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ORIGINAL ARTICLE

Socio-economic characteristics of families and physical activity of children

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Abstract

This study presents the results of empirical research conducted with the aim of analyzing differences in the physical activity of children in relation to the socio-economic characteristics of their families. The research was conducted by applying a questionnaire distributed to pupils aged 11-12 years, who live in the city of Novi Sad (the city and the village of Rumenka, Veternik, Kac, Bukovac, Futog). Bearing in mind that the work is a part of a broader research, the authors' attention was focused on the objective, and the evaluation of the respondents on the socio-economic status of the family, as well as differences in physical activity among boys and girls, and children who live in urban or rural setting. As dominant in this study stands out the finding of the author that the socioeconomic characteristics of families significantly affect the intensity, form and quality of physical activity of children. Since such a finding puts children living in families with low socioeconomic status into a disadvantaged position, the authors believe that with the findings of this and compatible researches it is needed to familiarize with the wider academic community, in order to include other social institutions in the process of affirmation of physical activity as an important lifestyle quality in children and youth.

Keywords Socio-economic characteristics • Children • Family • Physical activity

Introduction

Socio-economic characteristics, and the inequalities within them, are among the current topics in academic research focused on the development of children and youth (Mollborn, Lawrence, James-Hawkins, & Fomby, 2013). The social sciences continuously conduct research aimed at discovering as clear indicators of genetically inherited and even more intensely socially conditioned factors as possible, that affect the overall cognitive, socio-emotional and physical development of the youngest part of the population. In this regard, this study presents an empirical annex to the mentioned set of research, given the focus of authors' attention on the relation of some socio-economic characteristics of the family and physical activity of schoolchildren in the city of Novi Sad.

Insight into the published academic papers indicates the actuality of topics and diversity of directions in which the authors perceive the issue of physical activity of children and more concrete relation of socio-economic status of families on one hand and anthropometric features, motor behavior and intellectual ability on the other. In these studies (Strauss, Rodzilsky, Burack, & Colin, 2001; Scheerder, Vanreusel, Taks, & Renson, 2005; Brodersen, Steptoe, Boniface, & Wardle, 2007; Maksimovic, Matic, & Obradovic, 2009; Matic, Kuljic, & Maksimovic, 2010; De Cocker et al., 2012; Klein, Fröhlich, Pieter, & Emrich, 2016), among other things, we find some key factors that can influence the physical activity of children. It is

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the individual factors, family (that is appropriate family support), peers (adequate support), school (education), local community (low or high economic status).

The family as the basic social community, and the nearest environment in which children develop is crucial for the overall development of children, and therefore the results in the field of physical activity (Mayer, 2002; Giulianotti 2008). As children often learn by observing the behavior of people in their immediate environment, not surprising are the observations that the children of parents who have already achieved results in sport are themselves physically active and successful in this area (Giulianotti, 2008). Contrary to such families, there are also those where a parent due to various reasons, is not pointed to the importance of practicing physical activity, resulting in a gradual loss of children's interest in sport (Matic, Kuljic, & Maksimovic, 2010).

Peer influence is also important, and in adolescence certainly primary for general development, including physical activity of children (Rowland, 1999; Sallis, Prochaska, & Taylor, 2000). Finally, institutional support through activities at school or at the level of clubs in local governments is the last round of incentives of children to physical activity by the wider community. However, recently, among these factors socioeconomic status of the family has clearly separated as dominant. In the Serbian society, the reason for such situation is the general pauperization of the population, decades-long influence of which is visible in all areas of social life. As physical activity is not among the existential human needs, we can assume that in families of lower socioeconomic status from the perspective of parents, it does not occupy the primary place. On the other hand, the measures taken by parents directly affect the intensity and quality of physical activity, and long term general psycho-physical development of children.

With this in mind, our attention in this study is focused on the socio-economic context as a factor of influence on physical activity of schoolchildren in the city of Novi Sad and the surrounding places. More specifically, the aim of the research is to analyze the differences in the physical activity of children in relation to the socio-economic characteristics of their families.

Method

The sample of respondents in the research included 467 boys and 464 girls (N=931) aged 11-12 years (5th grade pupils of primary schools), of which 48.5% of respondents come from villages (Rumenka, Veternik, Kac , Bukovac, Futog) and 51.5% from the city of Novi Sad.

Evaluation of physical activity entailed the scale format from 0 to 7, depending on the frequency of the respondent's doing of varying intensity of physical activity on a weekly basis (walking, moderate (not walking) and intense physical activity).

Socio-economic characteristics were evaluated based on the issues related to one aspect of socio-economic status, that is the economic well-being of families, which indirectly reflects families' income. This segment of the research included the following questions: 1) “Does your family own a car or a van?”, 2) “Do you have your own room?” 3) “How many computers are in possession of your family?” 4) “How many bathrooms do you have at home?” 5) “Does your family own a dishwasher?” and 6) “How many times did you and your family travel on vacation outside of Serbia last year?” Summarizing the obtained results, all respondents were classified into 3 formed categories of socioeconomic status: low (0-4), intermediate (5-9) and high (10 and over). These results were supplemented by respondents' own assessment of families' wealth. Question 1 implied a scale of responses: 0-no, 1-yes, 1 vehicle, 2-yes, two or more vehicles. Questions 2 and 5 presented dichotomous variables (0-no, 1-yes), while questions 3, 4 and 6 implied the scale format with the following answers: 1) none, 2) one, 3) two, or 4) more than two.

The statistical data analysis of differences among the respondents belonging to different categories of socioeconomic status used Kruskal-Wallis and Man-Whitney tests.

Results and Discussion

The descriptive statistics in Table 1 show the following representation of respondents defined by socio-economic categories: middle (65.2%), high (24.6%), and low (10.2%) socio-economic status.

Table 1. Socio-economic characteristics of respondents

Variable	N	%
Socio-economic category		
Low status	94	10.2
Middle status	601	65.2
High status	227	24.6
How well-off/wealthy is the family?		
Not at all	3	0.3
Not really	45	4.8
Average	411	43.8
Really	323	34.4
Very	156	16.6

Weekly physical activity (freq.)	Walking (% of N)	Moderate physical activity (% of N)	Intensive physical activity (% of N)
0	0.1	0.3	1.2
1	2.2	2.8	3.7
2	3.1	13.7	15.1
3	3.6	31.2	41.0
4	4.5	12.4	15.9
5	19.5	15.0	12.8
6	8.6	6.8	4.6
7	58.5	17.8	5.6

However, it is interesting that the estimation of wealth of the family of the respondents showed slightly different results: the low status (5.1% answers - not at all and not really), middle (43.8%, answer - average) and high (51%, answers - really, very), which indicates that respondents consider the socio-economic status of their families to a certain extent higher than it is objectively observed according to the socio-economic parameters. This result can be attributed to the comparison of the socio-economic status of their families with the families of children from the immediate environment, which is a logical aspect of this kind of evaluation in the age category of the respondents.

The next step was a comparative statistical analysis of the data, which was started by analyzing the differences in the levels of physical activity in relation to gender, and is presented in Table 2.

