for assessment of subcutaneous adipose tissue: Skinfold of the abdomen and Skinfold of the back. The values of the multivariate F test and its statistical significance P (F = 4,071; P = 0,000;) at the final measurement have showed the existence of statistically significant differences between the control and experimental group in morphological characteristics. Individually

Na osnovu rezultata u tabeli 5. gde su prikazane razlike na finalnom merenju u morfološkim karakteristikama između grupa ispitanika možemo zaključiti da postoji dobra diskriminativnost merenja u svim analiziranim varijablama sem u varijablama za procenu potkožnog masnog tkiva: *Kožni nabor trbuha* i *Kožni nabor leđa*. Vrednosti multivarijatnog F testa i njegove statističke značajnosti P (F=4,071; P=0,000;) na finalnom merenju su pokazale postojanje statistički značajnih razlika između kontrolne i eksperimentalne grupe u morfološkim karakteristikama. Pojedinačno posmatrano vidimo da su

observed we can see that those differences are expressed in two variables for the assessment of subcutaneous adipose tissue, namely, Skinfold of the abdomen and Skinfold of the upper arm, which is probably the result of the influence of programmed exercise applied to the experimental group.

te razlike izražene u dve varijable za procenu potkožnog masnog tkiva, a to su*: Kožni nabor trbuha i Kožni nabor nadlaktice,* što je verovatno plod uticaja programiranog vežbanja koji je primenjen na ispitanicima eksperimentalne grupe.

Table 6. *Contingency analysis of the status of the arches of the feet on the initial measurement between the groups*

Tabela 6. *Kontigencijska analiza statusa svodova stopala na inicijalnom merenju između grupa*

***Variables* / Varijabla**	***Statistics* / Statistici**		***Group* / Grupa**		***Total* / Ukupno**
			E	C	
The arch of the foot / Status svoda stopala	*No deformities* / Nema deformiteta	Number	5	2	7
		% within Status	71.4%	28.6%	100.0%
		% within Group	11.1%	4.3%	7.6%
		% of Total	5.4%	2.2%	7.6%
	I Grade / I Stepen	Number	0	1	1
		% within Status	0.0%	100.0%	100.0%
		% within Group	0.0%	2.1%	1.1%
		% of Total	0.0%	1.1%	1.1%
	II Grade / II Stepen	Number	29	13	42
		% within Status	69.0%	31.0%	100.0%
		% within Group	64.4%	27.7%	45.7%
		% of Total	31.5%	14.1%	45.7%
	III Grade / III Stepen	Number	10	24	34
		% within Status	29.4%	70.6%	100.0%
		% within Group	22.2%	51.1%	37.0%
		% of Total	10.9%	26.1%	37.0%
	IV Grade / IV Stepen	Number	1	7	8
		% within Status	12.5%	87.5%	100.0%
		% within Group	2.2%	14.9%	8.7%
		% of Total	1.1%	7.6%	8.7%
	Total / Ukupno	Number	45	47	92
		% within Status	48.9%	51.1%	100.0%
		% within Group	100.0%	100.0%	100.0%
		% of Total	48.9%	51.1%	100.0%

χ^2=18.61; df=4; p=0.001;

Legend: *χ2- value Chi-square of the test; df - degree of freedom; p - statistical significance of Chi-square test; E-experimental group; C-control group*

χ^2=18,61; df=4; p=0,001;

Legenda: *χ^2- vrednost Hi kvadrat testa; df- stepen slobode; p- statistička značajnost Hi kvadrat testa; Ek-eksperimentalna grupa; Ko-kontrolna grupa*

In Table 6 the status of the arch of the foot was analysed on the initial measurement between the groups. It is stated that the value of χ2 – Chi-square of the test is statistically significant at the level of inference of p = 0.01 (χ2 = 18.61; df = 4; p = 0.001;), therefore it rejects the assumption that there are no statistically significant differences at the initial measurement in analysed sample of the subjects. Individually observed on the basis of categories (simultaneous belonging to the category of variables in row and column, the percentage for a variable in a row, the percentage

U datoj tabeli 6. analiziran je status svodova stopala na inicijalnom merenju između grupa. Konstatuje se da je vrednost χ^2- Hi kvadrat testa statistički značajna na nivou zaključivanja od p=0,01 (χ^2=18,61; df=4; p=0,001;), pa se odbacuje pretpostavka o nepostojanju statistički značajnih razlika na inicijalnom merenju u analiziranom uzorku ispitanika. Pojedinačno posmatrano na osnovu kategorija (istovremena pripadnost kategoriji varijable u redu i koloni, procenat za varijablu u redu, procenat

for a variable in the column and total percentage) of the variable *Status of the arch of the foot,* it is noticed that the number of the children without foot deformities is very small (7.6%), which coincides with some of our earlier research from this area. The number of the subjects with grade I deformity is 1.1%, grade II is 45.7%, grade III is 37%, and grade IV is 8.7%. At the initial measurement the subjects of the experimental group had a lower prevalence of deformities in relation to the children from the control group.

Table 7. *Contingency analysis of the status of the arches of the feet on the final measurement between the groups*

za varijablu u koloni i ukupni procenat) varijable Status svodova stopala uočava se da je broj dece bez deformiteta stopala veoma mali (7,6%), što se poklapa sa nekim našim ranijim istraživanjima sa ovih prostora. Broj ispitanika sa I stepenom deformiteta je 1,1%, sa II stepenom je 45,7%, sa trećim stepenom je 37%, i sa IV stepenom 8,7%. Ispitanici eksperimentalne grupe imali su na inicijalnom merenju manju zastupljenost deformiteta u odnosu na decu iz kontrolne grupe.

