

Estimating the relationship of the indices of general physical fitness in 8-10-year-old judo practitioners in rural schools

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Abstract

Judo is one of the most appreciated sports due to its positive influences on children since their formative stages. The research aims to highlight the influence of judo methods on the general physical fitness in 8-10-year-old children who practice judo in the rural area schools. *Material and methods.* A number of 24 children aged 8-10 years participated in this study. They were divided into two groups: control group (n=12) and experimental group (n=12). Then, 5 general physical fitness tests were administered in both groups. The following tests were used: shuttle run(sec), crunches (reps), push-ups (reps), squats (reps) and standing long jump (SLJ) (cm). Statistical analysis sought to estimate the differences in means between groups at initial testing (IT) and final testing (FT). There were used: t-Test (Assuming Equal Variances), Unpaired Comparison for Means and correlation analysis - the Pearson correlation coefficient. The experimental program was applied in EG throughout the 2020-2021 school year and consisted of physical education lessons with contents selected from judo. The CG students had classes of physical education performed in the traditional way. *Results.* The comparative analysis of the indices of the general physical fitness test reveals larger differences in the EG at FT – Shuttle test – of the median value (M) between groups, of 1.92 sec. There are significant differences between groups at p<0.001, Crunches test by 10.0 reps (p<0.001), Push-ups test by 11.5 reps (p<0.001), Squats test by 8.00 reps and significant differences at p<0.001. As for the SLJ test, it shows differences of 0.5 cm larger at CG (p>0.05) and of 10.5 cm at EG (p<0.05). Correlation analysis between the general physical fitness indices in CG highlights 20% significant connections at p<0.05 between the indices of Shuttle test with Crunches and SLJ tests. Regarding the results of the correlation analysis in EG, 60% significant connections are recorded, namely 30% at p<0.05 between the indices of Shuttle with Squats tests, Crunches with Squats and SLJ; 20% at p<0.01 between Shuttle with Push-ups and Crunches with Push-ups and at p<0.001 – 10% between Push-ups and Squats. *Conclusions.* The results of the research confirm the significant differences between the means of the groups. They highlight the estimated connection level between the indices of general physical fitness. The results also prove the effectiveness of applying the judo methods during the physical education lessons for 8-10-year-old students in the rural area schools.

Keywords: judo, children, physical training, motor skills

Introduction

Several specialists found out that health-related physical fitness, physical activity and object control skills are not sufficiently developed in children. The specialized literature also shows that currently children (mostly girls) are not active as much as is necessary. All these are worrisome findings because physical activity is an important factor for health and future development of children (Visagie, 2015).

At the present moment, judo is the most practiced combat sport worldwide. Doing judo during childhood and adolescence has several beneficial effects, mainly the cardiovascular system healthy functioning and increased body strength capabilities. Judo is a means of holistic education and is regularly practiced by hundreds of thousands of young people (Lawerteh, 2021; Detanico et al., 2022; Garbeloto et al., 2023).

Interest in judo is growing, especially among parents, because this sport educates the will and makes stronger the personality and character of children. Judo promotes a number of principles and a code of honor respected around the globe. Judo is a new method to be used in current school education (Manolachi et al., 2010). This sport helps to build a harmoniously developed body, to avoid conflicts and to learn the self-defense. It encourages a way of thinking specific to the oriental culture. All these aspects are also confirmed by one of the most well-known schools of Japanese martial arts in Asia (Dojo, 2010). Other effects of judo practicing are the increase in bone density, strengthening of joints, higher resistance of the body to fatigue and diseases (Romo & Frometa, 2018). The school of falling (ukemi), specific to judo, is very important for children because they can

avoid injury if they fall correctly. However, because of the high number of injuries in judo caused by incorrect falls, it is recommended to learn new falling techniques. These ones, if used in workouts and competitions, should prevent upper limbs injuries and also optimize performance in a competition. These new techniques should have the same effects in the physical education and sport lessons monitored by our study. Additionally, unlike karate or taekwondo, which use strikes and blocks, judo uses throws and holds. Thus, judo is a sport focused on complex movements that are rich in technique, speed and strength (Zaggelidis et al., 2013).

Training an athlete for performance is a rather difficult task as each sports discipline, branch or event requires complex and different efforts. For example, in judo, athletes devote long periods of training to improve physical fitness and tactical skills. Therefore, judo is much more than a sport performed on tatami. It is a symbiosis of knowledge from anatomy, physiology, biomechanics or psychology. Knowledge was gathered over time through Asian philosophy and thought based on thoroughly study of the environment and human resources (Franchini et al. 2014). Studies show that one of the training aspects necessary for reaching a high competitive level as required by tournaments is the general and special training. This is essential for the level of performance of the athlete. It is closely related to mental training which ensures a more precise use of the technical and tactical variants during combat (Ambroży et al., 2017).