Table 2. Analysis of the differences in the levels of physical activity by gender of the respondents

Variable	Mean Rank	
	Boys	Girls
Walking	445.08	462.98
Moderate physical activity	448.52	452.51
Intensive physical activity	388.40**	338.81

** < 0.01 - Man-Whitney test

The presented results suggest that gender differences in doing intensive forms of physical activity are in favor of the boys. These results correspond to the results of previously completed studies (Alexandre, Obert, Bonnet, & Courteix, 2003; Djordjic, 2006; Djordjic & Krneta, 2007; Djordjic & Matic, 2008), which indicate the increased willingness of parents of preschool and early-school ages to encourage children to engage in physical activity. There is also more intense stimulation of boys than girls to engage in physical activity, which is an important indicator of cultural and gender-stereotyped perception of doing sports activities. Earlier research carried out on a sample of children of higher primary school grades show themselves that boys and girls differently assess sport and their own competencies in sport (Djordjic & Krneta, 2007). The result of the aforementioned gender-stereotyping suggests that girls attach to sport some masculine traits. Djordjic and Matic (2008) pointed out that “boys feel more competent in sports, prefer competition and physical challenge more than girls, and that they do sports in clubs to a significantly greater extent than girls. Finally, they note the significantly lower number of female sporting role models”. As the results of this study correspond with the results of research already completed, it can be seen as an indicator of insufficient engagement of parents, teachers and children themselves in the meantime.

The obtained results of the difference analysis of respondents in relation to their socio-economic characteristics are shown in Table 3.

Table 3. Differences in respondents by socio-economic characteristics

socio-economic characteristics 1 – low, 2 – middle i 3 – high status	Mean Rank			χ^2
	1	2	3	
Walking	415.72	442.47	481.70[1b2b]	6.81*
Moderate physical activity	450.33	429.90	486.01[2a]	8.04*
Intensive physical activity	342.52	337.93	425.91[1a2a]	26.68**

* 0.05, ** < 0,01 - Kruskal Wallis test
[1,2,3] subsamples, [a] < 0.01, [b] < 0.05 - Man Whitney test

Based on the obtained results, it can be concluded that statistically significant differences in all variables of physical activity in respondents of different socio-economic characteristics are in favor of children whose families belong to the highest category of socio-economic status, while the respondents whose families belong to low and middle status reported no statistically significant differences. These results correspond to the factors of influence on physical activity in children, which were mentioned in the first part of the study. On one hand it can be assumed that the parents of children who are now more physically active turned their attention to a significant extent to that part of the everyday of their children in the preschool and early school age, and thus further developed the working habit in children who are now physically active independently, without the support of the adults. In less active children, it can be assumed that the parents due to the low socio-economic status of the family did not have the conditions, nor considered a priority at the stage of primary socialization of their children to point to physical activity as part of a future lifestyle. Finally, it can be assumed that some of the children at the stage of adolescence distance themselves from physical activities, diverting their resources to develop other talents or skills, which can be encountered in literature (see: Rowland 1999). The need of adolescents to conform, due to peer pressure, except in cases where doing sport has become an important part of the lifestyle of the child, in everyday life, will distance children rather than make them closer to physical activity.

Further statistical analysis determined to what extent the respondents' place of residence differs the respondents from the aspect of physical activity (Table 4).

Table 4. Analysis of difference in physical activity of respondents by place of residence

Variable	Mean Rank	
	Village	City
Walking	471.21	445.38
Moderate physical activity	485.03**	424.64
Intensive physical activity	357.60	376.97

** < 0.01 - Man Whitney test

According to the results from Table 4, it can be concluded that moderate physical activity in the respondents from rural areas were statistically significantly more active than the population of children in the city. These results were expected, considering that the village as a socio-cultural context, due to the absence of large, busy streets and modern children gives more freedom to spend time in organized or spontaneous activities outside the house. This is not the case in the city, where the children's everyday life from an early age is conditioned by circumstances of parents to spend time together or take children to organized sports trainings. On the other hand, the range of activities that the city offers is significantly wider than in the village, which is why, beside sports and music schools, children often attend a school of foreign language, mathematics, art, go to the cinema and theater. Thus, physical activity becomes an option for urban, and one of the dominant in rural environment. Generally, the village and the city as a socio-cultural frameworks provide different opportunities for development, which is reflected in the manner of growing up and life style of children. Physical activity is one of the indicators of these manifest differences.

If the results of our study should be summarized in one sentence, it would read: “socio-economic characteristics of families significantly affect the intensity, form and quality of physical activity of children”. Such a conclusion is compatible with the results of previously published studies (La Torre, Masala, De Vito, Arzano, Fargione, & Capelli, 2003;

Maksimovic & Matic, 2006; Matic & Jaksic, 2007; Matic, Kuljic, & Maksimovic, 2010; Kuljic, Matic, & Maksimovic, 2014) indicating the socio-economic status of the family as a disposition to engage parents and children in physical activities. Authors emphasize parents' education, their qualification, type of place where they spent childhood, type of current residence of the family and parents' achievements in sports as key variables, and talk about their growing influence of economic characteristics on the physical activity of their children. Although indirectly, this study speaks in favor of these findings, indicating a relation of some socio-demographic parameters (gender, place of residence), socio-economic characteristics of the family and the type and intensity of their sports activities. Consequently, our findings are consistent with the conclusion that "without adequate conditions for the growth and development of an individual in a favorable socio-economic environment, physical activity cannot achieve its stated goal" (Matic & Jaksic, 2007). Similarly, Vandendriessche et al. (2012) point to the need of the public and local authorities to consider the possibilities for sports in all walks of life, to experience its beneficial effects and improve the level of physical fitness and motor coordination, especially those with lower socio-economic status. For them, according to the authors of individual studies (Neves et al., 2005; Matsudo et al., 2006), there are special opportunities for the improvement in the participation and level of physical activity, or reducing sedentarism.

Finally, these findings point to the necessity of informing the academic and professional community of the aforementioned relations, especially as due to the inability of the family to fulfill its function in this area, the focus should be directed gradually to other communities and institutions (schools, clubs, local governments, legislators), in order to make physical activity an increasingly desirable part of the lifestyle of children and young people.

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ORIGINAL ARTICLE

Differences in motor abilities of boys and girls aged 7 in relation to the level of intellectual ability

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Abstract
Since previous studies suggest a relationship between motor and cognitive development in children, a research was conducted in order to examine the differences in motor skills of children with different levels of intellectual ability. In a sample of 88 respondents, boys and girls aged 7, an assessment of motor skills was performed by using the battery of seven motor tests and assessment of intellectual abilities by using the test of Raven's Coloured Progressive Matrices. Respondents were divided into three groups according to the results of the test. After analyzing the results of the research it was shown that there were no statistically significant differences in the area of motor abilities of children of different intellectual levels, but there were differences at the univariate level regarding the tests Hand Tapping and Seat-and-Reach.

Keywords Raven's Coloured Progressive Matrices • Motor skills • Intelligence • Younger school age

Introduction

Current theoretical approaches and empirical findings from the research conducted over the last decade indicate that physical activity may contribute to the improvement and preservation of cognitive abilities during the human life. Improvement of physical abilities is associated with improvement of brain tissue during aging, while also the functional aspects of a higher order, which are involved in the control of cognition are improved (Gomez-Pinilla & Hillman, 2013). Cognitive behavioral model emphasizes the role of cognitive functioning that contributes to the emergence of emotional and behavioral disorders. Incorrect assessment of social situations, the tendency self-underestimation, unreasonable sense of guilt for errors, are examples of dysfunctional cognitive processes. Cognitive abilities are responsible for forecasting, planning, decision-making processes, as well as comparisons and information processing along with the use of long-term memory in resolving problem situations.

Motor skills play a key role in the functioning of the child regarding the social and emotional area (domain). Weaker motor coordination in children can affect their feelings that they are less able than their peers, but also affects their academic achievements, and even the choice of recreational activities. The relationship between motor skills and social and emotional functioning is usually considered indirect. In other words, poor motor skills can lead to poor achievements in individual and team sports, which can reduce the feeling of competence in children and increase their anxiety and depression (Cummins et al., 2005). Children with poor motor coordination are less competent in their ability to recognize emotions. Study by Cummins and associates (2005) found that children with motor coordination problems are less accurate (correct) and slower in reacting to facial emotional signs. Children with coordination disorder may be at a disadvantage during the social process with their peers, as they may have more difficulties in detecting emotional states of others and in use of this

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information for their behavior in the social environment.