Tabela 7. *Kontigencijska analiza statusa svodova stopala na finalnom merenju između grupa*

Variables / **Varijabla**	***Statistics /*** **Statistici**		***Group /*** **Grupa**		***Total /*** **Ukupno**
			E	C	
The arch of the foot / Status svoda stopala	*No deformity /* Nema deformiteta	*Number /* Broj	5	2	7
		% within Status	71.4%	28.6%	100.0%
		% within Group	11.1%	4.3%	7.6%
		% of Total	5.4%	2.2%	7.6%
	I Grade / I Stepen	*Number /* Broj	4	3	7
		% within Status	57.1%	42.9%	100.0%
		% within Group	8.9%	6.4%	7.6%
		% of Total	4.3%	3.3%	7.6%
	II Grade / II Stepen	*Number /* Broj	26	12	38
		% within Status	68.4%	31.6%	100.0%
		% within Group	57.8%	25.5%	41.3%
		% of Total	28.3%	13.0%	41.3%
	III Grade / III Stepen	*Number /* Broj	9	23	32
		% within Status	28.1%	71.9%	100.0%
		% within Group	20.0%	48.9%	34.8%
		% of Total	9.8%	25.1%	34.8%
	IV Grade / IV Stepen	*Number /* Broj	1	7	8
		% within Status	12.5%	87.5%	100.0%
		% within Group	2.2%	14.9%	8.7%
		% of Total	1.1%	7.6%	8.7%
	Total / Ukupno	*Number /* Broj	45	47	92
		% within Status	48.9%	51.1%	100.0%
		% within Group	100.0%	100.0%	100.0%
		% of Total	48.9%	51.1%	100.0%

χ^2=17.176; df=4; p=0.002;

Legend: *χ2- value Chi-square of the test; df- degree of freedom; p- statistical significance of Chi-square test; E-experimental group; C-control group*

χ^2=17,176; df=4; p=0,002;

Legenda: *χ^2- vrednost Hi kvadrat testa; df- stepen slobode; p- statistička značajnost Hi kvadrat testa; Ek-eksperimentalna grupa; Ko-kontrolna grupa*

Table 7 presents the results of contingency analysis of the status of the arch of the foot at the final measurement between the groups. Observing the obtained results after the final measurement, we notice that the value of χ2-Chi square of the test is statistically significant at the level of inference

Tabela 7. prezentuje rezultate kontigencijske analize statusa svodova stopala na finalnom merenju između grupa. Posmatrajući dobijene rezultate nakon finalnog merenja, uočavamo da je vrednost χ^2- Hi kvadrat testa statistički značajna na nivou zaključivanja od p=0,01,

of p = 0.01, but slightly lower than at the initial measurement ($\chi 2$ = 17.176; df = 4; p = 0.002;). The percentage of the children with foot deformity at the final measurement is the same as at the initial one, with the difference that there are slight improvements in certain categories of the assessed variable. These improvements can be seen in the data that shows that the number of children with the III and II degree deformity has slightly decreased. Whether this is the result of programmed exercise cannot be ascertained with certainty, bearing in mind that improvements are visible in both, the control and experimental groups.

Discussion

The research shows that motor abilities in children deteriorated by over 10% in the period 1975-2000, and that this trend continues (Bos, 2003). The obtained results in this research unequivocally show that positive effects were caused and achieved in the experimental group by a specially designed exercise program according to the model of the School of Sports of the Faculty of Pedagogy. These effects are reflected in the positive changes achieved in motor abilities and morphological characteristics in the subjects of the experimental group. Slightly positive changes were also present in the variable for assessing the status of the arch of the foot, but they were realised in both, the control and in the experimental group, and it cannot be claimed with certainty that they were realised under the influence of the experimental treatment. The reason may be a potential threat to the internal validity of the research through the current or previous activities of the subjects of the control group and the growth, development and maturation of these subjects. Tittlbach, Bappert, Bos, Woll, (2004) in their research state that children achieve positive changes in the variable for estimating the intensity factor of excitation of motor units *Standing long jump*, and variables for estimating the factors of functional synergy and tone regulation, which is in accordance with results in our study. Positive changes after the application of the experimental exercise program in children are also mentioned in Popović and Stupar, 2011; Bocca, Corpeleijn, Van den Heuvel, Stolk, & Sauer, 2014. Physical activity and fitness are positively associated with general health and cognitive abilities in children (Chen, 2017).

A sedentary lifestyle not only has a negative effect on the motor development but also the harmful effects that are especially pronounced in morphological characteristics through an increase in the body nutrition index and thus obesity in children (Duan, Hu, Wang, Arao, 2015). The changes caused in the variables *Skinfold of the abdomen* and *Skinfold of the upper arm* are the product of the effects of

ali nešto manja nego na inicijalnom merenju (χ^2=17,176; df=4; p=0,002;). Procenat dece sa deformitetom stopala na finalnom merenju je isti kao i na inicijalnom, sa razlikom da postoje blaga poboljšanja u određenim kategorijama procenjivane varijable. Ta poboljšanja uočavaju se u podacima da je blago smanjen broj dece trećeg i drugog stepena. Da li je to plod programiranog vežbanja, ne može se sa sigurnošću konstatovati, imajući na umu da su poboljšanja vidljiva i u kontrolnoj i u eksperimentalnoj grupi.

Diskusija

istraživanja pokazuju da su se motoričke sposobnosti kod dece u periodu od 1975-2000.godine pogoršale za preko 10%, i da se taj trend nastavlja i dalje (Bos, 2003). Dobijeni rezultati u ovom istraživanju nedvosmisleno pokazuju da su ostvareni i prouzrokovani pozitivni efekti kod ispitanika eksperimentalne grupe posebno dizajniranim programom vežbanja po modelu rada „Školice sporta“ Pedagoškog fakulteta. Ti efekti se ogledaju u pozitivnim promenama koje su ostvarene u motoričkim sposobnostima i morfološkim karakteristikama kod ispitanika eksperimentalne grupe. Blago pozitivne promene su bile prisutne i u varijabli za procenu statusa svoda stopala, ali one su ostvarene i u kontrolnoj i u eksperimentalnoj grupi, te se sa sigurnošću ne može tvrditi da su ostvarene pod uticajem eksperimentalnog tretmana. Razlog može da bude i potencijalno ugrožavanje interne valjanosti istraživanja kroz aktuelnu ili bivšu aktivnost ispitanika kontrolne grupe i rast, razvoj i sazrevanje ispitanika. Tittlbach, Bappert, Bos, Woll, (2004) u svom istraživanju navode da deca ostvaruju pozitivne promene u varijabli za procenu faktora intenziteta ekscitacije motoričkih jedinica *Skok u dalj,* i varijabli za procenu faktora funkcionalne sinergije i regulacije tonusa, što je u skladu sa dobijenim rezultatima u našem istraživanju. Pozitivne promene nakon primene eksperimentalnog programa vežbanja kod dece navode i (Popović i Stupar, 2011; Bocca, Corpeleijn, Van den Heuvel, Stolk, & Sauer, 2014;). Fizička aktivnost i kondicija pozitivno su povezani sa opštim zdravljem i kognitivnim sposobnostima kod dece (Chen, 2017).

