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Journal of Anthropology of Sport and Physical Education

ORIGINAL SCIENTIFIC PAPER

The effects of aerobic exercsie program on the bilateral coordination of preschool children

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Abstract

The aim of this study was to determine the effects of aerobic exercise program on the bilateral coordination of preschool children. The boys and girls (n = 60), aged five to six, were randomly assigned to the experimental group (n = 30) or the control group (n = 30). The children in the experimental group were involved in aerobic training program over a 12-week period. Three training sessions were performed per week, lasting 30 minutes each. For the evaluation of children's coordination, the Bilateral Coordination subtest from the BOT-2 (Bruininks-Oseretsky Test of Motor Proficiency) battery of tests was used. The children completed seven different tasks, both at the initial and the final measurement, which were further used to calculate the total score. To determine the changes in bilateral coordination, the two-factor (group × time) univariate analysis of variance (ANOVA) was used, while the effect size, presented by the partial Eta squared, was calculated for each task and the total score. A non-significant effect ($p = .280$) was observed for the task "Touching Nose with Index Fingers - Closed Eyes", whereas a significant improvements in all the other tasks and the total score were found in the intervention group ($p < .05$). The magnitude of effect size ranged from medium to large. The findings indicate that the aerobic exercise program contributes to the development of bilateral coordination in preschool children.

Keywords: *Aerobic training, Motor abilities, Bilateral movement, Preschoolers, BOT-2*

Introduction

The preschool age, which represents one of the most crucial stages in the development of personality, ranges from the ages of three to seven. During the preschool period it is immensely important for a child to encounter with innumerable motor tasks (Venetsanou & Kambas, 2004). Specifically, the basic exercises for developing fundamental motor abilities are preferable, including those with coordination and balance elements (Derri et al., 2001). Fine motor skills are often described as smaller muscle movements performed in order to manipulate objects (Bratovčić et al., 2016; Luo et al., 2007), while bilateral coordination refers to the ability to perform movements which involve simultaneous use of both sides of the body (Gazbare et al., 2020; Rutkowska, et al., 2016; Uzunovic, et al., 2018). An adequate level of bilateral coordination, which indicates that both sides of the brain have integrated function (Karambe et al., 2017), can be developed as early as preschool age (Katanić et al., 2020).

The commonly used protocol for evaluating the coordination of preschool children is the Bruininks-Oseretsky test of motor proficiency (BOTMP) (Jirovec, Musalek & Mess, 2019). The second edition (BOT-2) represents a standardized protocol, mostly used in the field of medicine for the assessment of those between the ages of four and 21 (Brown, 2019). That includes experts, such as pediatricians, physiotherapists and physical education teachers, in whose profession the application of the BOT-2 is observed. The BOT-2 uses a composite structure that encompasses four motor areas: fine motor manual control, manual coordination, body coordination and strength and agility, with which it covers a total of 53 tasks (Bruininks & Bruininks, 2005). The body coordination composite contains the bilateral coordination subtest, where the number of performance trials for each task is specified. A raw score, previously obtained for each task, is further used to calcu-

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late a numerical point score (Balakrishnan & Rao, 2007).

Various evidence can be found as well, supporting the effects of physical exercise on motor abilities in children. Despite the fact that numerous authors highlighted the positive effects that physical exercise has on the motor abilities of preschool children (Bellows et al., 2013; De Privitellio et al., 2007; Jaksic et al., 2020; Popovic et al., 2020; Roth et al., 2015), researches investigating the motor coordination of children are mainly conducted on primary school students, given that the relationship between coordination and academic achievement is among the primary interests (Axford, Joosten & Harris, 2018; Lopes et al., 2013; Piek et al., 2004; Rigoli et al., 2013; Rosa Guillamón, García Cantó & Martínez García, 2020). When it comes to the effects of aerobic exercise on the motor development of preschoolers, Puder (2011) reported better results in running tasks in children in the intervention group compared to the non-aerobic exercise group. Further, it was reported that children, involved in moderate to vigorous physical activity, had better gross motor coordination compared to sedentary children at the age of six (De Souza et al., 2014).

Contrary to the aforementioned, there is a lack of studies dealing with the aerobic exercise and the coordination of preschool children in the region of South East Europe. To our knowledge, the recent study of Katanić and associates (2022) was the first to investigate the effects of a specific aerobic training program on bilateral coordination of preschoolers. A significant effect was determined as the 12-week intervention program contributed to better results on the test of fine motor coordination ($p = .020$), bilateral coordination ($p = .000$) and body coordination ($p = .000$) (Katanić et al., 2022). Opposed to the expectations, authors have reported a non-significant effect of a training program on cognitive abilities. Consequently, understanding the impact of aerobic exercise on the specific cognitive abilities and the specific coordination skills requires further research. That includes the bilateral coordination, given that there is an insufficient data regarding aerobic exercise and bilateral movements in preschoolers. Moreover, investigating the impact of the specific training program on the bilateral coordination might be of great importance not only for coaches and teachers, but for medical staff as well, since bilateral movement has been brought into connection with synchronized brain function.

Therefore, the aim of this study was to determine the effects of 12-week aerobic exercise program on the bilateral coordination, estimated with BOT-2 battery of tests, in preschool children.

Methods

Participants

The longitudinal study design was adopted, which involved the participation of 60 preschool children, aged five to six. In randomized order, participants were assigned to two groups: 1) experimental group (n = 30, girls 18, and boys 12) from preschool institution "Pionir" Jagodina, which are performed aerobic training program (ATP); 2) control group (n = 30, girls 16, boys 14) from preschool institution "Pčelice" Jagodina.

The research, which was carried out in accordance with the Declaration of Helsinki, was approved by the Faculty of Sport and Physical Education in Niš. The benefits, risks and procedures involved with participation were explained to the parents/guardians. Further, their right to withdraw from the study, at any time, was emphasized to them prior to testing. A permission was obtained as all of the parents and guardians gave their written consent for the children's participation.

Procedures

The initial testing for the Experimental group was on December 14, 2021, and the final testing on December 22, 2021 in the gymnasium of the "Pionir" preschool institution in Jagodina. While the Control group conducted the initial testing on December 14, 2021, and the final testing on December 22, 2021 in the gymnasium of the preschool institution "Pčelice" in Jagodina. The testing was always carried out at the same time (10:30h), so as to preclude daily variations in the measurement. The air temperature in the room during testing ranged from 22°C to 24°C.

Instruments

Bilateral Coordination

For the evaluation of the bilateral coordination, the subtest from the BOT-2 (Bruininks-Oseretsky Test of Motor Proficiency) battery of tests was used. Subtest 4 "Bilateral Coordination", which has shown considerable validity (Deitz, Kartin, & Kopp, 2007), was administered to all participants. In addition, Bruininks and Bruininks (2005) presented evidence for the validity of subtest 4 in the Manual.

The tests, both initial and final, were conducted in accordance with the BOT-2 instructions (Bruininks & Bruininks, 2005). The "Bilateral Coordination" subtest consist of 7 different tasks, which each participant had to perform. The acquired raw scores were used to calculate the numerical score, based on the standardized BOT tables in relation to gender and age. The raw score for each task was converted into a score rated on a scale of 0 to 3, or 4 selection points, in accordance to the study protocol of the BOT-2 (Bruininks & Bruininks, 2005). The sum of raw scores from all the seven tasks ranged from 0 to 24 points. The obtained results were used for further analysis.

Participants performed seven tasks:

1. Touching Nose with Index Fingers—Eyes Closed (point score: 0–4 pt).
2. Jumping Jacks (point score: 0–3 pt).
3. Jumping in Place—Same Sides Synchronized (point score: 0–3 pt).
4. Jumping in Place—Opposite Sides Synchronized (point score: 0–3 pt).
5. Pivoting Thumbs and Index Fingers (point score: 0–3 pt).
6. Tapping Feet and Fingers—Same Sides Synchronized (point score: 0–4 pt).
7. Tapping Feet and Fingers—Opposite Sides Synchronized(point score: 0–4 pt).

The experimental program

The aerobic training program , which was used in previous research (Katanić et al., 2022), was created according to the guidelines of leading health institutions (US Department of Health and Human Services, 2008; World Health Organization, 2010). The intervention program was conducted over a period of 12 weeks. Each week of the intervention program included three training sessions, lasting 30 minutes. Training sessions consisted of three phases: the warm-up phase, main phase, and the cool-down phase (Table 1).

The purpose of the warm-up phase was to adequately and gradually prepare participants for the intensity in the main phase. Therefore, the warm-up phase was carried out at the beginning of every training session, lasting 5 minutes approximately, and including a low intensity dynamic exercise (marching or skipping) with simultaneous performance of shaping exercises. The main phase consisted of 8 to 10 cycles. According to the recommendations for aerobic interval training (Garzon, 2018), the each cycle included one high intensity exercise, followed by low intensity exercise, where the duration of each was 30 seconds. The cycle was performed twice. Subsequently, the following cycle was performed, which was repeated until all the cycles were completed. Completing 8 to 10 cycles lasted for approximately 20 minutes,

which was in accordance with the guidelines of Garzon (2018), who outlined that the duration of aerobic activities should be over 10 minutes. The primary goals of the cool-down phase were to reduce the heart rate and to gradually lower the body temperature. The cool-down phase represented the last part of each training session, lasting approximately 5 minutes, and including low intensity aerobic exercise with stretching and breathing exercises. The aerobic exercise of low intensity included light walking or marching in place, while stretching exercises involved maintaining a given position for 10 to 15 seconds.

Table 1. The structure of the aerobic training session (adapted from Katanić et al., 2022).

	Training session		
	Warm-up phase	**Main phase**	**Cool-down phase**
Activity	Low intensity aerobic exercise + dynamic stretching exercises	Cycle: 1 high intensity exercise - 30″ 1 low intensity exercise - 30″	Low intensity aerobic exercise + stretching and breathing exercises
Cycle	1	8-10	1
Duration	5min	20min	5min

Statistical analysis

All statistical analyses were performed in the IBM SPSS 25 software (Statistical Package for Social Sciences, v25.0, SPSS Inc., Chicago, IL, USA). The normality of the data was confirmed by the Kolmogorov-Smirnov test. The descriptive analysis of the data for general characteristics and measures of the BOT-2 battery tests was applied for each group. Changes in bilateral coordination parameters were compared for the experimental and the control group using two-factor (group × time) univariate analysis of variance (ANOVA). The effect size (ES), represented by the partial Eta squared (ηp^2), was calculated for each task and the total score. The magnitude of the ES values were interpreted as:small (< 0.010); medium (0.011 - 1.137); large (> 1.138)(Cohen, 1988). All p-values less than 0.05 were considered significant for 95% level of probability.

Results

The results of the bilateral coordination tests, obtained on the initial and the final measurement, as well as the effect of the aerobic exercise program, are presented in Table 2.

Table 2. The changes in bilateral coordination after the intervention period for the aerobic training group (n = 30) and the control group (n = 30).

Tasks	Aerobic training group		Control group		F	p	ηp^2	Magnitude
	Initial	Final	Initial	Final				
TNWIFCE	3.90 ± 0.55	4.00 ± 0.00	3.73 ± 0.83	3.87 ± 0.51	1.189	.280	.020	medium
JJ	1.90 ± 0.92	3.00 ± 0.00	1.97 ± 1.19	2.20 ± 1.13	29.662	.000	.342	large
JIPSSS	2.16 ± 1.21	3.00 ± 0.00	2.57 ± 0.86	2.77 ± 0.68	7.064	.010	.110	medium
JIPOSS	0.63 ± 1.07	2.57 ± 0.86	0.63 ± 1.13	0.87 ± 1.22	65.993	.000	.537	large
PTAIF	1.30 ± 1.15	2.60 ± 0.81	1.50 ± 1.31	2.20 ± 1.13	5.533	.022	.088	medium
TFAFSSS	3.53 ± 1.07	4.00 ± 0.00	3.40 ± 1.10	3.60 ± 0.81	9.735	.003	.146	large
TFAFOSS	1.36 ± 1.47	3.60 ± 0.56	1.03 ± 1.25	1.43 ± 1.50	82.124	.000	.590	large
Total score	14.80 ± 4.11	22.77 ± 1.59	14.83 ± 4.59	16.93 ± 4.30	128.339	.000	.692	large

TNWIFEC - Touching Nose with Index Fingers—Closed Eyes; JJ - Jumping Jacks; JIPSSS - Jumping in Place—Same Sides Synchronized; JIPOSS - Jumping in Place—Opposite Sides Synchronized; PTAIF - Pivoting Thumbs and Index Fingers; TFAFSSS - Tapping Feet and Fingers—Same Sides Synchronized; TFAFOSS - Tapping Feet and Fingers—Opposite Sides Synchronized; F - F statistic; p - significance; ηp2 - partial Eta squared.

The F value, statistical significance and the effect size were calculated for each task and the total score. A combined analysis of variance (ANOVA) showed that there was no significant effect of aerobic training on the first task in Bilateral Coordination subtest (p = .280), which refers to "Touching Nose with Index Fingers - Closed Eyes". However, a significant effect of the intervention protocol on the remaining tasks was established (p = .000 - .022), where the magnitude of the effect size ranged from medium to large. In addition, the effect of the aerobic training program on the total score was significant as well (p = .000). The effect size was rated as large, since the partial Eta squared reached the value of .692.

Discussion

This study investigated the effects of a 12-week aerobic exercise program on bilateral coordination in preschool children. A non-significant effect was observed for the task "Touching Nose with Index Fingers - Closed Eyes", whereas a significant improvements in all the other tasks and the total score were found in the aerobic training group. The magnitude of the ES ranged from medium to large, indicating that the aerobic training program contributed considerably to the development of bilateral coordination in preschool children.