Sport and physical activity are positively correlated with children's physical and mental health (Strong et al., 2005). However, the increased participation of children in sport and other forms of physical activity also leads to improved cognitive functioning of children, better information processing, development of memory, concentration, behavior. There is sufficient evidence on the relationship between physical activity and improvement of cognitive skills and executive functioning and control. Executive functioning refers to the cognitive processes needed for target oriented cognition and behaviors that develop through childhood and adolescence (Best, 2010; Hillman, Erickson, & Kramer, 2008; Hillman, Pontifex, Raine, Castelli, Hall, & Kramer, 2009; Kamijo et al., 2011). Most motor tasks require precisely those processes, and many of them contain problematic component, for example, numerous situations in the sports game, creating their own solutions to overcome the track with obstacles, etc. The motor coordination tests also consist of a kind of problem situations that need to be addressed effectively (Dolenc, Pistotnik, & Pinter, 2002). In addition, individuals who are physically more active are able to process more information faster. These data suggest that physical activity may contribute to the improvement of cognitive skills, allows effective response to a given challenge with good results in carrying out the task. New evidence shows that physical exercise exerts its effects on cognition, by influencing the molecular events related to the control of energy metabolism and synaptic plasticity, and their processes (Ang, Tai Lo, Seet, & Soong, 2010). An important initiator of the molecular mechanism includes physical exercises because the brain (CNS) is a derived neurotrophic factor, which acts within the interface between the metabolism and plasticity. Recent studies show that exercise along with other aspects of lifestyle affects the molecular basis of cognition (Baker, et al., 2010; Berchtold, Chinn, Chou, Kesslak, & Cotman, 2010; Gomez-Pinilla & Hillman, 2013; Kamijo & Takeda, 2009). In addition, selected dietary factors have similar mechanisms as exercises and, in some cases, can complement the effect of exercise. So, exercise and diet are non-invasive and effective strategies of combating neurological and cognitive disorders.

In many studies the relations were found between mobility and intelligence (Dolenc, Pistotnik, & Pinter, 2002; Hariri et al., 2003; Planinšec, 2002; M. V. Stojanović i M. Stojanović, 2006; M. Stojanović, Rubin, M. V. Stojanović & Fratrić, 2006). The motor testing of children systematically uses appropriate measuring instruments, or tests, in order to quantify motor behavior. Differences in motor behavior are attributed to differences in coordination, explosive strength, speed of alternative movements, balance and flexibility, exogenous factors, as well as the functioning of the CNS during the manifestation of certain abilities in motor behavior. Even less mentally disabled persons are significantly inferior in motor skills compared to the standard population, where the level of motor behavior in less mentally disabled person falls behind 3-4 years compared to the standard population of the same age (Nićin, 2000). The connection between intellectual and motor functioning was first detected and confirmed in samples of persons who are mentally disabled (Bala, Sabo, & Popović, 2005). Bearing in mind the results of previous research, a research was conducted in order to examine the differences in motor skills of children aged 7 depending on the level of cognitive ability.

Method

Data were collected as part of the research project “Anthropological status and physical activity of the population of Vojvodina”, Faculty of Sport and Physical Education in Novi Sad.

The analysis was conducted on a sample of 88 students (43 boys and 45 girls) aged 7, from the cities across Vojvodina (Novi Sad, Bačka Palanka, Sombor, Sremska Mitrovica and Zrenjanin) which were included in the testing within the research project “Anthropological status and physical activity of the population of Vojvodina”. Testing of motor abilities was performed on the basis of the reduced model designed by Kurelić et al. (1975) with 7 motor tests.

Motor tests that were applied in this study were: 1) Obstacle course backwards test – coordination of body and reorganization of movement stereotypes; 2) Hand tapping test – movement frequency; 3) Sit-and-reach test – flexibility; 4) Standing broad jump test – explosive leg strength; 5) 20 meters run test – running speed; 6) Trunk lifting test – repetitive strength of the trunk and 7) Bent arm hang test – static strength of arms and shoulders.

To test the intelligence the Raven's Coloured Progressive Matrices were used (Fajgelj, Bala, & Tubić, 2007). Raven's Coloured Progressive Matrices are one of the most commonly-used tests for testing the intelligence of preschool and young school-age children in our country. Based on the results achieved by the respondents during the test, they were divided into three groups: the first group consisted of respondents whose result was located within the first quarter, the second group consisted of respondents who achieved results in the second and third quarters, and in the third group were classified respondents with the best results (the fourth quarter). The first group contained 11 respondents (from 55 to 81 of IQ), the second group was made of 56 respondents (86 to 107 of IQ) and the third group was made of 21 respondents (109 of IQ and more).To determine the quantitative differences, univariate and multivariate analysis of variance were applied.

Results

The results of testing by using the multivariate analysis of variance showed that at the level of the whole system of motor variables, there was no statistically significant differences between respondents with different levels of intellectual abilities (F = 1.446; P = .138). However, at the univariate level, statistically significant differences were obtained in two of the seven motor variables: Hand tapping and Sit-and-reach (Table 1). From the table we can conclude that the second group (AVERAGE) achieved the best average values regarding the variable Hand tapping, while the third group achieved the best results regarding the variable seat-and-reach (ABOVE AVERAGE).

Table 1. Results of MANOVA, ANOVA, and Post-hoc tests regarding the motor skills in all analyzed groups

	Below average (^{a}) N=11	Average (^{b}) N=56	Above average (^{c}) N=21		
	mean ± SD	mean ± SD	mean ± SD	f	p
20m dash (0,1 s)	48.45 ± 5.126	48.18 ± 6.025	47.71 ± 4.417	.078	.925
Obstacle course backwards (0,1 s)	277.27 ± 140.895	241.04 ± 96.506	264.38 ± 114.381	.739	.481
Hand taping (n/15 s)	16.27 ± 3.690	19.25 ± 3.553$^{a/\mathbf{b}}$	18.19 ± 2.804	3.730	.028
Seat-and-reach (cm)	37.00 ± 8.899	40.77 ± 8.093	45.19 ± 11.321$^{a/\mathbf{c}}$	3.280	.042
Standing broad jump (cm)	121.82 ± 20.841	124.75 ± 21.277	122.90 ± 20.152	.124	.884
Bent arm hang (0,1 s)	155.18 ± 181.770	167.16 ± 120.181	185.48 ± 177.789	.191	.826
Trunk lifting (n/60 s)	28.64 ± 6.265	25.14 ± 10.147	26.52 ± 7.607	.723	.488
	F=1.446	P=.138			

Legend:
f – univariate f-test; p – significance of f-test; F – multivariate F-test; P – significance of F-test, a/b – significant Post-Hoc tests (a vs b, if b is bolded means that b is better than a)

In order to identify groups between which there are statistically significant differences in variables Hand tapping and Seat and reach, LSD – Post Hoc test was applied (Table 1). Statistically significant differences were noticed between the first and second group regarding the HAND TAPPING motor test. The differences are in favor of the second group (AVERAGE). When it comes to SEAT-AND-REACH motor test, statistically significant differences were observed between the first and the third group, and the difference is in favor of a third group (HIGHER VALUES).

Discussion

This study was aimed at the investigation of the differences in motor skills of children aged 7, with different levels of intellectual ability.