Sedentarni način života ne samo da deluje negativno na motorički razvoj, štetni efekti su posebno izraženi u morfološkim karakteristikama kroz povećanje indeksa telesne uhranjenosti, a samim tim i gojaznosti kod dece (Duan, Hu, Wang, Arao, 2015). Prouzrokovane promene u varijablama *Kožni nabor trbuha* i *Kožni nabor nadlaktice* su produkt efekata programa vežbanja. Eminentni naučnici iz regiona u svojim studijama govore o pozi-

the exercise program. Eminent scientists from the region in their studies talk about the positive effects of programmed exercise on changes in morphological characteristics (Bala, Krneta, Lukač, Sadri, 2018).

The manifested differences in motor abilities, morphological characteristics, and status of the arch of the foot in the analysed sample are partly due to the effects of exercise programs according to the model of the School of Sports of the Faculty of Pedagogy, and partly due to the specifics of the overall maturation, the condition of muscle, joint-skeletal, cardiovascular, respiratory and probably the most of the endocrine system, observed in this age.

Conclusion

The existence of statistically significant differences in the variable for assessing flexibility, *Wide-angle seated forward bend*, and higher strength of the muscles of the lower extremities (*Standing long jump*) can be explained by the greater elasticity of the lower back, and muscles and tendons of the back of the thigh (primarily *m. biceps femoris, m. semimembranosus, m. semitendinosus)* from the aspect of physiology and elasticity - physics. Considering the elasticity of the muscles and the tendons, one should know that they play a significant role in increasing mechanical work during the movement. If the active muscle or tendon lengthens, the elastic energy accumulates within these biological structures and is used to increase the results in the concentric phase of the eccentric-concentric cycle, which is better in trained children. Based on the laws of physics, the degree of accumulated energy is proportional to the applied force and induced deformation. Since the muscle and tendon are placed in the series, the same force acts on them, and the accumulated energy corresponds to the degree of deformation of the muscles or tendons or their flexibility.

If muscle tension increases abruptly (e.g., static stretching) the Golgi tendon reflex prevents muscle contraction. The consequent reduction in muscle tension prevents the muscle and tendon damage (force feedback) (Zatsiorsky, & Kraemer, 2009).

Without entering the process of adaptation of the organism on the training process, but by the biomechanical requirements that dictate different outcomes of the activity of the effectors (usually upper and lower extremities, which act as levers that drive internal forces - muscles and external - gravity or some external generator), it is needed to point out that everything that happens in the body and requires some movement or various movements, it is manifested through the extremities and torso, and sometimes by the head (Vujmilović, 2012). In addition to the influence achieved by the programmed experimental treatment, the

tivnim uticajima programiranog vežbanja na promene u morfološkim karakteristikama (Bala, Krneta, Lukač, Sadri, 2018).

Manifestovane razlike u motoričkim sposobnostima, morfološkim karakteristikama i statusu svoda stopala kod analiziranog uzorka delom su posledica efekata programa vežbanja po modelu rada „Školice sporta“ Pedagoškog fakulteta, a delom su uticaj specifičnosti ukupnog sazrevanja, stanja mišićnog, koštano – zglobnog, kardiovaskularnog, respitatornog, nervnog i verovatno najviše endokrinog sistema posmatrajući analizirani uzrast.

Postojanje statistički značajnih razlika u varijabli za procenu gipkosti, *Pretklon u sedu raznožno,* i veće snage mišića donjih ekstremiteta (*Skok udalj iz mesta*) može se objasniti pojavom veće elastičnosti sa aspekta fiziologije donjeg dela leđa i mišića i tetiva sa zadnje strane natkolenice (pre svega mišića *m. bicepsa femorisa, m. semimembranosusa, m. semitendinosusa*). Uzimajući u obzir elastičnost mišića i tetiva, treba znati da one imaju značajnu ulogu u povećanju mehaničkog rada tokom pokreta. Ako se aktivni mišić ili tetiva izduže, unutar tih bioloških struktura akumulira se elastična energija i koristi se za povećavanje rezultata u koncentričnoj fazi ekscentrično-koncentričnog ciklusa koja je bolja kod trenirane dece. Na osnovu zakona fizike, stepen akumulirane energije proporcionalan je primenjenoj sili i indukovanoj deformaciji. S obzirom da su mišić i tetiva postavljeni serijski, na njih deluje ista sila, a akumulirana energija odgovara stepenu deformisanosti mišića ili tetiva ili njihove popustljivosti.

Ako se mišićno naprezanje naglo poveća (npr. statičko istezanje), Goldžijev tetivni refleks sprečava mišićnu kontrakciju. Posledično smanjenje mišićnog naprezanja sprečava oštećenje mišića i tetiva (povratna sprega sile) (Zatsiorsky, & Kraemer, 2009).

Ne ulazeći u proces adaptacije organizma u toku trenažnog procesa, biomehaničkim zahtevima koji diktiraju različite ishode aktivnosti efektora (najčešće gornjih i donjih ekstremiteta, koji se ponašaju kao poluge koje pokreću unutrašnje sile – mišići i spoljne – gravitacija ili neki spoljni generator), potrebno je samo da se istakne da se sve što se dešava u organizmu, a zahteva neko kretanje ili razne pokrete, manifestuje putem ekstremiteta i trupa, a nekada i glave (Vujmilović, 2012).

Zaključak

pored uticaja koji je ostvario programirani eksperimentalni tretman, ispoljene razlike u morfološkim karakteristikama kod analiziranog uzorka, mogu delom da zavise i od specifičnosti ukupnog sazrevanja i neophodno

manifested differences in morphological characteristics of the analysed sample may depend partially on the specifics of the overall maturation and it is necessary to constantly monitor and analyse them.

The feet grow faster than other parts of the body and their growth is completed before adolescence. To successfully treat the foot deformities the most important thing is their early detection during regular systematic examinations as well as controls by the parents, educators, and later by class teachers and teachers in the schools.