The body coordination, as the basis of motor development, also represents one of the main elements of children's cognitive abilities (Goodway, et al., 2019). Within it, the starting point for any complex movement (e.g sports technique) is well developed bilateral coordination (Veljković, Katanić & Ilić, 2020). Hence, it is immensely important to correct any irregularities in motor coordination at preschool age (Katanić et al., 2020).

Based on the obtained results, it could be argued that aerobic exercise contributes to the development of bilateral movements, which is in accordance with previous research. Namely, in the aforementioned study of Katanić and associates (2022) the effect of aerobic training program on the cognitive and motor abilities was investigated. Authors reported a significant (p =

.000) positive effect of a program on the bilateral coordination in preschoolers (Katanić et al., 2022). Further, a positive effect on the bilateral coordination was reported, when the experimental program consisted of sports activities (De Privitellio et al., 2007; Uzunović et al., 2018). Additionally, an improvements were observed when preschoolers performed dance movements (Pantelić et al., 2018). The existing data indicate that aerobic training, regardless of the type of activity, contributes to the development of coordination. Indeed, a significant, positive effect of various aerobic activities on the coordination of preschoolers has been established (Bellows et al., 2017; Birnbaum et al., 2017; Krneta et al., 2015).

For this particular study, the exercises used in each training phase may represent the explanation for such a large effect of the training program. The bilateral movements observed in exercises such as marching or skipping, probably contributed to better limb synchronization. Moreover, performing a successive movements for 30 seconds require maintenance of the rhythm, which could further affect the development of bilateral coordination. When interpreting the results of this research should be borne in mind that the BOT-2 subtest for estimating the bilateral coordination may have been insufficiently demanding for older preschoolers. It was previously stated that the BOT-2 battery of tests is commonly used protocol for assessing the coordination in individuals with various types of limitations (Gupta, Rao & Kumaran, 2011; Hughes et al., 2018; Myrelid et al., 2010; Rutkowska et al., 2016; Yeh et al., 2021). Therefore, it should be considered that the test, although intended for the preschool age, may be insufficiently complex for children whose motor abilities are well developed. In support of this assumption are the similar results achieved by older preschoolers, which were, as reported, excellent in certain tasks of Bilateral Coordination subtest (Katanić et al., 2020; Veljković, Katanić & Ilić, 2020).

In addition to the aforementioned, several shortcomings need to be emphasized. Despite the fact that the identical number of respondents were in the intervention and the control group, both groups consisted of only 30 children. Further, the conducted aerobic training program was previously used (Katanić et al., 2022), hence it would be beneficial to investigate the effects of different aerobic exercises on bilateral movements at a young age. Should be taken into account that at preschool age many activities outside the training program, during the 12 weeks period, could affect the coordination, and thus the outcome. It is, therefore, necessary to limit activities outside of experimental treatment.

For further research, a larger sample should be provided with, preferably, a longer intervention period. Moreover, investigating the effect of aerobic training differently designed, is needed in order to comprehensively understand the impact on the bilateral coordination. Finally, authors should consider assessing the bilateral coordination with different protocol, more challenging and complex.

Conclusion

The findings in this study indicate that the application of aerobic training can be beneficial for the physical development of preschool children. It can be concluded that aerobic exercises also represent an adequate tool for improving the coordination of preschoolers, even though in practice they are rarely used for that purpose. Bearing in mind the positive effect of aerobic training on the bilateral coordination, physical education teachers and coaches should consider implementing this type of activities when working with children under seven years of age.

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Conflict of Interest
The authors declare that there is no conflicts of interest.

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Journal of Anthropology of Sport and Physical Education

ORIGINAL SCIENTIFIC PAPER

Analysis of postural disorders with preschool and school children at the regional level

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Abstract

The aim of this work is to collect relevant research from Montenegro and the region, and their adequate analysis and making meaningful conclusions. The selection of works was made on the basis of issues related to the postural status of preschool and school children and youth. The shortlist included 30 works, which dealt with diagnosing postural status, determining the effects of targeted corrective programs, examining differences in posture in children from urban and rural areas (as well as gender) and discovering the interdependence of deformities with certain segments of anthropological status (usually morphological characteristics).The following conclusions were made: according to almost all the results obtained, the postural status is significantly disturbed and endangered in a large number of children; observed changes in the segments of the locomotor system are mostly of the initial stage, ie. functional type; positive changes in posture have been observed under the influence of applied preventive and corrective exercise programs; equal vulnerability of postural status was found among children from urban and rural areas; the greatest differences in posture between the sexes occur during puberty, and they are detected predominantly on the spinal column; changes in the locomotor system are mostly related to the parameters of the longitudinal dimensionality of the skeleton. The obtained results indicate the need for the implementation of studies that would include the diagnosis and application of experimental exercise programs, in order to gain new experiences and knowledge when applying corrective gymnastics exercises in regular physical education classes.

Keywords: *Postural disorders, Preschool children, School children*

Introduction

The number of children with posture problems is drastically increasing every year, as is the number of students complaining of pain in some part of the locomotor system (Lafond et al., 2007). The reasons for this situation are multiple, but they stand out: hereditary factor, insufficient movement and physical exercise, obesity, ignorance of the period of evolution of improper posture, as well as untimely detection of postural disorders (Watson et al., 2002).

Maintaining a correct upright posture is extremely complex, and can only be achieved if the active forces of the organism (muscles) are able to overcome the action of external forces, primarily the forces of gravity (Jovovic, 2008). The scheme of arranging the mechanism of control and regulation of posture can be reduced to: mechanisms from higher levels (motor area of the cerebral cortex) where there is a vision of ideal posture, then to those mechanisms at the level of the spinal cord where what can be accepted is realized. as a significant role of the central reflex center which, by innervating the descending motor pathways, acts on the spinal mechanisms (Pausic, 2007).

One of the main components of the proper physical maturation of a child is proper posture. From it arise others: motor, functional, psychological, pedagogical, sociological and work. Therefore, a child who has the correct posture, as a rule, has developed anthropomotor abilities, functional characteristics that are reflected in the harmonious relationship and functioning of organs and organ systems, is psychologically stable - that has increased concentration and emotional relief, creates healthy living habits, has improved work discipline and increased tolerance in interpersonal relationships, and his productivity is above the defined average (Lafond et al., 2007).

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In the last two decades, there have been major changes in terms of reducing physical activity in preschool and school children and youth, which has been accompanied by an increase in the number of physical deformities in them. This is indicated by the results of systematic examinations and numerous specialized kinesiological researches that have been realized in our country and environment.

If, as individuals and the social community, our children's priority is the health of our children, and at the same time we do not react to the enormous progression of postural disorders in them, then it absolutely disqualifies us in terms of seriousness, individual and collective responsibility. One of the priority goals of this study is to draw the attention of all relevant actors to the seriousness of this issue.

Method

Criteria for inclusion in the analysis process were related to studies that addressed the issue of postural disorders in preschool and school children and youth from the territory of the former Yugoslavia. The time period taken into account in this context is from 1980. to 2018. The included studies were of a transversal or longitudinal character, and were published as articles in scientific and other relevant journals. The search for available scientific material was performed using an electronic database of scientific studies, "Google Scholar", using combinations of the following keywords: "postural disorders", "preschool children", "school children", "posture", "deformity", and " spine ". Each individual study was reviewed and a selection of 40 eligible studies was made. Later, according to the criterion (that it is the age of preschool and school children and youth), which this study predicted within its main goal, a shortlist of 30 works was made, which were detail analyzed in it.

Results

Table 1 shows 30 studies that addressed the issue of postural disorders in preschool and school children at the regional level.

The analysis of Table 1 established the following: Radisavljevic et al., (1982) determined the status of the arches of the feet in students of different socio-economic backgrounds. The sample consisted of 196 first grade primary school students in Belgrade and the Kraljevo area. The variable lowered foot was taken into account. It was found that 67.6% of students have a lowered foot. Of

Table 1. Studies dealing with the issue of postural disorders in preschool and school children

Authors	Name of the study
Radisavljevic et al., 1982.	Study of the foot status of first grade elementary school students from different socio-economic backgrounds
Jovovic et al., 1995.	Physical deformities of early adolescent students in Montenegro
Jovovic & Marusic, 1996.	Kyphotic and lordotic deviations of the spinal column in school children in Montenegro
Ristic et al., 2002.	Bone and joint deformities in primary school students in the municipality of Bojnik
Zivkovic et al., 2004.	The state of postural disorders and physical deformities of children of younger school age
Niksic et al., 2006.	Relationships between relevant indicators of postural status and lumbar lordosis in juvenile children
Canjak, 2006.	Transversal analysis of the status of wing blades in seventh grade elementary school students
Vlaskalic et al., 2006.	Relationship between anthropometric characteristics and deformities of the locomotor system adolescents
Karaleic, 2006.	Postural status of students higher primary school age
Videmsek et al., 2006.	The analysis of the arch of the foot in three-year-old-children-a case of Ljubljana
Nozinovic et al., 2007.	Relationship between proper posture, spinal deformity and foot deformity
Bogdanovic & Hadzic, 2007.	Influence of program corrective exercise on kyphotic posture in the primary school population
Medojevic & Jaksic, 2007.	Differences in postural disorders between boys and girls aged 7-15 in the territory of Vojvodina
Pausic, 2007.	Construction and evaluation of measurement procedures for the assessment of posture in boys aged 10-13 years
Kosinac & Banovic, 2007.	Association between some indicators of improper posture and scoliosis in juvenile children
Bogdanovic, 2007.	Presence of kyphotic and lordotic bad posture in the school population
Milosevic & Obradovic, 2008.	Postural status of children from Novi Sad preschool institutions aged 7 years
Bogdanovic & Milenkovic, 2008.	Morphological space and postural disorders in younger school age
Trajkovic & Nikolic, 2008.	Analysis of anthropometric measures and postural disorders of children of the 1987 and 2002 generations
Canjak, 2009.	Transversal analysis of lordosis status in sixth grade elementary school students
Protic-Gava & Krneta, 2010.	Postural status of children of younger school age in four discricts of Vojvodina
Bogdanovic & Markovic, 2010.	Postrure depending on the presence of deformities of the lower extremities
Jovovic & Canjak, 2011.	Prevalence of chest and loaptical disorders in school children of different ages
Simov et al., 2012.	Incidence of poor posture and flat feet in preschool children
Jovovic & Canjak, 2012.	Frequency and structure of postural disorders in young adolescents in Montenegro
Canjak, 2012.	Comparative analysis of the postural status of adolescents in rural and urban environments in Montenegro
Beganovic & Besovic, 2013.	Analysis of body posture in younger school age students in the city of Sarajevo
Lastro et al., 2015.	Influence of physical activity on the posture of school-age children
Protic-Gava et al., 2015	Incidence of postural disorders in relation to adolescents nutritional status
Banjevic & Canjak, 2016.	Effects of the application of corrective exercise on the postural status of children in early adolescence