By reviewing the results obtained, we can conclude that there is no statistically significant difference in the general area ofmotor skills in children with different levels of intelligence. At the univariate level, however, there is a statistically significant difference regarding the two variables: Hand tapping and Sit-and-reach. Most authors agree with the fact that there are general mechanisms that are responsible for the speed of information flow,

and that the tasks with measuring the information flow rate, even the easiest ones, are significantly positively correlated with general intelligence factor (Vernon & Mori, 1992). It is concluded that complex motor tasks have a stronger relationship with cognitive abilities, i.e. their performance involves cognitive processes to a greater extent, while the process of performing a simple motor tasks is at the lower, elementary level, where the share of intellectual processes is minimized.

Van der Fels et al. (2015) have obtained different results regarding the relations between the basic categories of motor and cognitive abilities, resulting in interesting conclusions: fine motor skills, bilateral coordination of the body and movement performance in a given time interval showed the strongest correlation with cognitive abilities. Fine motor skills involve those tasks that require fine motor precision and integration; bilateral coordination of the body, includes the tasks of coordination of the whole body and require the involvement of almost all body parts and bilateral coordination of upper and lower extremities; movement performance in a given time interval includes the tasks (coarse/fine motor skills or tasks that involve object control) where the time needed by the child to perform a number of movements is essential, and these tasks are often divided into repetitive movements and sequencing movements. Repetitive movements are simple movements that are repeated as quickly as possible. Sequential movements include alternating patterns of complex movements executed as quickly as possible. However, balance, strength and agility are less associated with cognitive abilities. This can be explained by the fact that the first group of motor skills (fine motor skills, bilateral coordination of the body and movement performance in a given time interval) requires a higher level of cognitive demand. Motor skills that show a higher correlation with cognitive abilities can be interpreted as complex motor skills and they require cognitive abilities of higher order. Motor tasks that show lower correlation with cognitive abilities require less cognitive engagement.

Children of higher intellectual capacity are better and more effective in solving motor problems and tasks set before them, especially if they are under significant influence of the mechanism for movement structuring and mechanisms for regulation of excitation intensity (Fratrić et al., 2012). Without the mutual effect of motor and cognitive abilities it is hard to imagine most human activities, and this relationship lasts a lifetime. Acquisition of intellectual and motor abilities takes place in a very similar way, i.e. similar mechanisms govern both types of abilities (Paz et al., 2004). In addition to its well-established role in balance, coordination and other motor skills, the cerebellum plays a prominent role in a number of cognitive and emotional functions, and is also associated with the ability to learn complex motor tasks (Tiemeierisar., 2010). Cardiorespiratory endurance, muscular strength and power, and physical activity are associated with learning capability, which was consistent with the hypothesis that physical activity improves academic achievement. They concluded that physical activity and physical fitness, at best, can contribute to improved academic achievements (Dwyer et al., 2001). Cognitive abilities include mental processing of information and include processes such as attention, perception, memory, reasoning and problem solving. These obtained results coincide with some previous research (M. V. Stojanović & M. Stojanović, 2006). The highest partial influence on intelligence was achieved by the variable for assessing the frequency of movements, which is consistent with previous research by local authors (M. V. Stojanović et al., 2006), who also concluded that in preschool children intelligence has the greatest impact on the movements frequency (hand tapping), because it is the ability that is under the direct influence of the mechanism for the synergistic regulation and regulation of tone. In rapid execution of individual movements the mechanism of regulation of tone, whose main function is the activation of motor units, has a special role. In addition, the centers located in subcortical areas include regulatory mechanisms of different degree of excitation depending on the load, during the performance of the movement (special importance is given to the function of the reticular formation in the facilitation effect to the cerebrum cortex areas). This assertion is confirmed by research by Jakšić, Kolar, & Cvetković (2007) who have obtained results confirming the influence of the intelligence to the motor ability of movement frequency (hand tapping) among children aged 5 to 6.5 years.

The results obtained in this study do not coincide with the results from the most of the previous studies. This fact can be attributed to the specifics of both the sample of respondents and measuring instruments themselves. The results of study (Colquitt et al., 2011) indicate that other indicators of physical fitness may predict academic

achievement in students less than 10 years of age, as flexibility was a significant predictor of both language arts and mathematics achievement. The evidence of a relationship between flexibility and academic achievement in the results also provides support for the role of quality physical education in schools. The results of another study (Adesa et al., 2014) showed that there was an improvement of push up, trunk lift, nine meter running and sit and reach test for experimental group when it was compared from pre to post test measurements. The control group also improved in some aspects but it was not that much. The academic results showed that experimental group's academic achievement were greatly improved from first to second semester. But in the control group the mean value of academic achievement from first to second semester was decreased. The significance results showed that experimental group improved academic achievement due to participation of physical activities.

Regular participation in physical activity has a significant effect on the improvement and enhancement of physical fitness performance and improve academic achievements. The school participants, who take part in the regular physical activities can improve their physical fitness and academic achievement. Participation in regular exercises is very important for school children for overall development.

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ORIGINAL ARTICLE

Expert model of the most important methodical exercises for fast skiing turns teaching

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Abstract
The purpose of this research was to establish the expert model of learning and evaluation the most important methodical exercises for teaching short skiing turns in advanced skiing school. Participants were 20 skiing experts from different states. After the experts model was established, experts selected 5 most important methodical exercises for teaching short skiing turns. According to with the goal of the research, total frequency sum of expert choice of the most important methodical exercises has been used (O-observed; E-expected), while the difference between frequencies of expert evaluation has been tested by non-parametric Chi-square test (χ^2) and statistic meaning of differences (p). By natural selection, the ranking was made, and selection of the most important methodical exercises for teaching short skiing turns. After data processing, statistical differences were significant in frequencies in which experts choose most important methodical exercises (c2=17.30; p=0.14) while the differences between the values of most important methodical exercises were not established (c2=2.15; p=0.91). Statistical differences based on nationality were not established. Based on the obtained results it can be concluded that the experts in spite of the structural differences and specificity within each ski schools are equally recognized and valued those most important methodical exercises who contain the basic characteristics of effective lessons. This research is a foundation for future modeling which has made a selection of significant errors and exercises for their elimination, and their hierarchical classification.

Keywords expert model •ski demonstrators •short skiing turns

Introduction

The instruction of alpine skiers is a complex process conditioned by numerous endogenous and exogenous factors. Firstly, it depends on the specific mountain conditions in which it is performed, level of skiing foreknowledge, motivation and anthropological status of the subjects. In addition, it depends on the quality and the nature of the used skiing equipment, but mostly on the level of skiing education, experience and way of teaching used by skiing experts. Learning and performing specific skiing knowledge is a complex process that depends on the variable conditions of social environment. It can be defined as the process of systematic adoption and perfection of specific structure of dynamic movement, with the aim of efficient performance in various conditions and types of ski slopes. All the mentioned factors are the result of specific divisions and formations of different skiing school program models (Feinberg-Densmore, 2000; N. Jurković & D. Jurković, 2005; John, 2006; Murovec, 2006; Lešnik & Žvan, 2010). The skiing school programme enables and accelerates the process of acquiring skiing knowledge. The basis of the programme facilitates the adoption of various techniques of alpine skiing, and secures the gradual progress of skiing learning. In relation to the

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mentioned and with the aim of rational performance and lower energy consumption, the skiing elements and methodological exercises should succeed one another in a logical methodological order. Good skiers have high level of specific skiing knowledge, what is recognised as the ability of successfully performing characteristic skiing elements, as well as conquering different kinds of snow terrains. Thus, they require lower levels of energy in order to perform any of these elements than skiers of lower knowledge level. High quality and professional help of teachers or trainers is the key factor in the process of acquiring and perfecting skiing knowledge. In order to secure adequate teaching, skiing teacher or trainer should have a high level of skiing knowledge and skills, and also understand methodologic and didactic principles of training process and the basis of psychological approach of working with people. Since human being is the subject, there is a great diversity among potential students, regarding the level and degree of anthropological abilities and characteristics they possess. Therefore, it is very important that skiing experts know and understand the dynamics of learning process of motor, that is, skiing knowledge, and that they apply the adequate teaching methods. Based on the research results (Kuna, 2012) that formed the expert model of the most important skiing elements of the advanced skiing school programme, among which fast skiing turns was present, an idea of forming the methodological procedures of their teaching occurred. In relation to the mentioned, the following research aims were set: a) forming the expert model of the most important methodical exercises for fast skiing turns teaching, b) determining the difference among skiing experts of different degree of skiing education.