Proper shape and function of the foot directly depends on a properly built bone structure and a good balance of a muscle strength that participate in the activity of standing and walking. If this balance is disturbed the lowering of the foot arch occurs as a consequence, and in that case, it is necessary to work on strengthening the plantar region of the foot.

ih je konstantno pratiti i analizirati.

Stopala rastu brže nego drugi delovi tela i njihov rast je završen pre adolescencije. Da bi deformiteti stopala bili uspešno lečeni najvažnije je njihovo rano otkrivanje kako pri redovnim sistematskim pregledima tako i kontrolama od strane roditelja, vaspitača, a, kasnije i od profesora razredne nastave i nastavnika u školama.

Pravilan oblik i funkcija stopala direktno zavise od pravilno građene koštane strukture i dobrog balansa snage mišića koji učestvuju u stajanju i hodu. Ako je ta ravnoteža narušena, kao posledica se javlja spuštanje svodova, i u tom slučaju je potrebno raditi na jačanju plantarne regije stopala.

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Stručni članak

Corrective Gymnastics - Compulsory Course for Teachers and Educators

Korektivna gimnastika - obavezan predmet za učitelje i vaspitače

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Abstract: *Proper posture is an unavoidable part of physical education of preschool and younger school age children. Preventive approach is unavoidable from preschool age, by applying preventive physical exercises both as part of physical education activities and during daily stay in kindergartens, and it is necessary to apply the same in physical education classes at a younger school age, as well as during children's stay. at school. In order to implement this in a quality manner, it is necessary for educators and teachers to acquire basic knowledge in the field of corrective gymnastics, already during basic studies. Therefore, there is a need to include this subject in the curriculum of basic studies of all teachers and pedagogical faculties, as well as higher vocational schools for educators, as mandatory.*
Keywords: *corrective gymnastics, teachers, educators, program, education.*

Apstrakt: *Pravilno držanje tela je nezaobilazni deo fizičkog vaspitanja dece predškolskog i mlađeg školskog uzrasta. Nezaobilazan je preventivni pristup već od predškolskog uzrasta, primenom preventivnih telesnih vežbi kako u sklopu aktivnosti iz fizičkog vaspitanja, tako i tokom svakodnevnog boravka u vrtićima, a isto je neophodno primeniti i na časovima fizičkog vaspitanja u mlađem školskom uzrastu, kao i u toku boravka dece u školi. Da bi se ovo kvalitetno sprovelo, neophodno je da vaspitači i učitelji steknu osnovna znanja iz oblasti korektivne gimnastike, već u toku osnovnih studija. Stoga se pojavljuje potreba da se ovaj predmet uvrsti u plan i program osnovnih studija svih učiteljskih i pedagoških fakulteta kao i visokih strukovnih škola za vaspitače, kao obavezan.*
Ključne reči: *korektivna gimnastika, učitelji, vaspitači, program, obrazovanje.*

Introduction

Ensuring proper posture is an unavoidable part of the impact of physical education on the growth and development of children, both preschool and younger school age. Therefore, it can be concluded that proper posture is one of the important factors in the physical education of children of preschool and younger school age.

The basics of kinesitherapy and corrective gymnastics were dealt with by in their textbooks M. Radisavljević 1992; D. Ulić, 1997; Živković, D. 1998, Protić- Gava, B., & Šćepanović, T., 2016, who agreed that the goal of the same prevention and correction of poor posture and body deformities, and state body movement as the basic means. The concept of kinesitherapy is broader than corrective gymnastics, because it deals with treatment with the help of movement and is part of rehabilitation, while corrective gymnastics is one of the types of kinesitherapy, which is used in correction of initial stages of poor posture and prevention (RAdisavljević, 1992).

Uvod

Obezbeđivanje pravilnog držanja tela je nezaobilazni deo uticaja fizičkog vaspitanja na rast i razvoj dece, kako predškolskog tako i mlađeg školskog uzrasta. Stoga se može zaključiti da je pravilno držanje tela jedan od važnih činilaca fizičkog vaspitanja dece predškolskog i mlađeg školskog uzrasta.

Osnovama kineziterapije i korektivnom gimnastikom su se u svojim udžbenicima bavili M. Radisavljević 1992; D. Ulić, D, 1997; Živković D. 1998, Protić-Gava B. i Šćepanović T., 2016. koji su se složili oko toga da je cilj istih prevencija i korekcija loših držanja tela i telesnih deformiteta, a kao osnovno sredstvo navode telesni pokret. Pojam kineziterapije je širi od korektivne gimnastike, jer se bavi lečenjem uz pomoć pokreta i predstavlja deo rehabilitacije, dok je korektivna gimnastika jedan od vidova kineziterapije, koja se koristi u korekciji početnih stadijuma loših držanja tela i prevenciji (Radisavljević, 1992).

"Poor behavior is acquired in the earliest youth, mostly in the school period. That is why it is most important to start with exercises in that period, which mobilize the entire locomotor system "(Živković, 1998, 97). The causes of poor posture are mainly bad habits such as improper sitting, standing and carrying a school bag, as well as inappropriate footwear (B. Protić-Gava, T. Šćepanović, 2016). Many authors deal with the preservation of the health of children from three to ten years of age, because it is generally known that significant attention should be paid to the comprehensive motor preparation of this age. The child acquires the most lasting experiences in the earliest periods of his life, and then it continues through planned organized programs in educational institutions (G.Ákoshegyiné Hild & A. Simonné Christián, 1995). From the above, it can be concluded that it is not enough just to influence the correct posture of the body, but it is also necessary to shape it correctly from the earliest days, that is, from preschool age. Therefore, there is a need for the implementers of activities in preschool institutions, as well as physical education classes at a younger school age, to be adequately trained for the realization of the set tasks, which are set before them by the curriculum. It is not enough to mention in the methodology of physical education what are bad postures and that preventive action should be taken to prevent their occurrence, it is necessary for educators and teachers to gain knowledge about the causes of their occurrence, as well as their prevention, in order to they could more successfully realize the tasks set before them. Of course, teachers and educators will not deal with the diagnosis, because it is the job of a specialist doctor, they can only assess, based on observation, the child's posture, give their opinion on it, and refer the child to a specialist doctor, and after determining diagnoses, by applying a certain program of corrective exercises, help to eliminate the resulting poor posture.