which: I degree-65.8%, II degree-11.7% and III degree-22.4%. Respondents from rural areas had better arch status; Jovovic et al., (1995) dealt with the status of the locomotor system in young adolescents in Montenegro. The sample consisted of 511 respondents, with an average age of 13.7 years from primary schools in Niksic and Podgorica. The sample of measures included 9 morphological variables and 13 variables with 14 variations for postural status. With a view to the results obtained, scoliosis (68.6%) and lordosis (53%) have been shown to be the most common disorders. A large number of children with deteriorated foot arch status were observed (31.8%); Jovovic and Marusic (1996) assessed the kyphotic and lordotic deviations of the spinal column in school children. Their sample consisted of 511 students from elementary schools in Montenegro (253 female and 258 male) aged in average 13.6. The study examined 6 postural variables. The presence of spinal deviations in the sagittal plane was observed for a significant percentage of examinees (55% of boys and 43.8% of girls). The largest percentage of deviations were milder forms of the disorder; Ristic et al., (2002) dealt with the detection of bone and joint deformities. The study was conducted on a sample of 1219 primary school students in the municipality of Bojnik, while the set of measures included 6 postural variables. It was observed that 425 students (37.11%) had some of the deformities under study. The most common were foot deformities (296 students); Zivkovic et al., (2004) examined the state of postural status in children of younger school age. The research was conducted on the sample of 6112 students from the municipalities of Zajecar, Krusevac and Cacak, while 7 variables of postural status were analyzed. The observed incidence of the deformities was as follows: 1st grade: 45.7% -boys, 32.6% -girls; 2nd grade: 45.4% -boys, 56.2% -girls; 3rd grade: 64.7% -boys, 72.2% -girls; Niksic et al., (2006) dealt with the influence of posture deviation on lumbar lordosis in juveniles. The sample of examinees consisted of 150 male students and 155 female students aged from 6.5 to 8.5 from 4 elementary schools in Split. For the purposes of the study, 14 posture predictors and lumbar lordosis criterion were applied. A significant incidence of physical deformities at this age has been observed. The most important predictors in defining the mentioned criterion were the deformities of the lower limbs (genu valgum) and obesity; Canjak (2006) investigated the status of winged scapula in 120 thirteen-year-old students of both sexes from Niksic. The sample of variables consisted of 2 variables of anthropometric indicators and 1 variable of postural status. The results showed that the disorder in the mildest form had been observed in of 40 boys out of 63 (63.4%) and in 23 out of 57 girls (40.3%). Vlaskalic et al., (2006) examined the connection between morphological characteristics and deformations of the movement apparatus. The research included 709 students of both sexes aged 15-18, while 9 variables of anthropometric indicators and 8 variables of postural status were taken ito consideration. A high correlation between morphological characteristics and postural disorders, as well as the association between spinal and thoracic deformities were observed. Karaleic et al., (2006) examined the number of spinal disorders in 751 respondents (367 students and 384 students) from grades 5 through 8 of elementary school. For the purposes of the study 3 postural variables were applied. The results showed that 49% of the respondents had some of the examined spinal column deformities. Moreover, out of the 137 subjects with kyphotic posture, 103 were male (75.2%); Videmsek et al., (2006) examined the foot arch status in 127 examinees from 18 kindergartens in Ljubljana. It was found that ¾ of children (72%) had fallen arches, 20% were in the category of borderline cases, and the remaining 8% had normal feet; Nozinović et al., (2007) examined the postural status in 743 students aged 15-18 from high schools in Tuzla. Postural status was assessed using 6 variables. The results obtained showed that 50.23% of examinees had excellent posture, 42.23% had good or very good posture, while 6.54% of the examinees had poor or very poor posture; Bogdanovic and Hadzic (2007) examined the effect of corrective exercise on kyphotic posture. The sample consisted of 434 students of both sexes who attended the fifth grade of primary schools in Kragujevac. For the purposes of the research, 4 postural variables were used to assess kyphosis. It was observed that the number of students who had kyphotic poor posture decreased significantly by the time the final measurements were taken (from 44.7% to 27.18%); Medojevic and Jaksic (2007) examined differences in postural status in boys and girls aged 7 to 15. The respondents were the students from the territory of the larger cities in Vojvodina (340 boys and 255 girls), while 9 postural variables were compared. The results showed that the greatest differences between boys and girls were observed for the ages 9 to 10 in favor of boys, i.e. ages 12 to 13 years in favor of girls; Pausic, (2007) evaluated a new metric instrument for assessing the postural status of 273 boys aged 10 to 13, taking into consideration 15 motoric variables and 6 postural status variables. Factor analysis confirmed the validity of the measuring instrument for assessing posture. A decrease in the results for 5 motoric tests in boys with improper posture was observed. Kosinac and Banovic (2007) examined the postural status of juveniles. The sample consisted of 305 students from 4 elementary schools in Split, while a system of 15 predictor postural variables and scoliosis were applied as a criterion. It was observed that, in statistical terms, children differ significantly in terms of indicators of improper posture. Moreover, the asymmetry of the Lorentz triangle proved to be the most significant predictor of the defined criterion; Bogdanovic, (2007) examined the influence of programmed exercise on lordotic poor posture. The sample consisted of 434 students of both sexes attending the fifth grade of elementary schools in Kragujevac. For the assessment of lordosis, 4 postural variables were applied. It was observed that the experimental exercise program was effective, and that only 4 boys (7.14%) and 14 girls (19.44%) did not manage to successfully correct the spinal disorder classified as poor lordotic posture; Milosevic and Obradovic (2008) assessed the postural status of 377 respondents aged 7 (184 males and 193 females) from the territory of Novi Sad. The obtained results indicate that the boys had good spinal posture, while the posture of other segments was bad or very bad. As for the girls' group, good shoulder girdle posture was observed; Bogdanovic and Milenkovic's area of focus (2008) was postural status and the influence of morphological status on kyphosis and lordosis. For the purposes of the study, 8 morphological variables and 2 postural status variables were considered, while the sample included 434 fifth grade students from the territory of Kragujevac, both male and female. The results indicated that there were certain changes in the thoracic spine in children with higher body and sitting height; Trajkovic and Nikolic (2008) examined the differences in the postural status of different generations of students, i.e. students from the class of 1987 (150 students of both sexes) and students from the class of 2002 (149 students of both sexes), using a system of 2 postural and 10 anthropometric variables. There was a statistically significant difference in the prevalence of scoliosis in 2002 class of students when compared to the other group. In terms of anthropometric parameters, differences were noted for 4 variables; Canjak, (2009) examined the frequency of lordosis in 100 subjects aged 12, taking into consideration 1 variable and using 5 tests. The results indicated that lordosis was present in 56% of cases. The greatest degree of deviation was noted for functional disorders. Cervical lordosis was reported in a comparatively smaller number of cases (5.1%); Using 7 postural variables, Protic-Gava and Krneta (2010) examined the state of posture in 392 subjects of both sexes, aged 7-11, coming

from 4 districts of Vojvodina. It was observed that children of younger school age in some districts of Vojvodina do not differ significantly in terms of gender when it comes to postural status. Bogdanovic and Markovic (2010) examined the prevalence of foot deformities in 651 subjects (310 girls and 341 boys aged 7-14). The obtained data indicate that fallen foot arch was observed for 73% of boys and 65.2% of girls. Most of the disorders were functional in nature; Jovovic and Canjak (2011) examined the incidence of flat feet with regards to the age category. The research was conducted on the sample of 251 examinees (116 boys and 135 girls aged 10,12 and 14) from three elementary schools in Niksic. The results obtained indicate the highest frequency of disorders is in boys (14) -30% and girls (12) -31.5%; Using 8 variables to assess morphological status, Simov et al. (2012) examined the frequency of physical deformities in 968 subjects of both sexes, aged 6 and 7. All the examinees came from the territory of the Leskovac municipality. It was observed that 36% of examinees did not have any kind of deformity, 55% had one deformity and 9% had more than one deformity. Jovovic and Canjak, (2012) assessed the frequency and structure of postural disorders in 315 students aged 13.6 (160 boys and 155 girls) from 23 elementary schools in Montenegro. The system of 10 postural variables has been applied. The distortion of posture with the majority of examinees has been confirmed. It happened that the majority of examinees has the distorted status of the spinal column and scapula; Canjak, (2012) has determined the condition of postural status and the existence of differences in postures between adolescents of rural and urban environment. The research has been performed on 315 examinees of both sexes, of the 13,6 years of age (157 from urban and 136 from rural living environment), by using 10 postural variables with 14 variations. It was determined that the condition of postural status was significantly jeopardized. Flat foot is more frequent with examinees of urban environment. Scoliosis, kyphosis, sunken and pigeon chest, X and O legs have shown different frequency in both sexes from different environments; Beganovic and Besovic, (2013) have studied the irregularities of postures with 60 students of 10-11 years of age from Primary School "Kovacici" in Sarajevo, where they applied 6 postural variables. The following has been determined: by measuring the sagittal curve of the spine (43% irregular posture); by measuring sideways curve of the spine (13% irregular posture); Lastro et al., (2015) have studied the aspects of physical activity to the components of posture with 120 students (10-16 years) from Banja Luka. For studing the level of physical activity and postural status, 6 variables have been taken. The difference was determined in the level of physical activity of the studied subsamples, as well as the effect of different predictors on the set system of dependent variables. Protic-Gava et al., (2015) have evaluated the conditions of postural status and nutrition with 305 adolescents of 11 to 14 years of age, both sexes (158 girls and 147 boys), where 8 indicators of postural status were analyzed, while for the assessment for nutrition the Body Mass Index was calculated. The results have shown that there are no statistical significant differences in the postural status of examinees regarding gender, while this was not the case when we were talking about nutrition level; Banjevic and Canjak, (2016) have examined the efficiency of the impact of correction exercises program to the postural status of 110 students and student of seventh grade in three primary schools in Niksic. The gathering of data included the assessment of postural status (11 variables) and taking anthropometric indicators of examinees (6 variables). It has been determined that they succeeded through the four month experimental treatment to act preventively with appropriate exercises of corrective gymnastics to stop the deterioration of the current condition and the occurrence of new postural disorders.

Discussion

One of the greatest naturalists of all the times, Darvin's predecessor, Lamark, has summed one of the basic laws of science about living beings in one sentence: „the function develops the organ". It is obvious that today exactly this function is missing, and that such lack leads to numerous problems regarding posture with pre-school and school children and youth. This statement is supported by the obtained results of research represented within the systematic analysis of postural disorders of pre-school and school children.

The research dealt with diagnosis of condition of postural status, by determining the effects of targeted corrective programs, examining differences in the posture with children from urban and rural environment (as well as with reference to gender) and revealing the existence of interdependence of the occurred deformities with certain segments of anthropological status (most frequent morphological characteristics).

All the shown studies have examined the status of postural condition and structure of occurred changes on it. The postural condition is, according almost all obtained results, significantly jeopardized and distorted with the majority of children, which gives the right for these problems to be defined as alarming. The thing that gives a glimpse of hope, is the fact, that the majority of stated changes on the locomotor apparatus is of functional character i.e. initial stage, which represents the so called active stage of deformation in the sense of its stopping and removal. In other words, there is big space for the activation of the mechnisms of corrective gymnastics on the prevention and correction with the majority of diagnosed cases. We should point out that the examined students were mostly of 6 to14 years of age, and that this represents the period of highest effectiveness of active corrective program implementation. Analysing the obtained results, it is seen that most of the changes are on the muscle and bone and joint system of the shoulder and chest part of the spinal column. The domination of the kyphosis bad posture is easily recognized, rounded back and together with that the existence of winged scapula. We can freely say that this is the most dominant combined change on the locomotor apparatus of children nowadays. In addition, the weakness and insufficiency of paravertebral musculature is clearly recognized, which directly and indirectly leads to negative consequences, and first of all to the occurrence of lumbar lordosis. In majority of cases, the lowering of feet arches is present, which also brings with it certain changes in statics and dynamics of the moveent system. As one of the „most inconvenient" deviations, the deviation of the spinal column in the frontal plane the so called scoliosis, happens in the minority of cases, but due to complexity of its occurrence, development and form, this occurrence should also be reason for concern. Other types of deformations featured as sunken or pigeon chest, „X" and „O" legs, occur rarely, but they, however, shouldn't be neglected. It has been noticed that with a certain number of kids occur the so called complexes of joint changes, which include the existence of two or more deformations on the locomotor apparatus. A great neglect and system partial interdependence of negative changes is evident with them, which more or less have been supporting one another, both in the process of occurrence and development and later in progression. This is the detail which is very important for the point of view about inevitability of the timely effect in the sense of stopping it, first of all negative causes, and then as well the progress of the occurrence itself. If this does not happen, we shall have more and more children with the complex problem, which, as such, in the majority of cases, unfortunately, can only be stated.

Three significant researches which dealt with identifying the effects of activities of target corrective treatments (Bogdanovic and Hadzic, 2007; Bogdanovic, 2007; Banjevic and Canjak, 2016).

The results of these studies indicate to the statement that certain positive changes have occurred. Mostly, there were improvements in posture, which didn't lead to the increase of the number of diganosed changes compared to the initial taking of data. When we are talking about the ultimate stages or higher levels of distortion in posture, reasonably there was no progress. However, it has been determined that such conditions didn't have progression and that with it they didn't draw the occurrence of some of other types of deformation. The results obtained in this way are absolutely understandable if we take in condideration the limits that had effect on the more effective program application. Here, first of all, we think about the limitation of a number of available lessons, lack of time within them, non-incoporation of corrective programs in regular teaching, the loss of continuity due to various circumstances, adequate unpreparedness of qualified personnel, the impossibility of individual work and work in smaller groups etc.

One interesting study (Canjak, 2012) which related to the examination of differences in posture with students of urban and rural environment, has given for theory and practice several significant factual thesis. With the overview of comparative analysis of some morphological characteristics, certain differences were registered which mostly related to a significantly higher level of subcutaneous fat tissue with children of urban environment. Apart from the existence of certain differences, we can say that in overall analysis, there is equal problem both in urban and rural environment with reference to the occurrence and development of certain disorders on the segments of the movement appratus. It was sometimes inconceivable that in the rural region so much distortion could be registered wih reference to posture, as it was the case some years ago when this important study was made. Therefore, it is clear that even in rural region the „sitting" way of life is more and more prevailing with the majority of younger population, that has as well as the urban mostly accepted the means of the modern technological world. In addition, a great presence of mechanisation is evident which greatly contributed to the reduction of physical work in the village, and in that sense also the engagement of children in some of those forms of such activities. On the other hand, it is superfluous to speak about negative effects of activities of numeous factors on children from urban environment. When we add to that the unhealthyeating habits and an increasing number of children with overweight, then, it is clear why the actuality of this topic should be raised to the highest possible level.

The majority of the shown researches has dealt with, among other things, differences in postures between the students of masculine and feminine gender. One research has been typical because of this fact (Medojevic and Jaksic, 2007). Essentially, it was shown that there were no differences at the level of statistical significance, except for the periods of children entering the puberty when due to intensive hormonal activity and the overall changes in the functioning of the body, there happened the increase of longitudinal skeleton dimensionality, which caused the occurrence of negative changes on the movement apparatus to a greater degree. Since with genders, these periods of maturity differ, thus the differences are evident in them in the condition and structure of changes in the majority of cases on the spinal column itself.

In ceratin studies during the assessment of the postural status, taking of anthropometric paramteres has been performed, and thus the relations of their causes and consequences were examined with the occurred changes on the locomotor apparatus. Mostly, as in the study of Bogdanovic and Milenkovic from 2008, the connection with longitudinal skeleton dimensionality has been established (body height and sitting height). The connection was expressed especially with changes on the chest part of the spinal column, most of all in sagittal plane. The results obtained in this way are understandable bearing in mind the age of examined children which mostly related to critical periods for the occurrence of some types of deformation.

Based on the analysis of the results of the said studies, we can state a very serious condition with reference to postural disorders with us and in the region. The fact is that the problem exists for a longer period of time and its is not resolved in adequate way, due to which it progresses, which eventually leads to serious consequences with reference to the health of school children and youth. The process of solving the problem is complex, but with the planned and decisive actions of relevant subjects of the system, it would have to give adequate results. In those actions, the experts of kinesiology i.e. kinesitherapy should be recognized as the key link, who must be the driving force at the beginning of solving the problem. Therefore, that initial potential must cover the application of experimental exercise program in our schools so that we would not only confirm the results of the so far studies, but also gain new experience and knowledge when working on this issue. However, opinions must be intensively exchanged when talking about the complexity of further activities, ways of incorporation of the corrective exercise program in regular teaching, solving the problem of qualified personnel etc., by using numeroud feedback obtained by making the conclusion from applied kinesiology studies.