In order to train the technical/tactical skills of the athletes and to ensure their physiological and psychological preparation, the coach or teacher of judo must know the requirements of the Physical Education and Sport Science. This is necessary to improve the potential of judo players in all these aspects. In the judo training routines in which children are involved, the safety of the little ones must be ensured. It is also necessary to use a training methodology in accordance with the particularities of age, gender and, above all, level of training (Kowalczyk et al. 2022). General physical fitness tests were administered to young athletes in their various formative phases. These tests must reflect the specific requirements of the sports activity they come from (Lidor, 2005). It is considered that active participation in new well-structured instructional-educational programs of physical education and sport will develop positive qualities, behaviors and social attitudes (Nolte, 2023).

In 2015, the program called „Judo in rural area school” was implemented in Romania. The fundamental element of this program is the promotion of judo in rural environment. It also aims at the identification, orientation and support of talented children to do performance judo despite their limited financial resources.

For this reason, the program supported in our research for rural area children could bring benefits on a three dimensional (psycho-bio-motor) level. Thus, the increase of cognitive quality (psycho-) will lead to better school performance. The improvement of body functions (-bio-) and the harmonious physical development (-motor) will finally result in sports performance for the most talented children if they choose this path. Specifically, by practicing judo in all its forms and levels, the social abilities and self-confidence increase, while the aggressiveness decreases (Vertonghen & Theeboom, 2008). In the schools of Japan, judo has been a mandatory component of the lessons of physical education and sport since 2012 (Kimura, Suzuki & Yogi, 2022). However, martial arts are only introduced at middle school level; there is no systematic curriculum starting from primary school (Yogi et al., 2022). Applying different martial arts programs can have a considerable contribution to the improvement of general physical fitness in preschool and school children (Stamenković et al., 2022).

We strongly believe that providing a well-developed and implemented support for judo will increase sports performance among practitioners in the future. The share of children who want to do judo starts to be higher, both in urban and rural areas. Our purpose was to estimate the relationship of the general physical fitness indices in 8-9-year-old judo players in rural schools.

Materials & Methods

The proposed study was a transversal pedagogical experiment conducted from June 2020 to September 2021. The research sample was formed of 24 male students aged 8-10 years, randomly distributed into two groups: a control group (n=12) and an experimental group (n=12).

The place where the experimental research was carried out was the Gloria School Sports Club of Arad. This club includes children from rural area schools too.

Test protocol

So, to evaluate the general physical fitness of judoka students, a series of standard tests were used in the experimental group:

- 5 x 7.5 m shuttle run: it assumes running 5 times, with maximum speed, on a distance of 7.5 m, up to the extreme points;
- Crunches: it consists of performing the maximum number of reps in an interval of 30 s.;
- Push-ups: the assessment was based on the maximum number of reps that the young judoka can perform;
- Squats: they were assessed by the maximum number of reps performed;
- Standing long jump: it was assessed by the distance covered by the young judoka in a jump (cm).

The general physical training program was intended to improve the potential of the subjects in terms of motor ability. This improvement can be achieved by influencing the judo specific motor skills. In that regard, a specialized program for general physical training, taken from judo, was used in the experimental group. The

control group had classes of physical education carried out in the traditional way, without any intervention from our part.

Both groups had an initial assessment before the beginning of the experimental approach in June 2020. They had also a final assessment after the end of the experiment in September 2021.

Contents of the experimental program:

For the physical fitness, there were used exercises for upper limbs strength, abdomen strength, back strength, lower limbs strength, improvement of reaction (execution) speed and for specific mobility.

For the basic technical training, there were used: games for attention, coordination, reaction speed; acrobatic gymnastics exercises; learning of specific movements (shintai); learning of fighting stances (shinsei); learning of balance breaking (kuzushi); learning of sleeve and lapel grips (kumi kata); learning of specific falls (ukemi).

Statistical analysis

The obtained data were processed with the help of the IBM SPSS v. 23 software. Descriptive statistical indices were used as follows: Median (M), Standard Error of Mean (S.E.M.) and Confidence Level of Mean (0.95) (C.L.M.). The comparison of the results between groups (control and experimental) was performed using t-Test (Assuming Equal Variances), Unpaired Comparison for Means. The correlation analysis was carried out with the Pearson correlation coefficient at the significance threshold $p < 0.05$.

Results

It was estimated the relation of general physical fitness indices in the 8-10-year-old judo players of rural area schools. To this effect, a comparative analysis was performed between the control group(CG) and experimental group (EG) in initial testing (IT) and final testing (FT). In this sense, table 1 shows the results of the descriptive indices. It also highlights the significance of the differences in the means between groups at the initial and final testing.