Therefore, the problem of work is the place of corrective gymnastics in the program of education of educators and teachers.

The aim of this paper is to point out the importance of introducing corrective gymnastics as a compulsory subject in the programs of pedagogical and teaching faculties and higher vocational schools for the education of educators.

The review of previous research aims to point out the need to introduce this subject in the education of teachers and educators, and therefore previous research is based on the posture of children of preschool and younger school age, as well as the need for preventive and corrective programs in educational work of these age groups.

„Loše držanje se stiče u najranijoj mladosti i to najviše u školskom periodu. Zato je najvažnije da se u tom periodu i počne sa vežbama, koje mobilišu čitav lokomotorni sistem" (Živković, 1998, 97). Uzroci nastanka loših držanja tela su uglavnom loše navike kao što su nepravilno sedenje, stajanje i nošenje školske torbe, kao i neodgovarajuća obuća (B. Protić-Gava, T. Šćepanović, 2016). Mnogi autori se bave očuvanjem zdravlja dece od tri do deset godina, jer je opštepoznato da treba posvetiti značajnu pažnju svestranoj motoričkoj pripremi ovog uzrasta. Dete najviše trajnih iskustava stiče u najranijim periodima svoga života, a zatim se to nastavlja kroz planski organizovane programe u vaspitno-obrazovnim institucijama (G.Ákoshegyiné Hild & A. Simonné Christián, 1995). Iz ranije navedenog se može zaključiti da nije dovoljno samo uticati na pravilno držanje tela, već je neophodno i oblikovati ga pravilno od najranijih dana, to jest od predškolskog uzrasta. Stoga se pojavljuje potreba da realizatori aktivnosti u predškolskim ustanovama, a i časova fizičkog vaspitanja u mlađem školskom uzrastu, budu na adekvatan način osposobljeni za realizaciju postavljenih zadataka, koje pred njih postavlja nastavni program. Nije dovoljno da se u sklopu metodike fizičkog vaspitanja spomenu koja su loša držanja tela i da treba preventivno delovati da ne bi došlo do njihovog pojavljivanja, potrebno je da vaspitači i učitelji steknu znanja o uzrocima njihovog nastanka, kao i sa prevencijom istih, da bi što uspešnije mogli realizovati zadatke koji su pred njih postavljeni. Naravno, učitelji i vaspitači se neće baviti postavljanjem dijagnoze, jer je to posao lekara specijalista, oni mogu samo da procene, na osnovu posmatranja, držanje tela deteta, da daju svoje mišljenje o istom, i da upute dete kod lekara specijaliste, te nakon utvrđivanja dijagnoze, primenom određenog programa korektivnih vežbi, pomogne u otklanjanju nastajućeg lošeg držanja tela.

Prema tome, problem rada predstavlja mesto korektivne gimnastike u programu obrazovanja vaspitača i učitelja.

Cilj ovog rada je da se ukaže na značaj uvođenja korektivne gimnastike kao obaveznog predmeta u programe pedagoških i učiteljskih fakulteta i visokih strukovnih škola za obrazovanje vaspitača.

Pregledom dosadašnjih istraživanja želi se ukazati na potrebu uvođenja ovog predmeta u obrazovanje učitelja i vaspitača, pa se zbog toga dosadašnja istraživanja baziraju na držanju tela dece predškolskog i mlađeg školskog uzrasta, kao i potrebu primene preventivno-korektivnih programa u vaspitno-obrazovnom radu tih uzrasnih grupa.

There is a large presence of kyphotic and scoliotic posture in primary school children and corrective activities and preventive work are needed to prevent the occurrence of postural disorders and body deformities in the frontal and sagittal plane. “In addition to physical education teachers, educators in preschool institutions, as well as teachers in lower grades of primary schools, should be maximally educated in order to recognize certain postural disorders and physical deformities in the population of students they encounter in their daily work.” (Bogdanović i sar., 2010,408).

In their paper, the authors state that 30% of children have the first degree of foot deformity, and 6.7% degree of foot depression - flat feet, which should not be neglected, but special attention should be paid to the importance and need for organized physical education of preschool children. To improve postural status, they recommend the introduction of targeted activities in all age groups, which would include prevention and correction of the feet, as well as that “In addition to physical targeted activities, which should be carried out daily, postural status can be influenced by other activities and forms of work such as moving games and morning physical exercise, and if necessary to conduct individual work with children with postural disorders. ”(Stanišić, Đorđević, Maksimović 2014, 68).

Sabo (2006) in a study assessing the postural status of 1259 preschool children in Vojvodina, says that a large number of children have functional stages of deformity in almost all body segments and that there is a danger that they will undergo structural changes that can affect health, functioning of the organism and its working ability. Since in most cases they are functional deformities, they can be eliminated by corrective exercise in preschool institutions and schools.

In the territory of Novi Sad, 70% of preschool children have a deviation from the correct posture of the spine and 60% of children have lowered feet, so it is recommended that children at that age be included in corrective treatment and that “Implementing corrective work in the program of daily preschool activities institutions would significantly contribute to the prevention of functional disorders, ie their growth (at a somewhat later age) into structural disorders ”(R. Romanov i sar. 2014, 135).

In the results of research conducted on the posture of preschool children, aged four to seven years in Vojvodina, which were published in the research monograph “Anthropological characteristics and abilities of preschool children”, V. In the discussion, Djordjic states that the segments for which the musculature is properly held have a higher prevalence of poor posture, so the em-

Postoji veliko prisustvo kifotičnog i skoliotičnog držanja kod dece osnovnoškolskog uzrasta i da su potrebne korektivne aktivnosti i preventivni rad koji ima za cilj sprečavanje pojave posturalnih poremećaja i telesnih deformiteta u frontalnoj i sagitalnoj ravni. “Potrebno je da pored pedagoga fizičke kulture, vaspitači u predškolskim ustanovama, kao i učitelji u nižim razredima osnovnih škola, budu maksimalno edukovani u cilju prepoznavanja pojedinih posturalnih poremećaja i telesnih deformiteta kod populacije učenika sa kojima se u svom svakodnevnom radu susreću.“ (Bogdanović i sar. 2010,408).