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ORIGINAL SCIENTIFIC PAPER

Online Learning Process and Results in Indonesia

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Abstract

The focus of this research is (1) to describe and analyze how the process of online lectures at Universitas PGRI Semarang, and (2) to describe and analyze how the results of the implementation of online lectures at Universitas PGRI Semarang in suppressing disparities in higher education quality. Therefore, the purpose of this research is to monitor and evaluate the implementation of online learning at Universitas PGRI Semarang through the mechanism of online learning guidelines by the Quality Assurance Institute. This research uses a mixed method or often referred to as a mixed method. Data collection for the online lecture process was captured by using an online lecture implementation questionnaire filled out by students and lectures via googleform. The second data is student learning outcomes/achievements downloaded from the Universitas PGRI Semarang Lecture Information System (SIP). The results of the implementation of online lectures at Universitas PGRI Semarang are still not in line with expectations. Because students who carry out online lectures are not necessarily in a place with stable internet access, even though on the other hand online lectures require good internet access not only from the lecturer side but also from the student side. The limitations experienced by these students can cause the understanding of the material that has been delivered by the lecturer can not be maximized. The conclusion of the implementation of lectures are still not maximized so that it needs to be addressed immediately by increasing the effectiveness and efficiency of learning, one way is by providing education quota assistance or carrying out blended learning by taking into account the principles of the Covid-19 prevention protocol.

Keywords: *Education, National, College, Online*

Introduction

Indonesian education has experienced various problems during the Covid-19 pandemic. The social impact of social distancing is very influential on the implementation of learning. Conditions during the Covid-19 pandemic are called special conditions so that the implementation of learning is also carried out in a different way, namely Distance Learning. Distance learning is carried out based on the circular letter of the Minister of Education and Culture number 4 of 2020 regarding the implementation of education policies in an emergency situation of the spread of the virus (Pengelola Web Kemendikbud, 2020).

Distance learning is a big challenge for teachers and students in carrying out learning. Learning is done in two ways, namely online and offline (Adnan, 2020). Online learning can be defined as e-learning. Online learning is done using a network or online while learning outside the network without using a network. This means that through online learning during the Covid-19 pandemic, teachers and students can master science and technology. Mastery of technology is one of the frameworks of thinking in the 21st century in Indonesia. Mulyanti, Purnama, & Pawinanto (2020) explains that the 21st century thinking concepts that will be applied in basic education include: (1) creative and innovative thinking, (2) critical thinking and problem solving, (3) communication and collaboration; (4) information, media, and technology skills; (5) life and career skills, namely the formation of character and spiritual values.

Online learning is not a new model in Indonesia. Several studies on the implementation of online learning at the elementary school level have been carried out. Online learning has a positive impact and shows high student motivation (Adnan, 2020;

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Mulyanti et al., 2020). In addition, the use of the Edmodo application in online learning has a significant effect on student learning outcomes in science subjects compared to conventional learning. Online learning is considered effective and efficient because it can be done anywhere and anytime using a cellphone, android, laptop, or computer (OECD, 2020). Online learning during the Covid-19 pandemic needs attention from several aspects such as how to practice, what applications are used, and what strategies are used so that learning can be carried out properly.

The concept of online learning refers to e-learning. E-learning was created for distance learning. Distance learning separates students and teachers based on distance and time. In addition, this learning is one form of innovation in the world of education since the advent of internet technology. Computer programs are increasingly varied with the use of the internet so that distance learning can be carried out in multiway (Popovici & Mironov, 2015). Popovici & Mironov (2015) explain the abbreviation "E" in e-learning means electronics. E-learning is all forms of learning activities that utilize electronic media to help humans learn. This opinion has a broad meaning because it emphasizes electronics-based. Meanwhile, Zare, Sarikhani, Salari, & Mansouri (2016) and Samir Abou El-Seoud, Taj-Eddin, Seddiek, El-Khouly, & Nosseir (2014) explain that e-learning is the use of internet technology and computer networks in the human learning process. This opinion is significantly more specific because of its emphasis on internet-based.

Dhawan (2020) explains that e-learning refers to online learning, which means intentionally using information and communication technology networks in the teaching and learning process [7]. In particular, Suresh, Vishnu Priya, & Gayathri (2018) states that e-learning is a learning model in digital format. Implementation of e-learning can be done directly and indirectly. Implemented directly means that when the teacher gives lessons, students can immediately hear. While the implementation is done indirectly, for example, the instructor's message is recorded before being used.

Through online learning, students can study as usual and will not miss lecture material, as well as more flexible time (Aboagye, Yawson & Appiah, 2020; Adnan, 2020; OECD, 2020; Sobaih, Hasanein & Elnasr, 2020). However, online learning is not fully welcomed by students, because there are some students who think online learning is more difficult than ordinary learning (Adnan, 2020; Mulyanti et al., 2020), not to mention internet quota must be available and this is the biggest difficulty experienced by students, network problems, availability of learning tools such as laptops, the level of material understanding is felt to be better if doing face-to-face lectures, and also not all lecturers and students are ready to operate online learning systems quickly, including preparing lecture materials digitally.

The development of information and communication technology has a significant impact, including in the education aspect (Dhawan, 2020; Mulyanti et al., 2020; Popovici & Mironov, 2015; Samir Abou El-Seoud et al., 2014). Students and lectures can easily gain knowledge or insight from the internet. The number of sources scattered on the internet allows academics to access them via smartphones or gadgets. This development has begun to be used by several universities in Indonesia in the implementation of their educational programs known as online lecture programs or e-learning/online learning systems. Online lectures themselves can be understood as formal education organized by universities in which students and instructors (lecturers) are located in separate locations, thus requiring an interactive telecommunications system to connect the two and the various resources required in it.

Online lectures during the Covid-19 pandemic are the most appropriate way to carry out the learning process for students (Ali, 2020; Sobaih et al., 2020; Yusuf & Al-Banawi, 2013; Zare et al., 2016). This lecture activity can be carried out through various learning applications such as WA Group, Google Classroom, Zoom, Google Meet, etc., although it is realized that the results achieved will not be as optimal as the process carried out face-to-face on campus. The focus of this research is (1) to describe and analyze how the process of online lectures at Universitas PGRI Semarang, and (2) to describe and analyze how the results of the implementation of online lectures at Universitas PGRI Semarang in suppressing disparities in higher education quality. Therefore, the purpose of this research is to monitor and evaluate the implementation of online learning at Universitas PGRI Semarang through the mechanism of online learning guidelines by the Quality Assurance Institute.

Method

This research uses a mixed method or often referred to as a mixed method. The research sample was carried out randomly (proportional random sampling), so that all members of the population had the same opportunity and were not bound to be included in the sample. To determine the size of the sample in this study using the calculation formula recommended by Issac and Michael (1995) with a total of 2472 student respondents and 333 lecturer respondents from the Study Program. Data collection for the online lecture process was captured by using an online lecture implementation questionnaire E-Learning filled out by students via googleform, the second data is student learning outcomes/achievements downloaded from the Lecture Information System (SIP). In this study, the instrument used was a closed questionnaire (created by the authors of this study), because the researcher had already provided the answers so that the respondents just had to choose. The scale used is the five-point Likert Scale.

This research uses a mixed research with sequential exploratory methods, namely the research starts from collecting qualitative descriptive data to describe how the process in implementing online lectures starts from preparation, implementation of learning, evaluation, and reflection. Furthermore, quantitative data was collected to determine the results and effectiveness of online learning. The first result is used to answer the first problem question, and the second result is used to answer the second problem question. Furthermore, the two results are combined to get a complete picture of the implementation of online lectures This research was carried out for 8 months, starting from May to December 2020. The location of this research is in all Study Programs at Universitas PGRI Semarang. Data analysis techniques were carried out using: descriptive analysis and quantitative analysis.

Results

The data obtained from this study includes the national standards of higher education according to the Regulation of the Minister of Education and Culture of the Republic of Indonesia Number 3 of 2020 concerning the National Standards of Higher Education, in particular Article 4 (1) consists of: Graduate competency standards are used as the main reference in developing learning content standards, learning process standards, learning assessment standards, lecturers and education staff standards, learning facilities and infrastructure standards, learning management standards, and learning financing standards by showing that the most in accordance choices are chosen by lecturers (52.84%) and students (41.28%) (Table 1).

The standard of learning content is the minimum criteria for the level of depth and breadth of learning material that refers to graduate learning indicating that very suitable is chosen by the lecturer (100%) while students show quite appropriate with 48.46% (Table 1).

Table 1. The results of the research

	graduate competence standard		learning content standards		learning process standards		learning assessment standards		standards of lecturers and education staff		standard of learning facilities and infrastructure		learning management standards	
	Lecturer	Student	Lecturer	Student	Lecturer	Student	Lecturer	Student	Lecturer	Student	Lecturer	Student	Lecturer	Student
very inappropriate (%)	0	2.36	0	2.22	0	1.40	0	0.52	0	1.24	0	0.77	0	1.12
it is not in accordance with (%)	1.39	6.14	0	5.06	3.57	5.50	0	3.03	0	2.57	0	5.61	0	3.15
quite appropriate (%)	20.44	37.95	0	48.46	23.21	40.85	5.65	34.14	1.04	27.94	5.65	32.40	8.33	30.98
In accordance (%)	52.84	41.28	0	35.86	26.49	43.95	51.79	48.65	55.36	51.30	39.29	45.17	44.41	45.95
very suitable (%)	25.33	12.27	100	8.39	46.73	8.30	42.56	13.65	43.60	16.95	55.06	16.05	47.25	18.80
Total (%)	100	100	100	100	100	100	100	100	100	100	100	100	100	100

The standard of the learning process is the minimum criteria regarding the implementation of learning in the study program to obtain graduate learning outcomes. The standard of the learning process includes the characteristics of the learning process, the planning of the learning process, the implementation of the learning process, and the student's learning load. It shows that the lecturers are very suitable with 46.73% while the students are in accordance with 43.95% (Table 1).

Learning assessment standards are the minimum criteria regarding the assessment of student learning processes and outcomes in order to fulfill the learning outcomes of graduates showing a response from lecturers (51.79%) and students (48.65%) namely in accordance (Table 1).

The standards of lecturers and education staff are the minimum criteria regarding the qualifications and competencies of lecturers and education staff to provide education in the context of fulfilling graduate learning outcomes, showing lecturers at 55.36% and students 51.30% for in accordance (Table 1).

Facilities and infrastructure standards have minimum criteria regarding facilities and infrastructure in accordance with the needs of the content and learning process in order to fulfill graduate learning outcomes with lecturers choosing 55.06% for very suitable and students 45.17% for in accordance (table 1).

Learning management standards are minimal criteria regarding planning, implementation, control, monitoring and evaluation, as well as reporting of learning activities at the study program level, indicating that lecturers choose very suitable (47.25%) and students choose in accordance (45.95%) (Table 1).

Discussion

Taking these aspects into account, was deserved to how lecturers from Universitas PGRI Semarang succeeded in imparting knowledge during the Coronavirus pandemic. At the same time, we focused our paper on analyzing students' perceptions of their experiences during exclusive online learning, and what impact this type of learning has on their ability to learn and process information.

This study shows that when studying exclusively online, some of the previously mentioned benefits and advantages diminish in value and the disadvantages become more prominent. Students who responded to our questionnaire believed that exclusively online learning had no beneficial effect on information assimilation and processing, that it was more difficult to learn and focus online, and that teaching was also more difficult.

In the context of the crisis posed by the pandemic, the hierarchy of reasons why students are reluctant to study online is changing. Technical problems are the most frequently reported problems, which play a major role in reducing students' learning motivation. Lack of technical skills of lecturers is another important reason and this finding confirms the results of other research conducted during the crisis (Suresh et al., 2018). The incompatibility of teaching style with the online environment is the next reason, and at the last point, students mention poor communication and interaction with lecturers. These last two reasons are generated on the one hand by a lack of technical skills, and on the other by the resistance to change and lack of flexibility of some teachers to adapt in order to adequately impart knowledge in the online environment.

All of these elements are reflected in students' perceptions of the quality of the online education process, the overall score scale showing a simple result: the average level of satisfaction. Although there are several studies showing positive attitudes of students towards exclusive online learning during the crisis (Allo, 2020; Mulyanti et al., 2020), our results are consistent with recent research conducted on university students (De-Marcos, Domín-

guez, Saenz-De-Navarrete & Pagés, 2014; Popa, Repanovici, Lupu, Norel & Coman, 2020). However, the intermediate score of the overall score scale regarding satisfaction with exclusive online learning indicates that, despite all the problems encountered, students have the ability to relate these problems to the context of a pandemic when lecturers and students are forced to face situations they have never faced before. So, some teachers do try. Although there are several studies showing positive attitudes of students towards exclusive online learning during the crisis (Allo, 2020), our results are consistent with recent research conducted on university students (Popa et al., 2020), which confirms the negative attitude of students towards online learning.

Therefore, given the short time in which the lecturers had to adapt to the new teaching conditions, most of them managed to overcome the challenges, but there is still room for improvement. In this regard, our findings reveal that the educational process is teacher-centred rather than student-centered, and when there is an attempt to adopt a more student-centred process, students feel too much pressure due to the sheer number of tasks they undertake. asked to solve. The student-focused educational process involves assigning students more responsibilities and more assignments, but unfortunately, as students are not used to this type of learning, they feel pressured, making them more prone to developing negative attitudes towards online teaching and learning. Lecturers use a variety of tools when delivering online lectures to make lectures more interesting, but sometimes feedback from students is delayed, assignments are not concise, and lecturers often fail to express their expectations clearly. The reason why the online education process faces so many problems is represented by the fact that the traditional way that lecturers used to deliver the practical part of the course was no longer suitable for the online environment. So, because they do not manage to adapt quickly and find solutions, lecturers create confusion and uncertainty among students.