Method

Elite skiing experts participated in the formation of the expert model of the most important methodological exercises for fast skiing turns. They were the representatives of Slovenian, Croatian and Bosnian-Herzegovinian skiing assistants, members of assistant teams with years-long skiing experience, education and experience in the work with the Alpine skiers of different levels of skiing foreknowledge. Twenty examinees were included in the research, of which 7 Croatian, 7 Slovenian and 6 Bosnian-Herzegovinian state skiing assistants.

The experts performed the multiple extraction of methodological exercises variables, in coordination with the author of the research, via e-mail. After defining and acquiring all the propositions of basic methodological exercises for fast skiing turns teaching, the expert model of fast skiing turns teaching was formed. After that, the task of examiners was to choose 5 most important methodological exercises for fast skiing turns teaching, forming an expert model of the most important methodological exercises for fast skiing turns teaching.

The sample of variables for fast skiing turns teaching consisted of 13 exercises (N=13): OTFT (one turn), PTHFST (parallel turn from hill into fast ski turn), FSTSD (fast ski turn in downhill slope), HOHFT (hands on hips), HOTFT (hands on thighs), AIFT (antenna imitation), ESPFT (extended ski poles), SPBB (ski poles behind back), SSPAT (switching ski poles around trunk), FTUSB (fast ski turns with unlaced ski boots), SBPUS (stabs of both ski poles under skis), IFTSB (imitation of fast ski turns in ski boots), FTWJ (fast ski turns with jumps).

With the aim of forming the expert model of the most important methodological exercises for fast skiing turns teaching, and the testing of the difference between the frequencies of expert choice, the following values were calculated: observed frequencies (OF) – total sum of expert choice amount frequency, expected frequencies (EF), non-parametric Hi – square test ($\chi 2$), and the corresponding empirical level of significance (p). With the aim of determining the hierarchical classification of the most important methodological exercises for fast skiing turns teaching, the following vales were calculated: range sum (ΣR) of variable range, Kruskal-Wallis test (H-test), and the corresponding empirical level of significance (p).

Results

Based on the obtained values of testing the statistical significance of differences between the frequencies of expert choice of 5 most important methodological exercises for fast skiing turns teaching ($c2=17.29$; $p=0.14$), it was observed that there was no statistically significant difference between the frequencies of expert choice of 5 most important methodological exercises. In other words, the formed model of methodological model for fast ski turns teaching included those exercises with specific

importance and contribution to the teaching alpine skiers, not singling them out on the statistically significant level. Model consisting of 5 most important methodological exercises for fast skiing turns teaching was formed based on the sum of the total frequency of expert choice.

Table 1. Frequencies of expert choice of 5 most important methodological exercises for fast skiing turns teaching

Methodological exercises of short skiing turn	OF	EF
OTFT	4	7.15
PTHFST	14	7.15
FSTSD	10	7.15
HOHFT	9	7.15
HOTFT	8	7.15
AIFT	10	7.15
ESPFT	7	7.15
SPBB	5	7.15
SSPAT	3	7.15
FTUSB	4	7.15
SBPUS	4	7.15
IFTSB	6	7.15
FTWJ	9	7.15
$\chi 2$= 17.29 p = 0.14		

Legend:
Observed frequencies (OF) – total sum of expert choice amount frequency, expected frequencies (EF), non-parametric Hi – square test ($\chi 2$), and the corresponding empirical level of significance (p)

The FPTHFST (parallel turn from hill into fast ski turn) methodological exercise had the highest level of importance. While performing the exercise the skier, after performing several parallel turns from the hill, shortens the radius of the turn, and emphasizes the sideways and axial movement of the body with minimal trunk rotation, passing into the dynamic skiing technique, performing fast skiing turns. In this way, he gradually adapts to the technical characteristics of the dynamic movement structures, characteristic of fast skiing turns. It is assumed that the gradation of acquiring and mastering main characteristics of the fast turns technique enabled by this methodological exercise were the main reason for classifying this exercise within the model of the most important. The second methodological exercise in this model is the FSTSD (fast ski turns in sloping downhill), where the skier performs fast turns in the slantwise direction downhill. This exercise is important because while performing fast turns in the slantwise direction downhill, the skier learns how to adjust regular diameters of turns, in relation to the slope degree. Besides this, the performance of one turn in relation to the other is facilitated, due to the slope degree, enabling better movement speed control and developing sense of rhythm and coordination. The third most important methodological exercise is HOHFT (hands on hips), where the skier learns the fast turns technique while holding his hands on hips. When performing this exercise the skier concentrates on the acquisition and harmonisation of characteristic skiing movements that influence the success of advancing and skis speed control, as well as the harmonious connection between several turns of regular circular shape. The fourth methodological exercise is the AIFT (antenna imitation) where the skier learns the fast turns technique holding the ski poles perpendicularly in extension. It is assumed that this exercise helps the skier to easily restore the still upper part of the body, in perpendicular positionregarding the line of movement. Because of the outstretched arms, the skier achieves and maintains the central position on the skis more easily, developing a sense of regular skis pressure control and coordination of skiing movement, by passing from one turn to another. The fifth methodological exercise within the expert model of the most important ones is the FTWJ (fast turns with jumps), where the skier, passing from one turn to another, performs a jump. The vertical, circular and sideways knee movements in turns are especially important for their efficient performance. In comparison with the remaining methodological exercises defined according to the expert model, FTWJ is the most complex exercise regarding the coordination, and therefore the skiing teachers

should know how to apply it in concordance with the possibilities and abilities of the athlete they train.

Inspection of the Hi square test values and the statistical significance indicators (Table 2) showed no difference among experts, regarding the nationality. In spite of structural difference that do exist in the actual programmes of Croatian, Slovenian and Bosnian-Herzegovinian school and the methods of fast turns teaching, the statistically significant differences in the choice of most important methodological exercises were not determined.

Table 2. Differences in the choice of most important methodological exercises for teaching fast skiing turns

Methodological exercises of short skiing turn	CRO	SLO	BIH	$\chi 2$	p
OTFT	0.86	2	1	0.60	0.74
PTHFST	5.14	3	5	0.66	0.72
FSTSD	3.43	2	4	0.68	0.71
HOHFT	2.57	3	3	0.04	0.98
HOTFT	2.57	2	3	0.20	0.91
AIFT	3.43	3	3	0.04	0.98
ESPFT	2.57	2	2	0.10	0.95
SPBB	0.86	3	1	1.77	0.41
SSPAT	0.86	2	0	2.11	0.35
FTUSB	0.86	2	1	0.60	0.74
SBPUS	0.86	2	1	0.60	0.74
IFTSB	2.57	2	1	0.68	0.71
FTWJ	1.71	2	5	2.28	0.32

Legend:
Observed corrected frequency of Croatian experts (CRO), observed corrected frequency of Slovenian experts (SLO), observed corrected frequency of Bosnian experts (BIH), non-parametric Hi – square test ($\chi 2$), and the corresponding empirical level of significance (p)

Based on this, it can be claimed that the expert group that can be characterised as homogeneous, disregarding the differences between skiing schools they represent, formed the expert model of the most important methodological exercises for fast turns training. By forming the expert model of methodological exercises for teaching fast turns, and by selecting the most important ones, we contribute to the better understanding of relations and defining basic methodological procedures in the alpine skiers teaching process. The results obtained in this research open up a possibility of conducting future research that could define the characteristic errors and the most efficient exercises for their correction, in the process of fast turns acquisition. In addition, a need for constructing measuring instruments occured, instruments that could enable higher selection quality, and the choice of training modality and training exercises in the process of educating alpine skiers of different ages and levels of skiing knowledge.