U svom radu, autori navode da 30% dece ima prvi stepen deformiteta stopala, a 6,7% stepen spuštenosti stopala – ravna stopala, što ne treba zanemariti, već se posebna pažnja treba posvetiti značaju i potrebi organizovanog fizičkog vaspitanja dece predškolskog uzrasta. Za poboljšanje posturalnog statusa preporučuju uvođenje usmerenih aktivnosti, u svim uzrasnim grupama, u sklopu kojih bi se radilo na prevenciiji i korekciji stopala, kao i da „Pored fizičkih usmerenih aktivnosti, koje svakodnevno treba sprovoditi, na posturalni status može se uticati i drugim aktivnostima i formama rada kao što su pokretne igre i jutarnje telesno vežbanje, a po potrebi sprovoditi i individualni rad sa decom sa posturalnim poremećajima.“ (Stanišić, Đorđević, Maksimović 2014, 68).

Sabo (2006) u istraživanju koje se bavi procenom posturalnog statusa 1259 dece predškolskog uzrasta u Vojvodini, govori da veliki broj dece ima funkcionalne stadijume deformiteta u skoro svim segmentima tela i da postoji opasnost da oni pređu u strukturalne promene, koje mogu uticati na zdravlje, funkcionisanje organizma i njegove radne sposobnosti. Pošto su u većini slučajeva funkcionalni deformiteti, oni se mogu otkloniti korektivnim vežbanjem u predškolskim ustanovama i školama.

Na teritoriji Novog Sada kod 70% dece preškolskog uzrasta postoji odstupanje od pravilnog držanja kičmenog stuba i 60% dece ima spuštena stopala, te je preporučljivo da se deca već na tom uzrastu uključe u korektivi tretman i da „Implementiranje korektivnog rada u program dnevnih aktivnosti predškolske ustanove značajno bi doprineo predupređivanju funkcionalnih poremećaja odnosno njihovom prerastanju (u nešto kasnijem uzrastu) u strukturalne poremećaje“ (R. Romanov i sar. 2014, 135).

U rezultatima istraživanjima koja su sprovedena o držanju tela dece predškolskog doba, uzrasta od četiri do sedam godina na području Vojvodine, koja su objavljena u istraživačkoj monografiji „Antropološke karakteristike i sposobnosti predškolske dece“, V. Đorđić u diskusiji

phasis in preventive programs for preschool children is on "establishing the optimal balance of muscles responsible for holding the anterior abdominal wall, shoulders and shoulders." , and the arches of the feet. ", as well as that" In addition to strengthening the abdominal muscles, shoulder-scapular muscles and deep back muscles and the muscles of the feet and lower legs, their antagonists should be stretched "(V. Đorđić, 2007, 191).

S. Simov i sar. (2011) conducted a study, which assessed the posture of the bodies and feet of 968 preschool children aged six and seven. The results of the research show that 36.16% of children do not have postural disorders, 54.54% have one deformity, and 9.30% have children with two or more deformities. Of this number, according to the type of deformity, most children 30.78% have a lowered arch of the foot, 5.88% have chest deformities, 10.03% have spinal deformities.

Practice shows that early diagnosis of poor posture of children of younger school age is not given enough attention, they are only included in systematic examinations. The postural status of younger school-age children is deteriorating due to a sedentary lifestyle and this is noticeable in both urban and rural areas, among which there is not much difference in the occurrence of poor posture. (Vukićević i sar., 2018).

With the arrival of the child in primary school, proper posture "The teacher, for his part, can contribute in such a way that during work, when all the child's attention is focused on mastering reading and writing, so he often does not take into account the position of his own body, to warn him in relation to the way of sitting, to the position of the head, arms, shoulders and back and legs "(Živković, 1998, 88-89). According to the child, it would be a "sin" when in this period of his biological development, in which he has the greatest motor activity, when his need for movement is most pronounced, and his motor activities are most intensively developed, enough stimuli are left out, because that would lead to the appearance of negativity, which would primarily manifest itself in posture, endurance, strength, coordination of movements, etc. (Ákoshegyiné Hild, G. & Simonné Christián, A. 1995). However, not every movement can be used for prevention and correction. The movement should be targeted, to act on certain muscle groups that need to be strengthened, toned or stretched at a given time in accordance with the characteristics of a certain poor posture or deformity, and "Many authors believe that good postural status depends on health the condition of the individual (Lj. Radojčić - Finkelstein) "(D. Ulić, 1997, 51). The same author states that improper posture

navodi, da je kod segmenata za čije je pravilno držanje odgovara muskulatura, veća zastupljenost loših držanja tela, pa je zbog toga akcenat u preventivnim programima za predškolsku decu na „uspostavljanju optimalnog balansa mišića odgovornih za držanje prednjeg trbušnog zida, ramena i lopatica, te svodova stopala.", kao i da „Osim jačanja trbušnih mišića, rameno-lopatičnih mišića i dubokih mišića leđa i mišića stopala i potkolenice, treba istezati njihove antagoniste" (V. Đorđić, 2007, 191).

S. Simov i sar. (2011) su sproveli istraživanje, u kome je ocenjivano držanje tela i stopala 968 dece predškolskog uzrasta od šest i sedam godina. Rezultati istraživanja govore o tome da 36,16% dece nema posturalnih poremećaja, sa jednim deformitetom je 54,54%, a sa dva i više deformiteta je 9,30% dece. Od ovog broja prema vrsti deformiteta, najviše dece 30,78% ima spušteni svod stopala, 5,88% ima deformitete grudnog koša, 10,03% ima deformitete kičme.