In terms of student attitudes towards the use of E-learning platforms, students generally consider the platform to be a useful tool for online teaching and learning. Students prefer platforms that allow multiple users to communicate via video for a longer period of time, which does not pose as many technical problems, thereby facilitating interaction between them and their lecturers.

According to the Technology Acceptance Model (Zare et al., 2016), The intention to use an E-learning platform is influenced by the perceived ease of use of the tools provided by the platform and by the perceived usefulness of the tools. In this context, our findings reveal that students do not experience difficulties when using the tools offered by the E-learning platform, they become intuitive and easy to manage. Therefore, our results reveal that only perceived ease of use and perceived usefulness are not sufficient to determine students' use of an E-learning platform, as suggested by other studies (Aboagye, Yawson & Appiah, 2020; Adnan, 2020; OECD, 2020; Sobaih et al., 2020).

This study has without doubt certain limitations because E-learning has limitations. If online courses attract students who would otherwise not have attended higher education, this trend is important from a policy perspective, as it has a positive effect on the increase of human capital. Learners with low motivation or bad study habits may fall behind. Without a proper class, the students may get lost or confused about the course activities and deadlines. Students may feel isolated from the lecturer and classmates. Lecturer may not be available when students are studying or need help. Slow internet connections or older computers may make accessing course materials difficult.

The availability of supporting facilities for sophisticated online learning provides opportunities for education managers and lecturers to carry out educational reforms and innovations that can result in increased efficiency and effectiveness of the education system, namely, problem solving, critical learning and creative learning. Thus, lecturers must seriously consider how to integrate the use of online learning during COVID-19 in education.

Conclusion

The results and findings of our study lead to two categories of implications: practical and theoretical implications. On a practical level, a series of recommendations that are useful for lecturers can be outlined so that they can successfully improve the quality of the educational process in an online environment. This study offers a perspective on the way the educational process unfolds in a period of sudden and multiple change in the Indonesian higher education system. Thus, it is possible that after a longer period of adaptation and introduction of students and lecturers to the online environment, the quality of the educational process will improve, and students' perceptions of online learning become more positive and in line with other studies, which we mentioned earlier in this paper.

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Conflict of Interest
The authors declare that there is no conflicts of interest.

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ORIGINAL SCIENTIFIC PAPER

Contribution of self-assessment of football competencies and the length of football experience for explaining the self-efficacy in junior and senior players

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Abstract

Aim of this paper was to examine the contribution of football experience and the self-assessment of tactical/technical skills and social competencies on the perceived self-efficacy in junior and senior football players. A total of 164 football players from Bosnia & Herzegovina have taken part in the research, 79 of which were professional senior players and 85 were professional U18 (junior) players. Three measuring instruments were used in the research: A questionnaire on general information, a self-assessment scale of self-efficacy for football players and a scale for estimating tactical/technical and social competencies in football was used to gather data. Based on the results and the conducted analyses, it is indicative that the model that encompasses the length of football experience and a self-assessment of tactical/technical and social competencies in senior football players contributed around 8.5% to the total explanation of perceived self-efficacy. In senior players, the length of experience has a greater significance in perceived self-efficacy compared to the perceived success in performing football elements. The set model doesn't have an equal contribution in junior players, where the model entirely contributed with 14.3% of the explanation of perceived self-efficacy, and the perceived success of performing football elements also has a statistically significant contribution. So, the model which encompasses football experience and the perceived success in performing football elements (tactical/technical and social competencies in football) is not equally predictive in junior and senior players.

Keywords: *Self-efficacy, Experience, Success, Football*

Introduction

Success in football includes the simultaneous acting of multiple factors. As outlined by Petrić (1981), Jerković, and Barišić (1993), these factors are made up of a set of different knowledge and abilities, such as tactical/technical knowledge applied in competition (competitive efficacy), specific abilities, motor and functional abilities, morphological structure, and cognitive-conative aspects.

However, in addition to the known, abilities and skills for efficient and successful performance of certain tasks depends on individual's belief that a certain task will be successfully performed is also important. An individual's belief in their own competency and success at a certain task is defined as self-efficacy.

Bandura (1986) considers self-efficacy a foundational aspect of performance. It is practically assumed that, in competitive conditions, a higher degree of self-efficacy contributes to better results and lower emotional arousal. According to Bandura (1986), self-efficacy is an individual's estimate of their own abilities to organize and perform certain actions necessary for achieving the desired outcomes.

Self-efficacy doesn't just relate to real skills that someone

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possesses, but it also includes estimates of what an individual can achieve regardless of their actual skills. There are two basic types of expectations in the process of realizing behaviors aimed towards a goal in the scope of this theory: expectations of efficacy and expectations of outcomes. Expectations of outcomes refer to an individual's belief that a certain behavior will lead to a desired outcome, and expectations of personal efficacy refer to an individual's belief in their capabilities to achieve the behavior that will lead towards the expected outcome (Ivanov, 2007). Bandura and Cervone (1983) report that greater perceived self-efficacy for achieving a certain goal result in a higher degree of effort that an individual is willing to put into achieving a specific goal.

Culos-Reed, Brawley, Gyurcsik (2001) list four main determinants that act upon the perception and expectations of their own efficacy: the experience of success and skill, indirect experience, verbal convincing (persuasion), and psychologically-affective state. The experience of success and skill is the most important determinant of belief in one's own efficacy, and it is developed through the agency of achievement. The above implies that experienced success and acquiring new skills provide direct evidence of competency, i.e. the ability to successfully overcome the challenges of a situation the individual is placed in. Furthermore, indirect experience is based on modeling (as a form of social learning), through the agency of the experiences of others and the perception of the consequences of the behaviors of actors. The next determinant, verbal convincing, relates to a powerful persuasive effect in order to convince an individual that they possess the abilities required for success in a certain area. Finally, psychological (cognitive) status and emotional state produce changes in the body that provide the person with extra information needed for estimating their own competency in a given situation.

According to Bandura (1997), in order for a measure of self-efficacy to be useful in explaining motivated behavior and sports success, it is necessary that it is built in the scope of the rules of theory and that the measures used are specific to the area of execution. Felts & Lirgg (2001) in their meta-analytical study of the relationship between self-efficacy and sports performance report on low correlation coefficient (r = .26) between self-efficacy and the measures of performance in studies where the measures of self-efficacy weren't aligned with the measures of performance (when different abilities were estimated, to be more exact). However, in studies where the estimates between self-efficacy and the outcomes were congruent, a higher correlation coefficient was found (r = .43). Also, Felts & Lirgg (2001) list findings of studies where it was found that coaches modeling with instructions and exercises, reward statements and verbal convincing had a positive effect on the belief of self-efficacy in players and teams. Many authors stress the importance of the perception of self-efficacy (e.g. Cox, 2005; Trninić, Kardum & Mlačić, 2008; Šetić, 2018). Self-efficacy can be a powerful predictor of success in sports, under the condition that a distinction is made between the effects oriented on the process and effects oriented on the outcome. In other words, as stated by Tresure, Monson, and Lox (1996), self-efficacy is a better predictor in process-oriented athletes. Furthermore, when the physical abilities of athletes are equal, self-efficacy is a powerful indicator of performance, especially in martial arts. In regards to that, Kane et al. (1996) believe that self-efficacy is the best indicator of performance in overtime of wrestling matches. When the wrestlers are of equal physical ability and when they are physically equal at a high level of competition. Research has also shown that perceived self-efficacy is a good predictor in explaining individual estimates of success of football players (Šetić, 2018).

Football is a very specific sport that has continuously developed and where the models of play have changed over time, so that the system of play today is very elastic. A system with a strict arrangement and function of players is no longer at the forefront, but a certain conception that gives the game sense and specificity of action of a team in the same system of play. The arrangement and actions of players depend more and more on the position and the movement of the ball on both offense and defense. The tempo has also increased, which can be seen in fast transition from defense to offense and vice-versa, so top-tier football today requires players of universal character, with regards to all the components needed for achieving great results in play. It doesn't matter if we talk about the offensive or the defensive phase, all players of a team participate in the realization of every phase of play. Football consists of four phases and their respective subphases (Bašić, Barišić, Jozak, and Dizdar, 2015): the offense phase, the defense phase, defense to offense transition (transition upon gaining the ball), offense to defense transition (transition upon losing the ball). Based on the above, success at football depends on the technical/tactical execution of every player within the four listed phases of play, regardless of their position within the team.

Mouloud & Elkader (2007) have conducted a study on a group of amateur football players and the results they got point to high self-efficacy among football players. However, the authors didn't find statistically significant differences in self-efficacy in football players based on their positions. The results are inconsistent with the results found by Kirkcaldy (1982) and Andrew et al. (2007).

The aim of this paper was to examine the contribution of the of football experience (length of career) and the self-assessment of tactical/technical and social competencies in football players relative to the perceived self-efficacy of junior and senior football players. Secondarily, research was oriented on determining the differences in self-efficacy in regards to a player's position.

An insufficient amount of research in this area, as well as the existing inconsistent results (although with differing research methodologies) on the connection between success at football and self-efficacy, we expect that the length of football experience and a self-assessment of technical/tactical and social competencies will be significant in explaining self-efficacy in football.

Methods

Study design and procedure

Research was conducted as cross-sectional study among football players of teams competing in Premier league of BiH (PLBiH - highest rank). To meat eligibility criteria, team had to spend at least two consecutive years competing in PLBiH and junior league. All procedures regarding the data collection were done during first 5 days of winter preseason preparation period in 2018/2019. Mobile team of two researchers collected the data on different time points in different locations from six professional football clubs in BiH. Teams' representatives signed written informative contest for their players. Two football clubs did not meet the eligibility criteria.

Data was collected individually for each participant. Firstly, the participants were introduced to the purpose of the research and the method of estimate. Every player has individually ciphered their questionnaire according to the researchers' instructions. They filled the questionnaires (using pen and paper). There was no time limitation on filling the questionnaire, but it took around 15 minutes on average for each contestant. Study was conducted according to the Ethical standards of Helsinki convention.

Sample of participants

To meet eligibility criteria, besides being member off professional football team and competing at highest senior or junior level, participants had to be without serious injurie which disabled them for playing during past 6 months. A total of 164 players from six football teams that competed in the professional Premier League of Bosnia & Herzegovina have participated in

this research. Age structure of participants: 79 were senior players (age: 25.15±4.21 yrs.) and 85 were juniors (age:17.23±0.49). Goalkeepers were excluded from the study.

Instruments and variables

A questionnaire on the general information on the players was constructed specifically for this research and it encompassed data on age, selection, the player's club, the length of their tenure with the club, position in the team and the length of playing football (length of football experience).

Self-efficacy was measured with a Scale for estimating self-efficacy in football players created by Šamija & Bosnar (2010). The scale contains 21 claims related to the estimate of the efficacy of performing certain actions (example of particle 4: „I have no doubts in the accuracy of my shot even when I have missed several likely chances during the game"). The players' task was to make estimates using a Likert-type scale (from 1 - entirely disagree, to 5 - entirely agree), where a higher score signifies a higher level of self-efficacy. Overall score was calculated as sum of the given answers. The questionnaire possesses a satisfactory internal reliability coefficient of α = .840, which was confirmed in our research where we got a coefficient of internal reliability of α = .893.

Self-efficacy of competencies was measured with a Scale for estimating tactical/technical and social competencies at football (Šetić, Kolenović-Đapo, and Talović, 2017). The authors have conducted a validation study that has shown a four-factor structure and good metrical characteristics. The first factor encompasses offensive tactical/technical competencies (OTTC) and contains the abilities and skills that are necessary during the offense phase, such as the long and short pass, scoring goals, the ability to keep the ball (example of a particle: „I make the last pass (I assist in scoring goals)."). The second factor encompasses defensive tactical competencies (DTC). This factor includes abilities such as: strict coverage of an opposing player, reducing the maneuvering area for the opponents, maintaining defensive pressure (example of a particle: „I pressure the player who is close to the ball. "). The third factor encompasses technical competencies in a duel (TCD) in the air, blocking shots, clearing the ball in a duel (example of a particle: „I am successful in an aerial duel. "). The fourth factor encompasses social competencies (SC) that are necessary in every phase of play (example of a particle:" I have timely communication with teammates during a game (verbal and nonverbal signals to teammates are required. "). Individual successfulness was estimated by the players on a scale of 1 (bad performance) to 7 (excellent performance). The scale contains a total of 42 football elements. A higher result points to a higher level of successfulness. Sum of the answers was noted as overall score. The calculated coefficient of internal reliability is high and it was α = .986.

Statistical analysis

Data are presented as mean ± standard deviation. Data analysis was performed using software package SPSS (ver 21.0, IBM). Normality of data distribution was checked using Kolmogorov – Smirnov test. Regression model analysis was done to determine contribution of football experience and self-assessment of tactical/technical and social competencies in explaining football self-efficacy. Cronbach's α coefficient was used to assess internal reliability for self-efficacy in football players. Statistical significance was set at $p<0.05$.

Results

From Table 1 it is observed that the average score for the self-efficacy assessment in senior players was 85.73±8.73, with similar value for junior players 85.54±9.88. The average length of football experience in senior players was 16.76±3.89 years, while the average value for junior players was 9.02±2.58 years. The average score of self-assessment for tactical/technical and social competencies in senior players was 172.53±43.09, while the average score in junior players was 216.10±36.01.