Discussion

Based on the acquaintance with the basic characteristics of motor learning, great practical and methodological knowledge while working with skiers of different skiing knowledge, 20 elite Croatian, Slovenian and Bosnian-Herzegovinian skiing experts first defined, and then evaluated the 5 most important methodological exercises that facilitate the acquisition of fast turns technique.

Based on the determined statistically significant differences between the frequencies of expert evaluation of the most important methodological exercises in teaching fast turns, the model of exercises that was distinguished by their importance and applicative value was identified. In spite of the structural differences and specificities of skiing schools that skiing experts represent, the differences between them were not determined.

It can be concluded that the examinees formed a homogeneous group in defining the dynamics and fast turns teaching process. The values of this paper

are the new and original research approach, which secured crucial information on the systematic mode of acquiring specific skiing knowledge. The information regarding the methodological laws on organising the fast ski turns process obtained through experiments are extremely important for the kinesiological practice of alpine skiing. This research opens the routs towards the future research that could detect characteristic errors, exercises for their correction and conduct empirical tests of the formed model on different samples of examinees.

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FACULTY OF SPORT AND PHYSICAL EDUCATION
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ORIGINAL ARTICLE

Physiological responses during arm and leg aerobic power tests in elite female judokas

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Abstract
The aim of this study was to compare physiological responses during arm and leg aerobic power tests.

Ten elite female judokas of the Serbian National Team participated in the study. In addition to the Special Judo Fitness Test (SJFT), maximal oxygen uptake (VO2max) and anaerobic threshold (AT) were determined using an arm crank ergometer and a treadmill. Body fat percentage was estimated by bio-impedance.

The VO2max was only 3 ml·kg–1·min–1 higher on the treadmill than in the arm crank ($p<0.03$), the AT was also higher on the treadmill test (8.6 l·min–1, $p=0.005$). Nevertheless, the SJFT results were significantly correlated only with the maximal heart rate during the treadmill test ($r=0.77$, $p<0.01$ for index; $r=-0.73$, $p<0.02$ for total throws). Body fat percentage was correlated with VO2max ($r=-0.67$, $p<0.05$) and AT in the arm crank test ($r=-0.88$, $p=0.001$).

The maximal oxygen uptake was not statistically correlated with the SJFT results in elite female judokas. However, judokas who had higher maximal heart rate during the treadmill test, showed a worse judo-specific capacity on the SJFT. Female judokas with higher body fat seem to have lower VO2max and AT, with statistically significant correlations in the arm crank, and close to significance on the treadmill. On the other hand, arm crank and treadmill tests presented different results concerning aerobic capacity. However, our female judokas interestingly presented similar VO2max results during both aerobic tests, which highlights some judo-specific demands on the upper-body aerobic fitness.

Keywords Arm crank • Treadmill • Anaerobic threshold

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Introduction

Judo has been characterized as a high-intensity intermittent combat sport, consisting of many different techniques and actions employed during a match (Drid et al., 2012). High level of strength and coordination is needed to overcome the adversary through rapid execution of technical maneuvers throughout the match (Drid et al., 2010). In addition to faster recovery process after high-intensity intermittent activity associated to aerobic performance (Franchini et al., 2011; Drid et al., 2015), some evidence exists for higher values of maximal oxygen consumption (VO2max) in judokas who are able to win points in the decisive moments of bout. Furthermore, those judokas were able to re-synthesis creatine-phosphate fasterin gastrocnemius muscle compared to judokas who win points earlier in the match and have better performance on Wingate test for lower extremities (Gariod et al., 1995).

Drop in aerobic performance of lower extremities in judokas prior to main competition has been found in study of Franchini, Cassio de Moreas Bertuzzi,

Takito, & Kiss (2009), in addition to increase in aerobic performance of the upper body during the same period. Authors concluded that the performance of the upper body is more important than performance for the lower part of the body, and consequently, the aerobic capacity of the upper body was more relevant than the same test for lower body. Furthermore, Jagelo, Wolska, & Smulski (2009) analyzed correlation between International Physical Fitness Test (IPFT) and Special Judo Fitness Test (SJFT) for three groups of female judokas. Highly skilled judokas were characterized by distinct and more diverse direct relationship between indicators of general and specific physical preparation compared to judokas 13 – 15 and 16 – 18 year olds. Other research, conducted on Brazilian Olympic judo team (Franchini et al., 2005) showed no significant differences in aerobic power between first team and reserves. On the other hand, Drid et al., 2009 found significant differences between judokas of A and B Serbian national team.

The aim of this study was to compare physiological responses during arm and leg aerobic power tests in elite female judokas and correlation between oxygen uptake and the special judo fitness test in female judokas.

Method

Subjects

Ten elite female judokas of the Serbian National Team participated in the study.

Procedures

Anthropometric Profile was assessed in all participants through body mass (Model 3306 ABV; Avery Ltd., Crosswell, United Kingdom) and body height (Holtain Ltd., London, United Kingdom), whereas body fat percentage was estimated through manual bioimpedance (MaltronBioScan 920-2, Edinburgh, United Kingdom).

Aerobic Profile was estimated through treadmill and an arm crank ergometer test, with maximal oxygen uptake (VO2max) and anaerobic threshold (AT) determined. For treadmill test, ventilatory and metabolic indices were measured at rest for 1 minute and then for another minute at a 5 km.h-1speed; afterwards workload incremented progressively starting at 7 km.h-1at a rate of 0.5 km.h-1 every 30 seconds until exhaustion (CPET, COSMED, Rome, Italy) with constant 2% inclination throughout the trial. The test was considered completed when the oxygen uptake reached plateau and the respiratory and ventilator quotients reached reference values. The gas analyzer was calibrated after five athletes completed tests with gas mixture of known oxygen and CO2 concentrations (20.9% O2, 0.03% CO2 and 16.0% O2, 5.0% CO2, respectively).

Second VO2max was estimated by a method of extrapolation after a standardized sub maximal test on the arm cycle ergometer (Monark, Sweden) along with telemetric monitoring of heart function (Polar, Finland) after a five day period.

Specific Judo Performance was assessed through SJFT test. SJFT is divided into three active periods (A=15 s; B and C=30 s) with 10 s rest intervals between them. During each period, athlete that is being evaluated (tori) throws two partners (uke A and uke B; separated from each other by a distance of 6 m) as many times as possible using the one-arm shoulder throw (ippon-seoi-nage) technique. All participants (tori, uke A, and uke B) involved with the test should possess similar height and weight characteristics. Immediately following, and one minute after completion of the three active periods, the tested subject's heart rate is measured (Sterkowicz, 1995). Afterwards, subsequent analysis in the number of throws completed during the active periods, along with heart rate response to the active periods, and an index calculation was conducted. The SJFT Index was calculated as follows:

$$\text{Index} = (\text{Final HR} + \text{HR1 min}) / \text{Throws} \quad (1)$$

Where: Final HR = heart rate registered immediately after the test, HR1 min = heart rate obtained 1 minute after the test, and Throws = number of throws completed during the test.