Praksa pokazuje da se ranom dijagnostifikovanju loših držanja tela dece mlađeg školskog uzrasta ne pridaje dovoljna pažnja, ona se jedino kostatuju na sistematskim pregledima. Posturalni status dece mlađeg školskog uzrasta je sve lošiji zbog sedentarnog načina života i to je uočljivo kako u urbanim tako i ruralnim sredinama, među kojima ne postoji velika razlika u pojavljivanju loših držanja tela. (Vukićević i sar., 2018)

Dolaskom deteta u osnovnu školu, pravilnom držanju tela „Učitelj sa svoje strane može da doprinese na taj način, što će za vreme rada, kada je sva pažnja deteta usmerena ka savladavanju čitanja i pisanja, tako da često ne vodi računa o položaju sopstvenog tela, da ga opomene u odnosu na način sedenja, na položaj glave, ruku, ramena i leđa i nogu" (Živković, 1998, 88-89). Prema detetu bi bio "greh", kada se u ovom periodu njegovog biološkog razvoja, u kome ima najveću kretnu aktivnost, kada mu je potreba za kretanjem najizraženija, a i kretne aktivnosti mu se najintenzivnije razvijaju, izostaviti dovoljno podsticaja, jer bi to dovelo do pojave negativnosti, koje bi se prvenstveno manifestovale na držanju tela, izdržljivosti, snazi, koordinaciji izvođenja pokreta pokreta itd. (Ákoshegyiné Hild, G. & Simonné Christián, A. 1995). Međutim, ne može se svaki pokret koristiti u cilju prevencije i korekcije. Pokret treba da bude ciljano odabran, da deluje na određene mišićne grupe koje je u datom momentu neophodno jačati, tonizirati ili istezati u skladu sa karakteristikama određenog lošeg držanja tela ili telesnog deformiteta, a i „Mnogi autori su mišljenja da od dobrog posturalnog statusa zavisi zdravstveno stanje pojedinca (LJ. Radojčić – Finkelštajn)" (D. Ulić, 1997, 51). Isti autor navodi da nepravilno držanje tela dovodi

leads to fatigue, mood swings, headaches, and all this can have an impact on the individual's psyche.

From the above, it can be concluded that the disturbed postural status is present in children already in preschool age, that it can be corrected by regular corrective exercise and that this exercise should be present in everyday activities of children from preschool age.

Insight into the programs, basic academic studies of the faculties of sports and physical education, pedagogical and teacher training faculties, as well as vocational colleges for educators, we can conclude that Corrective Gymnastics or Kinesitherapy appears in some pedagogical and teaching faculties and vocational colleges for educators. as an elective subject, and even less often as a compulsory subject, while at the Faculty of Sports and Physical Education Corrective Gymnastics or Kinesitherapy appear as compulsory subjects in undergraduate studies. Therefore, we can conclude that at pedagogical and teacher training faculties, as well as vocational colleges, students who have opted for this elective subject, or if some have a compulsory subject, learn more about the importance of proper posture and its impact on proper growth and development and general health of children, as well as contents that can be applied as preventive, both as part of activities in preschool and in physical education classes at a younger school age. In addition, within the subject Methodology of Physical Education, there is not enough space to deal with this issue, because the contents of this subject are focused primarily on planning, organization and implementation of targeted activities and classes of physical education.

In accordance with the above, there is a need to introduce Corrective Gymnastics at pedagogical and teacher training colleges, as well as high schools of vocational studies for educators. Within this course, basic knowledge in this very important area would be acquired, which directly affects the proper growth, development and health of preschool and young school children, because as can be seen from previous research and previously analyzed literature, this period of child growth and development represents a period in which the foundations of proper posture can be laid in the best way, and in later ages when some deviations from proper posture have already appeared, we must painstakingly eliminate them with corrective exercise, which involves a very long process of exercise.

During the lecture, students would get acquainted with the correct posture and its preservation, as well as with the locomotor system and its parts, then with the impact of exercises on muscle groups that ensure proper posture in standing position and in a sitting position, and

do zamora, neraspoloženja, glavobolja, a sve to može da ima uticaja i na psihu pojedinca.

Iz navedenog se može zaključiti da je narušen posturalni status prisutan kod dece već u predškolskom dobu, da se on redovnim korektivnim vežbanjem može korigovati i da bi to vežbanje trebalo da bude prisutno u svakodnevnim aktivnostima dece već od predškolskog uzrasta.

Uvidom u programe, osnovnih akademskih studija fakulteta za sport i fizičko vaspitanje, pedagoških i učiteljskih fakulteta, kao i visokih škola strukovnih studija za vaspitače, možemo zaključiti da se Korektivna gimnastika ili Kineziterapija na ponekim pedagoškim i učiteljskim fakultetima i visokim školama strukovnih studija za vaspitače pojavljuje kao izborni predmet, a još ređe kao obavezni predmet, dok se kod fakulteta za sport i fizičko vaspitanje Korektivna gimnastika ili Kineziterapija pojavljuju kao obavezni predmeti na osnovnim studijama. Stoga možemo zaključiti da se na pedagoškim i učiteljskim fakulteta, kao i visokim školama strukovnih studija za vaspitače studenti koji su se opredelili za ovaj izborni predmet, ili ukoliko kod nekih postoji obavezan predmet šire i detaljnije upoznaju sa značajem pravilnog držanja tela i njegovim uticajem na pravilan rast i razvoj i opšte zdravlje dece, kao i sadržajima koje mogu primenjivati kao preventivne, kako u sklopu aktivnosti u predškolskim, tako i na časovima fizičkog vaspitanja u mlađem školskom uzrastu. Sem toga, u sklopu predmeta Metodika fizičkog vaspitanja, nema dovoljno prostora da se bavi ovom problematikom, jer su sadržaji ovog predmeta usmereni pre svega na planiranje, organizaciju i realizaciju usmerenih aktivnosti i časova fizičkog vaspitanja.

Shodno ranije navedenom, pojavljuje se potreba uvođenja Korektivne gimnastike na pedagoške i učiteljske fakultete, kao i visoke škole strukovnih studija za vaspitače. U sklopu ovog predmeta bi se stekla osnovna znanja iz ove veoma važne oblasti, koja direktno utiče na pravilan rast, razvoj i zdravlje dece predškolskog i mlađeg školskog uzrasta, jer kao što se vidi iz dosadašnjih istraživanja i ranije analizirane literature ovaj period dečijeg rasta i razvoja predstavlja period u kome se na najbolji način mogu postaviti temelji pravilnog držanja tela, a u kasnijim uzrastima kada su se već pojavila neka odstupanja od pravilnog držanja tela, njih moramo mukotrpnim radom otklanjati korektivnim vežbanjem, koje podrazumeva jedan veoma dugotrajan proces vežbanja.