Table 1. Descriptive statistical values for variables included in the research

	Selection	N	Mean	SD	Min	Max
Senior	Self-efficacy	79	85.73	8.73	68.00	104.00
	Length of football experience	79	16.76	3.89	8.00	26.00
	Self-assessment of tactical/technical and social competencies	79	172.53	43.09	80.00	281.00
Junior	Self-efficacy	85	85.54	9.88	55.00	105.00
	Length of football experience	85	9.02	2.58	2.00	13.80
	Self-assessment of tactical/technical and social competencies	85	216.10	36.01	141.0	289.00

To answer the outlined research problem, we have conducted a standard regression analysis to ascertain the predictiveness of the model in explaining football self-efficacy in junior and senior players (Table 2 and Table 3.). Set model of the length of football experience and the self-assessment of tactical/technical and social competencies in senior football players was statistically significant where the F value is 4.640 (p=0.013). The model contributes 8,5% of the explanation of the perceived self-efficacy of senior football players. Length of football experience has a higher contribution to explaining perceived self-efficacy (β = 0.229, p=0.04). The contribution of self-assessment of tactical/technical and social competencies has a lower contribution (β = 0.208), but it isn't statistically significant (p=0.06).

Table 2. Standard regression model of football experience and self-assessment of tactical/technical and social competencies in explaining football self-efficacy in senior players.

	B	p	β	t	p
Length of football experience	.513	.245	.229	2.091	0.04
Self-assessment of tactical/technical and social competencies	.042	.022	.208	1.900	0.06
			R=0.33		
			R^2=0.109		
			cR^2 =0.085		
			F (2,78) =4.640		

Table 3 shows that the same set model is statistically significant in junior players (F=8.013, p=0.01). The model explains 14.3% of the variance of the criterion variable. At the same time, the self-assessment of tactical/technical and social competencies is a powerful predictor of perceived self-efficacy β = 0.408 (p=0.001).

Table 3. Standard regression model of football experience and self-assessment of tactical/technical and social competencies in explaining football self-efficacy in junior players.

	B	st. p	β	t	p
Length of football experience	-.57	.400	-.015	-,142	0.89
Self-assessment of tactical/technical and social competencies	.112	.020	.408	3.903	0.001
			R =0.404		
			R^2 =0.163		
			cR^2 =0.143		
			F (2,84) =8.013		

Discussion and conclusion

In accordance with the theoretical foundation, as Culos-Reed et al. (2001) list four main determinants that act upon the perception and expectation of one's own efficacy as follows: the experience of success and skill, indirect experience, verbal convincing (persuasion), and psychologically-affective state, where the experience of success and skill are the most influential determinant of belief in one's own self-efficacy which is developed through the agency of achievement. We have assumed that a player with a longer football experience gains more positive experiences, and that players that have a perception of higher competencies also have a higher perception of self-efficacy. We can conclude that, based on the calculated results and the conducted analyses, the model that encompasses the length of football experience and the self-assessment of technical/tactical and social competencies of football players combined contribute 8.5% of the explanation of perceived self-efficacy in senior football players. In senior players, the length of football experience has a higher significance than the perceived successfulness at performing football elements. So, the set model does not have an equal contribution in junior players, where the model in its entirety contributes 14.3% of the explanation of perceived self-efficacy, where perceived successfulness in performing football elements has a higher and statistically significant contribution.

The model that encompasses the length of football experience and the perceived successfulness in performing football elements (tactical/technical and social competencies in football) is not equally predictive in juniors and seniors.

We have concluded that the set model is more predictive with junior players compared to senior players, where self-assessment of successfulness in junior players (40,8%) is significant and higher compared to senior players (20.8%) in terms of predicting perceived self-efficacy. In terms of the length of football experience, the situation is reversed in junior and senior players. Football experience is more and significantly predictive in seniors (22.9%) compared to junior players (1.5%).

In this research, we have not encompassed other factors that can contribute to a perception of self-efficacy, and that is especially related to indirect experience, verbal convincing where a coach's role should be of extreme importance, especially the feedback that the player gets from the coach. We can assume that it would be especially important to encompass the current psychological state of a player in future research. The current psychological state of a player can be affected by a large number of factors that appear during a period of competition, especially things like recent success or failure experiences, both individually or as a team, as well as current team mood and competition anxiety, because those are the most commonly listed psychological factors that affect situational performance. As far as the unequal contribution of the set model between junior and senior players is concerned, we can assume that the cause is mainly the structure of the sample. The sample of junior players is homogenous in the sense of the chronological age of players (16 to 18; experience span - 9.02 yrs), while the age range in senior players is much wider (18 to 34 experience span - 16.76 yrs). The age of players is an important factor in a development sense, i.e. in the sense of the development period that the players are currently in, which could affect various importance of factors that we did not control in this research, but which could affect the contribution of the model to the perception of self-efficacy. It is especially important to take into account the specificity of the Premier League of Bosnia & Herzegovina, where we have several established teams that show serious professional tendencies, while other teams are heterogeneous in every sense. We are of the opinion that future research for senior players (professionals) should take into account the factors that will try to present one's own perception of successfulness during one's career, factors such as playing outside of Bosnia & Herzegovina, the length of international experience, playing for the national team, and finally, one's own perception of satisfaction with their career. In addition to the above, in order to piece together that mosaic in future research, it is necessary to encompass a significant portion of potential predictors for the perceived self-efficacy of estimating earlier experiences of success, indirect learning, the role of a coach, and the player-coach relationship, as pointed to by Felts & Lirgg (2001), as well as the current psychological state (especially mood and anxiety).

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The authors declare that they have no conflict of interest relevant to the content of this article.

Availability of data and material
The data that support the findings of this study are available on reasonable request from the corresponding author

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CASE STUDY

Recommendations for Effective Coaching Practices: A Case Study using the Multidimensional Model of Leadership as a Guiding Framework

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Abstract

Universities, sport governing bodies, and industry associations have employed coach development programs to remedy gaps that coaches experience in their job preparation. The purpose of this article is to report on a single-participant case study that investigated the applicability of one popular theory used in coach development programs: the multidimensional model of leadership (MDML). A key tenet of MDML is that athletes will experience positive gains in their performance and performance satisfaction when coached in their preferred way. Research testing the MDML has produced a nearly universal list of athlete-preferred coaching behaviors (e.g., democratic coaching styles are highly valued). The present case study explored the extent such a list held true for one collegiate athlete during her playing days. A structured telephone interview was used. The participant's responses were analyzed using discourse analysis. The results of the discourse analysis were synthesized with findings from the research literature used to compose the interview questions (i.e., a critical interpretive synthesis). Findings from the present study indicated there was general agreement between the research-generated list of athlete preferences and the participant's own preferences as a collegiate athlete. Yet, findings of the investigation also revealed nuances in how situations (e.g., injuries, athlete empathy towards coaches) may influence/explain an athlete's choice in coaching preference. Namely what is preferred, and preference order, is not static. This study provides coaches with a tangible example of how theory connects to athlete experiences. Key findings are discussed as an educational tool for coaching preparation, including their application to future coach development programs.

Keywords: *Athlete Training, Coach Development Program, Kinesiology, Leadership, Theory to Practice*

Introduction

Unfortunately, many coaches experience a gap between their personal sport experiences and their readiness to be a sports coach (Ahmed & Cardinal, 2020). Paid positions in the United States and elsewhere do little to incentive coaches to complete training in pedagogy and related areas (Vernau et al., 2021). Universities, sport governing bodies, and industry associations have sought to fill this gap in preparation through coach development programs (Beith, 2020; Da Silva et al., 2020). These programs seek to teach coaches a variety of strategies to work effectively with athletes (Da Silva et al., 2020). Beyond a list of strategies, coaches learn theoretical knowledge that could help them expand their toolbox (Da Silva et al., 2020), which could decrease a reliance upon prioritizing what had worked for them as an athlete or simply copying and pasting what their own coaches had done (Oldridge et al., 2016).

Article Purpose

Awareness of theoretical knowledge and lessons from research could empower coaches to use more than "personal experience" to

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plan how they work with athletes and solve problems. According to the Multidimensional Model of Leadership (MDML), athletes will experience positive gains in their performance and performance satisfaction when they are coached in ways that they prefer (Weinberg & Gould, 2015). The present case study explored the extent a general list of athlete preferences based on MDML research held true for one collegiate athlete during her playing days. In doing so, it provides pragmatic insight to ways coaching theory translates to effective coaching by showing ways principles impact athletes' motivation, wellbeing, and connection with coaches.

Methods

Recruitment

A convenience sampling method was used to identify a former collegiate athlete who was acquainted with the first author. The interview took place in February of 2016. The study was completed while the first author was at a different university (Graduate course on the psychosocial factors in physical activity, Oregon State University, Corvallis, Oregon, USA). According to that university's human subjects research policy, the study met criteria for an exempt IRB review because it involved one adult participant and used an anonymous style of reporting (Oregon State University, n.d.). The alias "Sasha" is used. Sasha gave permission to disseminate the results of the interview.

Participant biography

At the time of the interview, Sasha was around 24 years old and was a physical educator in a public school system. She had played several sports since a young age, including soccer and softball. As a collegiate athlete, her chosen sport was soccer. She did not join any other university athletic teams. The participant had trained and competed for 15 years within the sport of soccer and was a collegiate athlete all four years of her undergraduate education. This interview focused on her experiences as a collegiate athlete on a NCAA Division I women's soccer team (private university, western coast in the United States).

Protocol

To perform a structured interview, a list of interview questions was generated based on the key findings of three original research studies that tested the MDML in the sport domain (Horn et al., 2011; Moen et al., 2014; Surujlal & Dhurup, 2012). The three studies were found using the Google Scholar database. Sasha was asked to discern if, when she was a collegiate athlete, she would have agreed/disagreed with the list of preferences reported in each study article (e.g., Surujlal and Dhurup observed that a preference for a democratic leadership style and social support were lower than training and instruction). Sasha felt the responses transcribed from the phone interview and the first author's interpretations were accurate and did not request any modifications (i.e., a draft of the full manuscript write-up was shared with Sasha for review; Birt et al., 2016).

Analytic Plan

A discourse analysis to produce a critical interpretive synthesis was performed (Thomas et al., 2021). The focus was on the reflections made by Sasha evidenced in the typed interview transcript. A critical interpretation was conducted by the first author (JDT), discerning how Sasha's responses provided insight into the application of theorized principles for effective coaching behavior (Elliot & Timulak, 2021). The second author (SMR) was invited to serve as a 'critical friend' (Smith & McGannon, 2018) and independently verify the results/interpretations of the first author (March 2021; Hodge et al., 2009). The second author independently judged the first author's interpretations (Lee & Yoon, 2020): (a) fully aligns with interview transcript, (b) aligns with transcript, but the interpretation could be extended for a complete analysis, (c) result/interpretation omits key content or does not fully align with transcript, and (d) result/interpretation inaccurately represents an interviewee response.

Results and Discussion

The critical friend (second author) identified 10 interpretations made by the first author, which she then evaluated for accuracy and completeness (Table 1). All interpretations made by the first author were ultimately deemed to be 100% accurate. The second author made suggestions on how to expand upon an interpretation, which would add clarity to how an interview response affirmed/challenged the results of previous research, or could inform future coaching practice in the sport domain. The Results and Discussion section were revised accordingly.

Table 1. Results of Independent Verification of Interview Interpretation Accuracy & Completeness

Independent Appraisal	
Category	Count: Interpretations
Full alignment with interview transcript	3
Full alignment with transcript, but the interpretation could be extended for a more complete analysis	5
Results/interpretations omits key content or does not fully represent totality of interviewee response	1
Misaligned, interpretation inaccurately represents interviewee response	1
Consensus Following Discussion	
Category	Count: Interpretations
Full alignment with interview transcript	4
Full alignment with transcript, but the interpretation could be extended for a more complete analysis	6
Results/interpretations omits key content or does not fully represent totality of interviewee response	0
Misaligned, interpretation inaccurately represents interviewee response	0

Note. The second author (critical friend) independently identified 10 conclusions/interpretations the first author made based on the typed interview transcript (approved by the interviewee). The second author categorized the 10 conclusions/interpretations into one of the four categories listed in this table. This provided a general assessment of how well results presented in the write-up accurately reflected interviewee responses and corresponded to the summarized findings of the select research articles (the basis to the interview questions). The first and second author discussed the results and came to a consensus on the most accurate category for each conclusion/interpretation (based on explicit review of the interview question, interviewee response, and summarized research findings used to construct the interview questions). The process informed the precise revision of the results presented and discussed in the present article.

Main Findings

Article one by Surujlal & Dhurup (2012).
Focus: Athlete preference of coach's leadership style

Key take-a-ways for practice

1. The most preferred leadership behaviors were training, providing instruction and positive feedback, while an autocratic approach was the least preferred.
2. Preferences for training and instruction were greater than for both a democratic leadership style and social support.

For Sasha, a democratic coaching style and an autocratic coaching style were both valued. This contrasts with the findings of Surujlal and Dhurup (2012), who reported athletes, irrespective of gender, age, and competition level, preferred an autocratic coaching style the least. Sasha appeared to weigh them relatively equally, suggesting that there exists a time and place where each would be effective. For example, in distinguishing the two, she made the following comment:

I feel like I can relate to both. At times [it is] appropriate to be autocratic to sometimes get your point across. There were times [when] my coach was not the nicest…[would not] say the nicest things to me…[but I] knew if I don't fix this right away, then I'm not going [to] get better or satisfy his needs to get playing time… maybe the way [the coach] is saying [the feedback] is to help me.

For Sasha, an autocratic coaching behavior was to be firm and direct, which helped athletes to understand their coach's standards and expectations, and that they could not take advantage of the nice tendencies. But she also shared that, in the moment, positive feedback is much more appreciated. Sasha concluded that effective coaching struck a balance between the autocratic and democratic coaching leadership styles.