Statistical Analyses

Data are expressed as mean ± standard deviation. The Shapiro-Wilks statistic was used for checking the normality of distribution. The Pearson or Spearman correlation tests were applied where appropriate. Comparisons between treadmill and arm ergometry were performed using the Wilcoxon test. The data were analyzed using the statistical package SPSS, PC program, version 20.0 (IBM Inc., USA).

Results

Physical characteristics and the Special Judo fitness test results are presented in table 1.

Table 1. Physical characteristics and Special Judo Fitness Test results in elite female judokas

Weight (kg)		64.89±11.19
Height (cm)		166.50±7.15
Body Fat (%)		22.92±5.34
SJFT	Index	13.89±1.59
	Total number of throws	25.70±1.63
	Final HR (bpm)	188.00±9.08
	HR 1 min after (bpm)	166.80±15.31

Comparison between results obtained on arm crank and treadmill test are presented in Table 2. The VO2max was higher on the treadmill than in the arm crank ($p<0.03$), the AnT was also higher on the treadmill test ($p=0.005$).

Table 2. Heart rate (HR), oxygen uptake (VO2max) and anaerobic threshold (AnT) in different ergometry tests

	Arm crank	Treadmill
HR max (bpm)*	183.00±8.79	188.10±6.42
VO_{2max} (ml·kg–1·min–1)*	34.29±6.71	37.66±4.29
AnT (l·min–1)*	25.30±3.35	33.88±4.17

* means $p<0.05$

The SJFT results were significantly correlated only with the maximal heart rate during the treadmill test ($r=0.77$, $p<0.01$ for index, Fig 1; $r=-0.73$, $p<0.02$ for total throws, Fig 2).

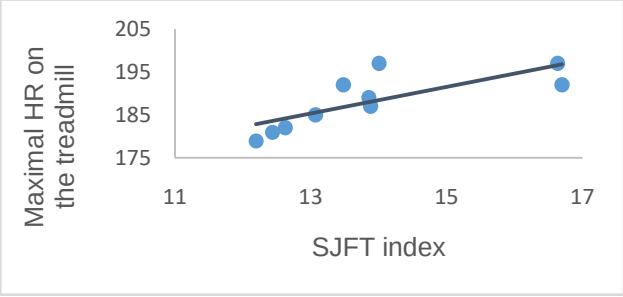

Figure 1. Correlation between HR_{max} and SJFT index

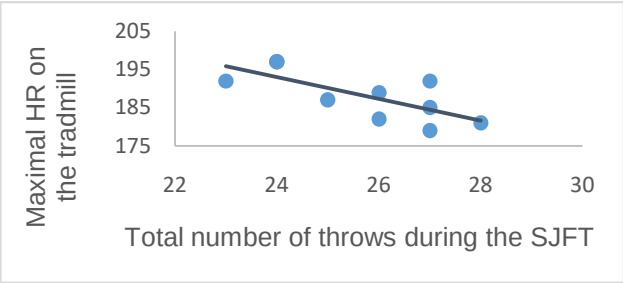

Figure 2. Correlation between HR_{max} and SJFT total number of throws

Body fat percentage was correlated with VO2max and AT in the arm crank test (Fig 3-4). Body fat percentage was correlated with VO2max ($r= -0.67$, $p<0.05$) and AT in the arm crank test ($r= 0.88$, $p=0.001$).

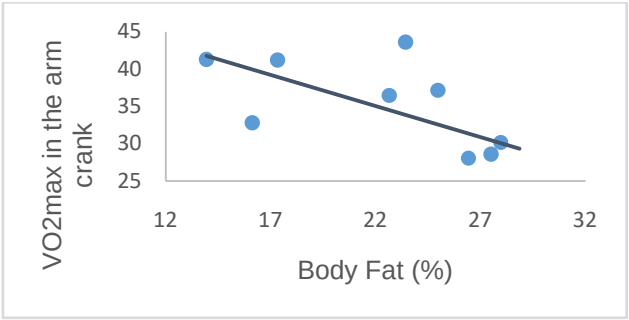

Figure 3. Correlation between $VO2_{max}$ and % of body fat

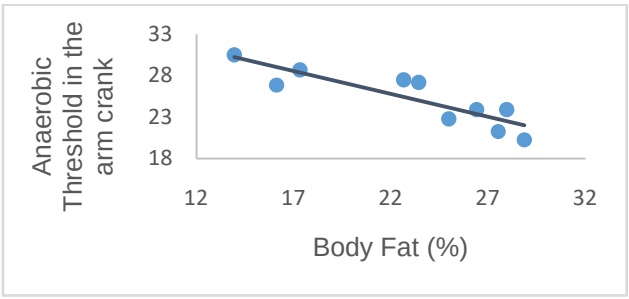

Figure 4. Correlation between arm crank AnT and % of body fat

Discussion

Higher values for all observed variables were obtained on treadmill compared to arm crank, suggesting a higher cardiovascular stress during treadmill test. These results are understandable when observing larger muscle groups involved in running on treadmill compared to arm crank test involving only upper body muscles.

ObtainedVO2max and AnT, on both arm crank ergometer and treadmill, were not statistically correlated with the SJFT results in elite female judokas. This is not in line with previous researches (Franchini et al., 2005; Franchini et al., 2007) that showed correlations of the aerobic fitness and the SJFT in male judokas. This could imply a need for additional investigation for substantial conclusions. According to the results of the present study, VO2max and AnT results do not seems to represent useful assessment tool in determining the specific performance of female judokas. Almansba et al. (2010) obtained similar results in male judokas, and noted that VO2max is highly sensitive to changes in training loads.

Female judokas who had higher maximal HR during the treadmill test, showed a worse judo-specific capacity on the SJFT, indicating a lower aerobic fitness. In addition, judokas with higher body fat had significantly lower VO2max and AnT in the arm crank, and close to significance level on the treadmill (p=0.06, p=0.08, respectively). These results are in accordance with other study in male judokas (Franchini et al., 2007) that showed lower performance in body displacement activities with judokas with higher body fat percent.

Conclusion

Arm crank and treadmill tests presented different results in the anaerobic capacity of female judokas. In addition, the same judokas interestingly presented similar VO2max results during both aerobic tests, which highlights some judo-specific demands on the upper-body aerobic fitness. However, VO2max and AnT do not seem to represent useful assessment tool in determining the specific performance of female judokas. Higher values for all observed variables were obtained on treadmill compared to arm crank, suggesting a higher cardiovascular stress during treadmill test. These results are understandable when observing larger muscle groups involved in running on treadmill compared to arm crank test involving only upper body muscles.

Acknowledgements

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ORIGINAL ARTICLE

Sources of stress as predictors of partner relationship quality

Zeljka Bojanic[1] ✉ • Natasa Ninic[1]

Abstract
The purpose of this survey is to establish whether, and in which manner, different sources of stress predict the partner relationship quality, as well as to establish differences concerning the gender, age and job of respondents. Sources of stress are defined as individual, interpersonal and organizational, whereas the quality of partner relationship was tested as a degree of satisfaction with the romantic relationship. The survey was conducted on an adequate sample of 100 respondents involved in a partner relationship, similar in terms of gender and aged 18 to 44. Questionnaires were used to measure the sources of stress and partner relationship quality (Hendrick, 1988). The results indicated that all three sources of stress were significantly connected with the partner relationship quality, also that family-related sources of stress were the only significant predictor (β= -0.286, $p<0.01$). The greater the family-related sources of stress, the poorer the partnership relation quality. Differences were obtained in assessing the individual factors of stress according to gender and age categories.