Studenti bi se u toku predavanja upoznali sa pravilnim držanjem tela i njegovim očuvanjem, kao i sa lokomotornim aparatom i njegovim delovima, zatim sa uticajem vežbi na grupe mišića koje obezbeđuju pravil-

in during movement. She would gain basic knowledge about poor posture and the causes of their occurrence, with special emphasis on acquired poor posture and deformities, as it is known that one of the "critical" periods for the occurrence of poor posture is the period of children's departure to school. he spends in a sitting position, both at school and at home while doing homework, all of which reduces the time he has left for physical activity. Then they would get acquainted with the harmful influences of the modern way of life on the movement of children and hypokinesia, as a consequence of the same. During the exercises, students would get acquainted with the contents used in the prevention of poor posture, as well as body deformities, with the impact of specific exercises on certain muscle groups, as well as with exercises and games that can be applied in daily activities and physical education classes. . Then they would be introduced to exercises that serve to correct certain bad postures of the spine, chest, legs and feet, which are most common in children. They would get acquainted with the ways and possibilities of correcting posture and other activities and classes during their stay in preschool institutions and schools.

Addressing this issue would draw the attention of educators and teachers to the importance and significance of physical education of children, as well as proper posture, which has a direct impact on the proper growth, development, and thus the health of children.

Conclusion

by studying previous research on the posture of children of preschool and primary school age, we can conclude that a large percentage of children of this age have incorrect posture, which is alarming, because it is known that posture takes shape at these ages. Therefore, there is a need for educators and teachers, both in activities and physical education classes, and during the stay of children in kindergartens and schools, to take care that the process of forming body posture runs in the direction of proper. In addition, it is known that during the day, children spend most of their time in kindergartens and schools, and especially in school in a sitting position. Therefore, teachers should take into account how children sit during classes and instruct them with their suggestions on proper posture, while it would be desirable for educators, in kindergartens, to teach children to sit properly before going to school. In addition to working with children, educators and teachers could include parents, i.e. to draw their attention to correct the posture of their child during their stay at home and to include him

no držanje tela kako u stojećem stavu, tako i u sedećem položaju, a i u toku kretanja. Stekla bi osnovna znanja o lošim držanjima tela i uzrocima njihovog nastanka, s posebnim akcentom na stečena loša držanja i deformitete, pošto se zna da je jedan od „kritičnih" perioda za nastanak loših držanja tela period polaska dece u školu, pošto dete sve više vremena provodi u sedećem položaju, kako u školi tako i kod kuće dok izvršava domaće zadatke, a sve to mu smanjuje vreme koje mu preostaje za fizičku aktivnost. Potom bi se upoznali sa štetnim uticajima savremenog načina života na kretanje dece i hipokinezijom, kao posledicom istog. Na vežbama bi se studenti upoznali sa sadržajima koji se primenjuju u prevenciji nastanka loših držanja tela, kao i telesnih deformiteta i to sa uticajem konkretnih vežbi na određene mišićne grupe, kao i sa vežbama i igrama koje mogu primenjivati u svakodnevnim aktivnostima i na časovima fizičkog vaspitanja. Potom bi bili upoznati sa vežbama koje služe za korekciju određenih loših držanja kičmenog stuba, grudi, nogu i stopala, koja su najčešće zastupljena kod dece. Upoznali bi se sa načinima i mogućnostima korigovanja držanja tela i na drugim aktivnostima i časovima u toku boravka u predškolskim ustanovama i školama.

Bavljenje ovom problematikom bi u većoj meri skrenulo pažnju vaspitača i učitelja na važnost i značaj fizičkog vaspitanja dece, kao i pravilno držanje tela, koje ima direktan uticaj na pravilan rast, razvoj, a time i zdravlje dece.

Zaključak

Izučavanjem dosadašnjih istraživanja o držanju tela dece predškolskog i mlađeg školskog doba možemo zaključiti, da veliki procenat dece ovog uzrasta ima nepravilno držanje tela, što je alarmantno, jer se zna da se držanje tela uobličava u ovim uzrastima. Stoga se pojavljuje potreba da vaspitači i učitelji kako na aktivnostima i časovima fizičkog vaspitanja, tako i tokom boravka dece u vrtićima i školama, vode računa da taj proces formiranja držanja tela teče u pravcu pravilnog. Sem toga se zna, da u toku dana skoro najviše vremena deca provedu u vrtićima i školama, a pogotovo u školi u sedećem položaju. Prema tome, učitelji i u toku nastave treba da vode računa o tome kako deca sede i da ih svojim sugestijama upućuju na pravilno držanje tela, dok bi bilo poželjno da vaspitači, u vrtićima, decu pre polaska u školu nauče pravilnom sedenju. Pored rada sa decom, vaspitači i učitelji bi mogli da uključe i roditelje, tj. da im skrenu pažnju da u toku boravka kod kuće koriguju držanje tela svoga deteta i da ga što više uključuju u sportske ili rekreativne aktivnosti, kako bi sprečili pojavu hipokinezije, koja

as much as possible in sports or recreational activities, in order to prevent the occurrence of hypokinesia, which is gaining momentum in modern society and directly affects the health of children and adults.

Based on previous analyzes and findings, there is a need for the introduction of corrective gymnastics, as a compulsory subject, in undergraduate studies, so that students are introduced to ensuring proper posture and its significant impact on growth and development, and general health of the child. together with the acquired knowledge from the methodology of physical education could be very easily applied in practice. Thus, after the end of their education, educators and teachers could act preventively in their work in a timely manner, so that future generations would have the correct posture, and thus a better general health condition.

u savremenom društvu uzima sve više maha, a direktno utiče na zdravlje kako dece tako i odraslih.

Na osnovu prethodnih analiza i konstatacija pojavljuje se potreba za uvođenjem korektivne gimnastike, kao obaveznog predmeta, na osnovnim studijama, da bi se studenti pravovremeno upoznali sa obezbeđivanjem pravilnog držanjem tela i njegovim značajnim uticajem na rast i razvoj, a i opšte zdravlje deteta, što bi zajedno sa stečenim znanjima iz metodike fizičkog vaspitanja mogli veoma lako primenjivati u praksi. Tako bi po završetku svog obrazovanja, vaspitači i učitelji mogli pravovremeno preventivno da deluju u svom radu, pa bi nam buduće generacije imale pravilno držanje tela, samim tim i bolje opšte zdravstveno stanje.

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