Sasha's explanation about striking a balance between the two coaching styles presents helpful insight. First, athletes may work hard to understand the motive and perspective of their coach. However, because an autocratic coaching style is one-directional communication from coach to athlete, autocratic coaching may be more likely to cause athletes to feel dissatisfied about their performance status or progression. Specifically, an athlete's personal achievements or persistence may often be elided within a one-directional communication which prioritizes the coach's agenda/assumptions (Szedlak et al., 2020). Second insight from Sasha's explanation is that athletes may expect coaches to oscillate between autocratic (firm) and democratic (collaborative) coaching styles.

Surujlal and Dhurup's study addresses the idea of "self-determination." The more self-determined a person feels, the more intrinsically motivated they are. A democratic style of coaching likely affirms perceived autonomy, while social support affirms non-controlling fellowship. Both behaviors foster intrinsic motivation, which research has shown fosters/maintains skill development, tenacity, and performance satisfaction (De Muynck et al., 2017).

It is striking that, like Surujlal and Dhurup's sample of participants, Sasha also recalled having a preference that her coaches focus on training and instruction over a democratic leadership style and social support (not to say the latter two were not important). She felt that an emphasis on training and instruction sent a clear message that all players would be held to the same standards, both on and off the field. Sasha's response was further interpreted by the first author as an implicit preference for coaches to dedicate equal attention to the training and instruction of each athlete. This interpretation was substantiated by the following comments from Sasha.

I think…with the training and instruction [being emphasized], it's just better as a player to understand that everyone is on an equal playing field and the coach doesn't hold other players at a higher level or show some players are more [in] high demand to play more minutes…that way, players could feel more [trust in the coach…knowing] that everyone is going to be treated [the same] and have the same consequences…

For Sasha, trust may have represented confidence in a coach's integrity to fairness and equality. This might bring into question how both a democratic leadership style and social support are popularly operationalized within the wider literature. Athletes may feel socially supported knowing that equitable attention will be paid to their personal development, and through equitable attention, a coach may be viewed as behaving democratically.

Article two by Horn and colleagues (2011).
Focus: Relationship between collegiate athletes' psychological characteristics and their preferences for different types of coaching behavior

Key take-a-ways for practice

1. Athletes who were highly self-determined (i.e., internally motivated) and who experienced somatic anxiety (physical symptoms of nervousness or worry such as butterflies in the stomach or dry mouth) preferred the following leadership behaviors:
   a. Democratic leadership style
   b. Dedicating a majority of time to training and instruction
   c. Creating a socially supportive atmosphere
   d. Recognizing and rewarding performance efforts (i.e., positive feedback)
   e. Providing specific and achievable information for how an athlete may improve (i.e., constructive feedback).
2. Athletes who experienced nervousness and worry (cognitive anxiety), but little physical symptoms preferred high frequency of positive feedback and had a low preference for the use of punishment as a motivational strategy.

Horn and colleagues' (2011) findings indicated self-determined athletes who experienced somatic anxiety resonated with Sasha's own experiences. Within her collegiate career, Sasha experienced a terrible back injury that sharply undermined her ability to keep up with the training schedule. The challenge or struggle to meet training expectations in a rigidly defined way caused Sasha to feel physically anxious. For example, during team meetings, Sasha shared that she would commonly experience butterflies in her stomach area and physical symptoms of nervousness because she was never sure if she would be allowed to play. When afforded an opportunity to play, Sasha was uncertain for how long she would be kept in the game. This all changed once the coaches gave more credibility to the advice of the team's athletic trainers and Sasha's self-evaluations concerning her abilities while recovering from an injury.

Modifying the training exercises so as not to exacerbate her injuries and working with Sasha on how she could best participate helped to clarify Sasha's role on the team. It was no longer tenuous, but specific and appropriate to her needs as a person and athlete (e.g., playing for specific time durations during certain periods of games). The discussions that unfolded between Sasha, the athletic trainer, and her coaches helped all three stakeholders to arrive at what Sasha felt were promising solutions. This shared decision making represents a democratic coaching style in a traditional sense. Furthermore, through a candid discussion with Sasha, her coaches displayed empathy towards Sasha's situation. This display of empathy, as well as the use of clear communication to the rest of the team concerning Sasha's new role, may have contributed to Sasha's perception that the team environment be-

came more socially supportive. Specifically, Sasha expressed that when she felt secure in her role on the team—what her specific contribution was to be—she felt more self-determined. The socially supportive behavior provided by her coaches gave her reassurance about her role. This allowed Sasha to feel content in simply trying her best and she began to experience more joy from her participation.

Sasha's collegiate athlete experience also concurred with Horn and colleague's second finding. Athletes who have cognitive anxiety only/mainly preferred a higher frequency of positive feedback, and they had a lower preference for punishment as a motivational strategy. Sasha revealed that during, "hell week," she was beset with cognitive anxiety, not somatic (a.k.a., physical). She was constantly on edge contemplating what the coaching staff might have in store for them (next). Here are her thoughts on the matter: "There was always a sense of worry. What are we going to do at practice? Are we going to run? Are we going to have fitness? [It was a] time when [I was] most anxious…nervous [since we] had to run more…" Sasha speculated many possible reasons for why their practices became more physically demanding, including wondering if the extra physical conditioning was a form of punishment.

At times like these, Sasha wished that the coaches would offer motivation more often in their communications to the team. Sasha confirmed that by positive motivation she meant positive feedback (i.e., recognizing and/or rewarding performance efforts). This is also in-line with the findings of Horn and colleagues. It was clear from Sasha's description of her memories that positive feedback was not very common, and the same was true for the use of social support strategies. In their absence, she often questioned her abilities: "Am I going to survive this? Am I really mentally tough, and what is it to be mentally tough? How are these activities going to make us better soccer players?" These findings show the importance of not viewing athletes in passive terms, but rather as active agents interpreting their cultural environments (Barcza-Renner et al., 2016).

Article three by Moen and colleagues (2014).
Focus: Performance progress and leadership behavior

Key take-a-ways for practice

1. Athletes most satisfied with their performance preferred the following coaching behaviors
   - Democratic behavior
   - Positive feedback
   - Social support
   - Training and instruction
2. For athletes most satisfied with their performance, below lists their top three preferred coaching behaviors:
   - Democratic coaching behavior
   - Positive feedback
   - Training and instruction

Note. For both lists, the article authors did not appear to base them on a particular order.

Moen and colleagues (2014) found that athletes reported higher satisfaction if they recalled their coaches performing the following behaviors: dedicating time to training and instruction, facilitating a socially supportive environment, and providing positive feedback. Sasha agreed that these results aligned with her own experiences as a collegiate athlete. She recounted one game in which she believed her coaches integrated the latter of the three.

Sasha stated: at the time we were playing very well, but we still hadn't reached our peak performance. At half-time [the coaches] gave us this kind of very strong speech…which kind of gave us an idea we weren't performing to our best, but we were close and just had to work hard…I remember going into that second half highly motivated, determined to work harder to achieve [my] greatest potential, [to] max out [my] effort… [The] result? We won that game. Looking back, [I] had very high satisfaction in my performance.

Sasha disclosed that her coaches' language was perhaps not the most appropriate and that they were curt (e.g., you need to get to work… get your job done). This discloser reveals situations in which autocratic communication could positively impact performance, even if the tone/wording itself does not directly lead athletes to feel satisfied with their performance (outcomes or effort).

Sasha also agreed with the lists Moen and colleagues reported. Sasha's interview reveals how a dynamic feedback loop may operate between athlete and coach to impact two ultimate outcomes which the MDML suggests should concern coaches: (a) athletes' performance, and (b) athletes' satisfaction towards their performance. Namely, athlete satisfaction with their own performance mediates athlete perception of if a coach is an effective leader. In the situation Sasha described, there was alignment between what she sensed/desired about herself and what the coaches encouraged, despite the gruff delivery that risked making Sasha into a passive agent. This spotlights the significance of alignment between a coach's behavior and the desires/self-appraisals of an athlete.

Several limitations should be kept in mind when interpreting the results of this case study. This case study focused on the experiences of a former woman collegiate soccer athlete who attended a private university. The degree to which her responses may contrast with other players from her team, male athletes of the same university, or athletes at different educational levels cannot be accurately accounted for. Another limitation of this case study is the participant was personally acquainted with the first author. She may have been particularly motivated to participate and give favorable responses. However, methodology for a member check (Birt et al., 2016) and a critical friend (Smith & McGannon, 2018), increased the trustworthiness of the findings to the present study. Moreover, the overlap of our findings with those consistently reported in the peer-reviewed literature supported the coaching strategies we offered.

Conclusion

This case study provides insight as to why and at what times athletes might prefer certain coaching behaviors over others. This insight was generated by comparing the findings of three original studies that investigated the Multidimensional Model of Leadership (MDML) and the experience of a former NCAA Division I collegiate athlete. Though there were similarities between her preferences and the results of the three studies reviewed, there were also differences. The findings of this study provided information that could help coaches see the applicability of one theory common to coach development programs. The situations described in this study could be the basis for role-playing exercises, where coaches practice using theory-based strategies in scenarios commonly faced by coaches (e.g., Szarabajko et al., 2021). Situations highlighted in this article include: (a) communicating goals for each phase of training, (b) training plans for injured athletes, and (c) responding to 'stalled' or 'disappointing' performances. While true most coaches face gaps in their readiness to work with atheltes, efforts to close them can be elevated by helping coaches see the relevance of coaching theory and research (Oldridge et al., 2016). When these connections are made, coaches and athletes stand to benefit (Massey & Whitley, 2021).

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Conflict of Interest
The authors declare that there is no conflicts of interest.

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- ✓ In one study (Reilly, 1997), soccer players
- ✓ In the study by Reilly (1997), soccer players
- ✓ In 1997, Reilly's study of soccer players

Works by two authors
- ✓ Duffield and Marino (2007) studied
- ✓ In one study (Duffield & Marino, 2007), soccer players
- ✓ In 2007, Duffield and Marino's study of soccer players

Works by three to five authors: cite all the author names the first time the reference occurs and then subsequently include only the first author followed by et al.
- ✓ First citation: Bangsbo, Iaia, and Krustrup (2008) stated that
- ✓ Subséquent citation: Bangsbo et al. (2008) stated that

Works by six or more authors: cite only the name of the first author followed by et al. and the year
- ✓ Krustrup et al. (2003) studied
- ✓ In one study (Krustrup et al., 2003), soccer players

Two or more works in the same parenthetical citation: Citation of two or more works in the same parentheses should be listed in the order they appear in the reference list (i.e., alphabetically, then chronologically)
- ✓ Several studies (Bangsbo et al., 2008; Duffield & Marino, 2007; Reilly, 1997) suggest that

2.4.3. Examples for Reference list

Journal article (print):

Nepocatych, S., Balilionis, G., & O'Neal, E. K. (2017). Analysis of dietary intake and body composition of female athletes over a competitive season. *Montenegrin Journal of Sports Science and Medicine, 6*(2), 57-65. doi: 10.26773/mjssm.2017.09.008

Duffield, R., & Marino, F. E. (2007). Effects of pre-cooling procedures on intermittent-sprint exercise performance in warm conditions. *European Journal of Applied Physiology, 100*(6), 727-735. doi: 10.1007/s00421-007-0468-x

Krustrup, P., Mohr, M., Amstrup, T., Rysgaard, T., Johansen, J., Steensberg, A., Bangsbo, J. (2003). The yo-yo intermittent recovery test: physiological response, reliability, and validity. *Medicine and Science in Sports and Exercise, 35*(4), 697-705. doi: 10.1249/01.MSS.0000058441.94520.32

Journal article (online; electronic version of print source):

Williams, R. (2016). Krishna's Neglected Responsibilities: Religious devotion and social critique in eighteenth-century North India [Electronic version]. *Modern Asian Studies, 50*(5), 1403-1440. doi:10.1017/S0026749X14000444

Journal article (online; electronic only):

Chantavanich, S. (2003, October). Recent research on human trafficking. *Kyoto Review of Southeast Asia, 4*. Retrieved November 15, 2005, from http://kyotoreview.cseas.kyoto-u.ac.jp/issue/issue3/index.html

Conference paper:

Pasadilla, G. O., & Milo, M. (2005, June 27). *Effect of liberalization on banking competition*. Paper presented at the conference on Policies to Strengthen Productivity in the Philippines, Manila, Philippines. Retrieved August 23, 2006, from http://siteresources.worldbank.org/INTPHILIPPINES/Resources/Pasadilla.pdf

Encyclopedia entry (print, with author):

Pittau, J. (1983). Meiji constitution. In *Kodansha encyclopedia of Japan* (Vol. 2, pp. 1-3). Tokyo: Kodansha.

Encyclopedia entry (online, no author):

Ethnology. (2005, July). In *The Columbia encyclopedia* (6th ed.). New York: Columbia University Press. Retrieved November 21, 2005, from http://www.bartleby.com/65/et/ethnolog.html

Thesis and dissertation:

Pyun, D. Y. (2006). *The proposed model of attitude toward advertising through sport.* Unpublished Doctoral Dissertation. Tallahassee, FL: The Florida State University.

Book:
Borg, G. (1998). *Borg's perceived exertion and pain scales*: Human kinetics.

Chapter of a book:
Kellmann, M. (2012). Chapter 31-Overtraining and recovery: Chapter taken from Routledge Handbook of Applied Sport Psychology ISBN: 978-0-203-85104-3 *Routledge Online Studies on the Olympic and Paralympic Games* (Vol. 1, pp. 292-302).

Reference to an internet source:
Agency. (2007). Water for Health: Hydration Best Practice Toolkit for Hospitals and Healthcare. Retrieved 10/29, 2013, from www.rcn.org.uk/newsevents/hydration

2.5. Tables

All tables should be included in the main manuscript file, each on a separate page right after the Reference section.