Keywords Partner relationship quality • Sources of stress • Gender • Age

Introduction

Stress is a negative life experience accompanied by physiological, cognitive, emotional and behavioral changes. The factors causing stress are numerous and multiple and they are referred to as stressors. They could be individual and concern the inner state of individuals and the way they experience different changes in life, demands from their environment; interpersonal, concerning different interpersonal relations; and organizational (incompatibility of the job contents, working hours, poor physical conditions in the work environment). At the present time, stress has become an inevitable problem and, in order to mitigate the effects of stress, we must examine how and which aspects of a person's life it affects. One of the significant aspects is having a partner relationship. Zotovic (2002) emphasizes that stress is a threat to life, but also a threat to other persons that matter to us, to ourselves and the emotional relations we create. However, how partner relationship is affected by stress circumstances outside the relationship has been significantly less studied. In this respect, the main issue arising from this survey concerns the question whether and in which manner the stressors from different aspects of life predict and determine the satisfaction with and quality of the partner relationship?

Definition of Stress

There are a number of different definitions of stress, with respect to its causes, characteristics, sources and consequences, viewed from the perspective of different scientific disciplines. Authors Steinberger and Cizmic (1991) consider these definitions and indicate that stress reflects the pressures from the environment, causing an emotional tension and anxiety, while according to other authors, this emotional tension is the essence of stress, while pressures from the environment are stressors, or agents of stress. Any agent that disturbs the balance of an organism, or its mental, physical and social integrity, may cause a stress. These agents are referred to sources of stress, i.e. stressors (Kalicanin et al., 2011).

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There are many sources of stress and they are classified into several groups:

1) Personal (types of personality, life changes, demographic characteristics),
2) Interpersonal (different interpersonal conflicts),
3) Organisational (incompatibility of the job contents, working hours, poor physical conditions in the work environment)

Partner relationship quality

Partner relationship quality may be defined as an objectively existing set of desirable characteristics, such as the feeling of mutual love and respect, equal division of responsibilities and duties, joint decision-making, agreeing on important issues in life. Close partner relationship is a form in which most people spend their lifetime. Therefore, it is very important to understand the factors connected with the quality of our partner relationship. Stress certainly is a significant factor, which is a threat to the partner relationship on the one hand, while on the other hand, the quality partner relationship may be efficient in the reduction of stress.

Assessment of the high quality of intimate relations makes a person feel protected and loved, emotionally and socially supported, which results in perceiving the problems as less threatening (Batinic & Vukosavljevic-Gvozden, 2008).

For this reason, the main purpose of this survey is to analyze the nature of interconnection between the three sources of stress, individual, interpersonal and organizational and satisfaction in a romantic relationship, as well as to determine differences in the quality of partner relationships and frequency of various stressors, with reference to age and gender of the respondents.

Method

Sample

The survey sample is adequate, comprising 100 respondents, both male and female, above the age of 18, who were either married or in a relationship.

Instruments

The three groups of stress sources were measured by the Stress Sources Questionnaire (Interpersonal Skills for Business, 2007).

In assessing the degree of the partner relationship quality, we used the Relationship Assessment Scale (Hendrick, 1988).

Results

To respond to the main goal of this survey, Table 1 presents the results of the Pearson Correlation of the quality of romantic relationships in three groups of stress sources. As noted, all three sources of stress are negatively and statistically significantly correlated with the partner relationship quality. The relationship quality shares the largest percentage of variation with the personal and family-related source of stress ($r=-0.286$, $p<0.01$), then the individual ($r=-0.241$, $p<0.05$) and significantly less with the organizational source ($r=-0.266$, $p<0.05$). This indicates that the less present the stressors from all three groups, the better assessed the partner relationship quality.

Table 1. Results of the correlation analysis

Dimension		Sources of stress		
		Individual	Personal and family-related	Organisational
Partner relationship quality	r	-0.241	-0.286	-0.206
	p	**0.016**	**0.004**	**0.040**
	N	100	100	100

A multiple regression analysis was conducted to establish that all three sources of stress provide an incremental contribution to predicting the partner relationship quality. The variable of partner relationship quality was used as a criterion, while three predictors were the three sources of stress. The stepwise regression analysis method was used. The results were presented in Table 2 and Table 3.

Table 2. Multiple Correlation Coefficient and Determination Coefficient

Model	R	R^2	Corrected R^2	F	p
1	0.286	0.082	0.072	8.723	0.004

Table 3. Standardized Beta Coefficient

Predictor	β	t	p
Personal and family-related sources	-0.286	2.953	0.004

Discussion

The main issue in this survey was to examine the nature of connection of stress, caused by different agents outside a partner relationship and to assess its quality. It seems that surveys most often focus on establishing the agents of satisfaction or dissatisfaction with a romantic relationship that concerned the agents alone, such as quarrels, infidelity and so on. Consequently, two main goals were set in this survey.

When it comes to the first goal, the results indicated that individual, personal and family-related, as well as organizational sources of stress were significantly connected with the assessment of quality of romantic relationships. In other words, those who think they encounter a number of stressors, regardless of their source, will be less satisfied with their partner relationship. This may indicate that, when an individual is under stress, this will reflect on different aspects of their life, and at that particular moment the origin of that stress is irrelevant. In this respect, for instance, negative things experienced by an individual at work will be transferred to their private life, because the state of stress, no matter what its source is, will reduce the capacity and willingness of the individual to engage in a positive, efficient and functional partner relationship.

Nevertheless, the regression analysis indicated that the partner relationship quality is most closely connected with the personal and family-related source of stress and that individual and organizational factors do not provide any novel explanation. This means that what is common to individual and organizational sources of stress and the partner relationship quality is also common to the assessment of personal and family-related stressors. It may be assumed that a certain predisposition determines whether some individuals will simply perceive their environment as more stressful (Funder, 2016; Rauthman, Sherman, & Funder, 2015) or, when exposed to the intense effects of a concrete stressor, any situation will seem to be stressful to them. In any case, it is reasonable that stressors arising from personal and family life are the main agents of satisfaction with a romantic relationship, because this relationship also belongs to personal and family-related aspects of life.

Differences with regard to gender were obtained only in cases of assessing the individual agents' effects on stress, where women achieved significantly higher score on the scale. These results could perhaps be explained by the fact that there are cultural differences in the role of men and women in a society. Consequently, it seems to be more acceptable that "women tend to be weaker" and the main source of their own stress. In other words, women are more inclined to introspection, which makes them more vulnerable towards a wide range of stressors. As far as the assessment of the partner relationship quality is concerned, no differences were obtained with reference to gender.

In assessing the individual sources of stress, differences were obtained with reference to age groups as well. In fact, younger respondents assessed that their traits were often the source of stress, in a much greater extent than with the older respondents. It is possible that it is so because of the higher emotional instability of young people, along with significant changes and challenges of their age, so they tend to reconsider things more, what makes them realize that they alone are the source of their stress.

Considering the fact that differences with reference to gender and age were obtained in assessing the individual source of stress, it turned out that once the variability of these two grouping variables is eliminated, the connection with the assessment of the partner relationship quality disappears. This indicates that the connection probably exists only in a subsample of women and young people, if we monitor the connection direction between the two variables, as well as the fact that these two categories have a higher score in the assessment of individual stressors' effects. In other words, it is possible that individual stressors influence the quality of partner relationship, although to a greater extent among women and young people.

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Harter, S. (1999). *The construction of the self: a developmental perspective*. New York: The Guilford Press.

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