Tables should be presented as standard MS Word tables.

Number (Arabic) tables consecutively in the order of their first citation in the text.

Tables and table headings should be completely intelligible without reference to the text. Give each column a short or abbreviated heading. Authors should place explanatory matter in footnotes, not in the heading. All abbreviations appearing in a table and not considered standard must be explained in a footnote of that table. Avoid any shading or coloring in your tables and be sure that each table is cited in the text.

If you use data from another published or unpublished source, it is the authors' responsibility to obtain permission and acknowledge them fully.

2.5.1. Table heading

Table heading should be written above the table, in Title Case, and without a full stop at the end of the heading. Do not use suffix letters (e.g., Table 1a, 1b, 1c); instead, combine the related tables. *See* example:

- ✓ **Table 1.** Repeated Sprint Time Following Ingestion of Carbohydrate-Electrolyte Beverage

2.5.2. Table sub-heading

All text appearing in tables should be written beginning only with first letter of the first word in all capitals, i.e., all words for variable names, column headings etc. in tables should start with the first letter in all capitals. Avoid any formatting (e.g., bold, italic, underline) in tables.

2.5.3. Table footnotes

Table footnotes should be written below the table.

General notes explain, qualify or provide information about the table as a whole. Put explanations of abbreviations, symbols, etc. here. General notes are designated by the word *Note* (italicized) followed by a period.

- ✓ *Note.* CI: confidence interval; Con: control group; CE: carbohydrate-electrolyte group.

Specific notes explain, qualify or provide information about a particular column, row, or individual entry. To indicate specific notes, use superscript lowercase letters (e.g. $^{a, b, c}$), and order the superscripts from left to right, top to bottom. Each table's first footnote must be the superscript ^{a}.

- ✓ ^{a}One participant was diagnosed with heat illness and n = 19.^{b}n =20.

Probability notes provide the reader with the results of the texts for statistical significance. Probability notes must be indicated with consecutive use of the following symbols: * † ‡ § ¶ || etc.

- ✓ *P<0.05,†p<0.01.

2.5.4. Table citation

In the text, tables should be cited as full words. *See* example:

- ✓ Table 1 (first letter in all capitals and no full stop)
- ✓ ...as shown in Tables 1 and 3. (citing more tables at once)
- ✓ ...result has shown (Tables 1-3) that... (citing more tables at once)
- ✓ ....in our results (Tables 1, 2 and 5)... (citing more tables at once)

2.6. Figures

On the last separate page of the main manuscript file, authors should place the legends of all the figures submitted separately.

All graphic materials should be of sufficient quality for print with a minimum resolution of 600 dpi. JASPE prefers TIFF, EPS and PNG formats.

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Figures and figure legends should be completely intelligible without reference to the text.

The price of printing in color is 50 EUR per page as printed in an issue of JASPE.

2.6.1. Figure legends

Figures should not contain footnotes. All information, including explanations of abbreviations must be present in figure legends. Figure legends should be written bellow the figure, in sentence case. *See* example:

- ✓ **Figure 1.** Changes in accuracy of instep football kick measured before and after fatigued. SR – resting state, SF – state of fatigue, *p>0.01, †p>0.05.

2.6.2. Figure citation

All graphic materials should be referred to as Figures in the text. Figures are cited in the text as full words. *See* example:

- ✓ Figure 1
  - × figure 1
  - × Figure 1.
  - ✓ ….exhibit greater variance than the year before (Figure 2). Therefore…
  - ✓ ….as shown in Figures 1 and 3. (citing more figures at once)
  - ✓ ….result has shown (Figures 1-3) that... (citing more figures at once)
  - ✓ ….in our results (Figures 1, 2 and 5)... (citing more figures at once)

2.6.3. Sub-figures

If there is a figure divided in several sub-figures, each sub-figure should be marked with a small letter, starting with a, b, c etc. The letter should be marked for each subfigure in a logical and consistent way. *See* example:

- ✓ Figure 1a
- ✓ …in Figures 1a and b we can…
- ✓ …data represent (Figures 1a-d)…

2.7. Scientific Terminology

All units of measures should conform to the International System of Units (SI).

Measurements of length, height, weight, and volume should be reported in metric units (meter, kilogram, or liter) or their decimal multiples.

Decimal places in English language are separated with a full stop and not with a comma. Thousands are separated with a comma.

Percentage	Degrees	All other units of measure	Ratios	Decimal numbers
✓ 10%	✓ 10º	✓ 10 kg	✓ 12:2	✓ 0.056
× 10 %	× 10 º	× 10kg	× 12 : 2	× .056

Signs should be placed immediately preceding the relevant number.		
✓ 45±3.4	✓ p<0.01	✓ males >30 years of age
× 45 ± 3.4	× p < 0.01	× males > 30 years of age

2.8. Latin Names

Latin names of species, families etc. should be written in italics (even in titles). If you mention Latin names in your abstract they should be written in non-italic since the rest of the text in abstract is in italic. The first time the name of a species appears in the text both genus and species must be present; later on in the text it is possible to use genus abbreviations. *See* example:

- ✓ First time appearing: *musculus biceps brachii*

Abbreviated: *m. biceps brachii*

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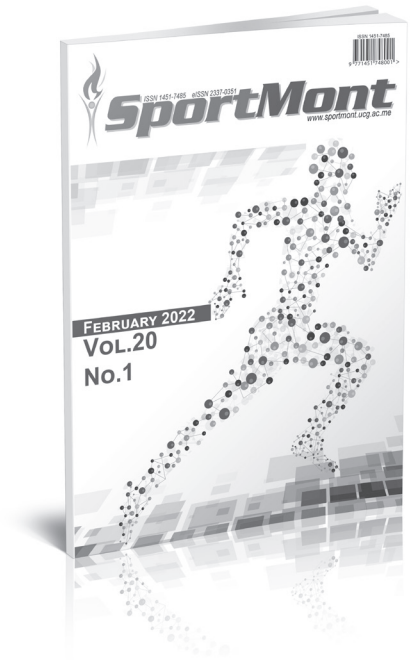

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Winter issue – February 2023

Montenegrin Journal of Sports Science and Medicine

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OF **S**PORTS **S**CIENCE
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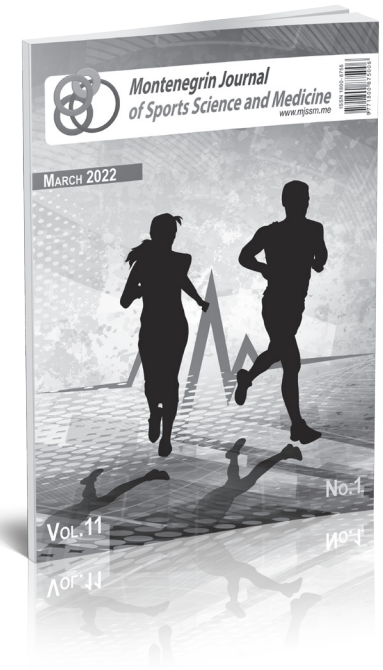

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MONTENEGRIN SPORTS ACADEMY

Founded in 2003 in Podgorica (Montenegro), the Montenegrin Sports Academy (MSA) is a sports scientific society dedicated to the collection, generation and dissemination of scientific knowledge at the Montenegrin level and beyond.

The Montenegrin Sports Academy (MSA) is the leading association of sports scientists at the Montenegrin level, which maintains extensive co-operation with the corresponding associations from abroad. The purpose of the MSA is the promotion of science and research, with special attention to sports science across Montenegro and beyond. Its topics include motivation, attitudes, values and responses, adaptation, performance and health aspects of people engaged in physical activity and the relation of physical activity and lifestyle to health, prevention and aging. These topics are investigated on an interdisciplinary basis and they bring together scientists from all areas of sports science, such as adapted physical activity, biochemistry, biomechanics, chronic disease and exercise, coaching and performance, doping, education, engineering and technology, environmental physiology, ethics, exercise and health, exercise, lifestyle and fitness, gender in sports, growth and development, human performance and aging, management and sports law, molecular biology and genetics, motor control and learning, muscle mechanics and neuromuscular control, muscle metabolism and hemodynamics, nutrition and exercise, overtraining, physiology, physiotherapy, rehabilitation, sports history, sports medicine, sports pedagogy, sports philosophy, sports psychology, sports sociology, training and testing.

The MSA is a non-profit organization. It supports Montenegrin institutions, such as the Ministry of Education and Sports, the Ministry of Science and the Montenegrin Olympic Committee, by offering scientific advice and assistance for carrying out coordinated national and European research projects defined by these bodies. In addition, the MSA serves as the most important Montenegrin and regional network of sports scientists from all relevant subdisciplines.

The main scientific event organized by the Montenegrin Sports Academy (MSA) is the annual conference held in the first week of April.

Annual conferences have been organized since the inauguration of the MSA in 2003. Today the MSA conference ranks among the leading sports scientific congresses in the Western Balkans. The conference comprises a range of invited lecturers, oral and poster presentations from multi- and mono-disciplinary areas, as well as various types of workshops. The MSA conference is attended by national, regional and international sports scientists with academic careers. The MSA conference now welcomes up to 200 participants from all over the world.

It is our great pleasure to announce the upcoming 19th Annual Scientific Conference of Montenegrin Sports Academy “Sport, Physical Activity and Health: Contemporary Perspectives” to be held in Dubrovnik, Croatia, from 7 to 10 April, 2022. It is planned to be once again organized by the Montenegrin Sports Academy, in cooperation with the Faculty of Sport and Physical Education, University of Montenegro and other international partner institutions (specified in the partner section).

The conference is focused on very current topics from all areas of sports science and sports medicine including physiology and sports medicine, social sciences and humanities, biomechanics and neuromuscular (see Abstract Submission page for more information).

We do believe that the topics offered to our conference participants will serve as a useful forum for the presentation of the latest research, as well as both for the theoretical and applied insight into the field of sports science and sports medicine disciplines.

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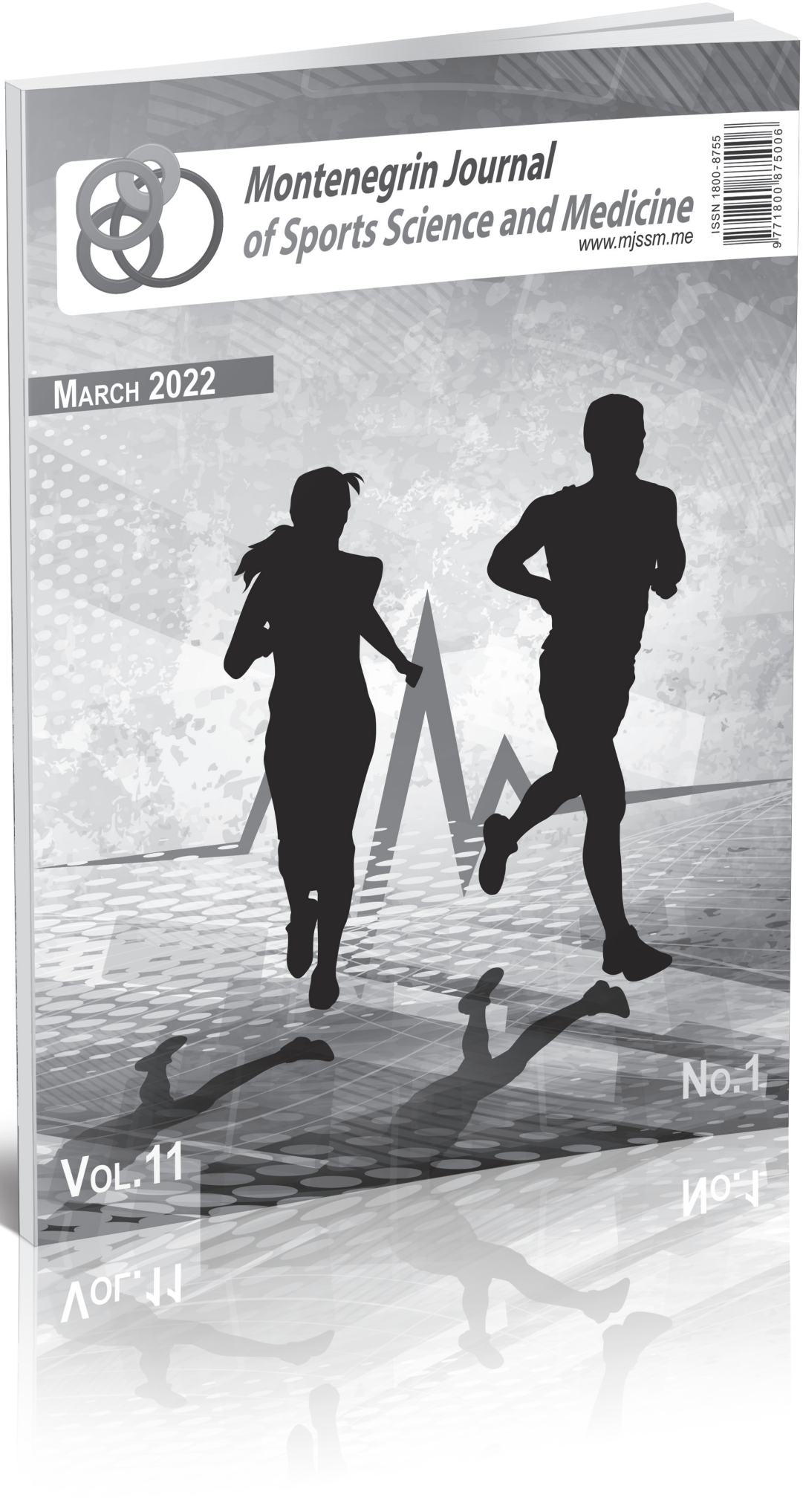
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