Table 1. Results of the general physical fitness testing in judokas of rural area schools(8-10-year-old)

Variables	Test stage	M; $\pm$ S.E.M.; C.L.M.				t	P
		Control Group		Experimental Group			
Shuttle (s)	Initial	9.98; $\pm$ 0.38	0.84	8.02; $\pm$ 0.13	0.28	5.67	<0.001
	Final	8.97; $\pm$ 0.36	0.80	7.05; $\pm$ 0.14	0.32	5.93	<0.001
Crunches (reps)	Initial	16.50; $\pm$ 0.39	0.88	18.00; $\pm$ 0.47	1.03	-1.76	>0.05
	Final	18.00; $\pm$ 0.45	0.99	28.00; $\pm$ 0.95	2.09	-7.93	<0.001
Push-ups (reps)	Initial	13.00; $\pm$ 0.67	1.49	15.00; $\pm$ 0.86	1.90	-1.89	>0.05
	Final	16.00; $\pm$ 0.68	1.51	27.5; $\pm$ 1.92	4.22	-6.58	<0.001
Squats (reps)	Initial	14.00; $\pm$ 0.31	0.69	12.50; $\pm$ 0.42	0.92	2.88	<0.01
	Final	17.00; $\pm$ 0.29	0.63	25.00; $\pm$ 0.96	2.12	-7.79	<0.001
Standing long jump (cm)	Initial	157.0; $\pm$ 3.00	6.61	157.5; $\pm$ 3.52	7.74	-0.47	>0.05
	Final	160.0; $\pm$ 2.74	6.03	170.5; $\pm$ 2.24	4.94	-2.37	<0.05

Notes. n=12, M – Median; S.E.M. – Standard Error of Mean; C.L.M. – Confidence Level of Mean (0.95); t-Test (Assuming Equal Variances), Unpaired Comparison for Means

After the comparative analysis presented in table 1, it was found that the tests highlight the following matters: *Shuttle test* has differences of the median (M) value between groups of 1.96 sec at IT and 1.92 sec at FT with 0.04 sec Confidence Level of Mean (0.95) (C.L.M.) higher in EG at FT and significant differences between groups in both tests at $p < 0.001$. As for *Crunches test*, there are higher differences in EG at IT, of 1.50 reps ($p > 0.05$) and 10.0 reps at FT ($p < 0.001$), with 1.06 reps C.L.M. higher in EG at FT. The *Push-ups test* reveals differences of 2.00 reps at IT ($p > 0.05$) and 11.5 reps at FT ($p < 0.001$), with 2.32 reps C.L.M. higher in EG at FT. The *Squats test* has higher differences in EG, of 1.50 reps at IT and 8.00 reps at FT with CLM of 1.2 reps at FT and significant differences in both tests at $p < 0.001$. The *SLJ test* presents differences of 0.5 cm higher in CG ($p > 0.05$) and of 10.5 cm in EG ($p < 0.05$); C.L.M. is higher by 2.8 cm in CG. The values of the descriptive indices and of comparison of the means recorded at each fitness test show that the variables could not influence significantly the results of the assessment in CG, while the use of the specialized training program in EG lead to significant differences.

Figures 1 and 2 highlight the results of the correlation analysis between the indices of general physical fitness in the control group and the experimental group at the final testing.

Correlation analysis between the indices of general physical fitness in CG highlights 20% significant connections at $p < 0.05$ between the indices of the Shuttle with Crunches tests and SLJ. Of the total number of correlations, 20% have negative connections related to the performances obtained at the Shuttle.

Regarding the results of the correlation analysis in EG, 60% significant connections are recorded, namely: 30% at $p < 0.05$ between the indices of the Shuttle with Squats tests, Crunches with Squats and SLJ; 20% at $p < 0.01$ between Shuttle with Push-ups and Crunches with Push-ups and at $p < 0.001$ – 10% between Push-ups with Squats. One can also observe 40% negative connections that are inversely correlated with the performances at Shuttle.

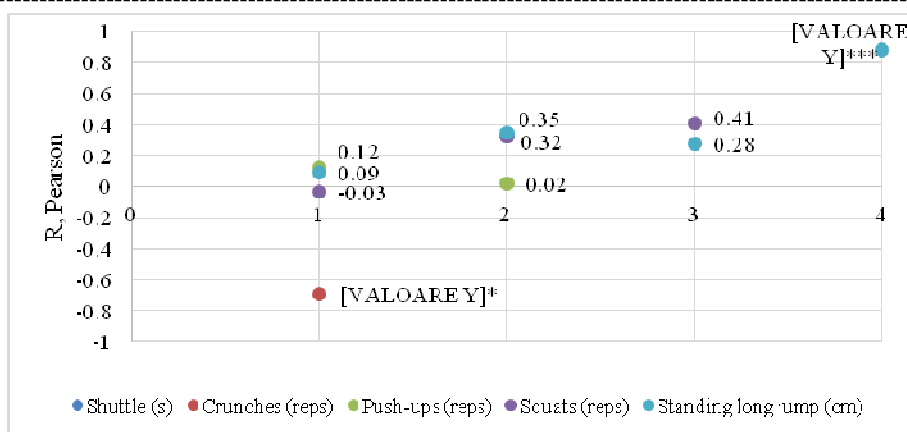


Fig. 1. Results of correlation analysis between the physical training indices in the control group at final testing

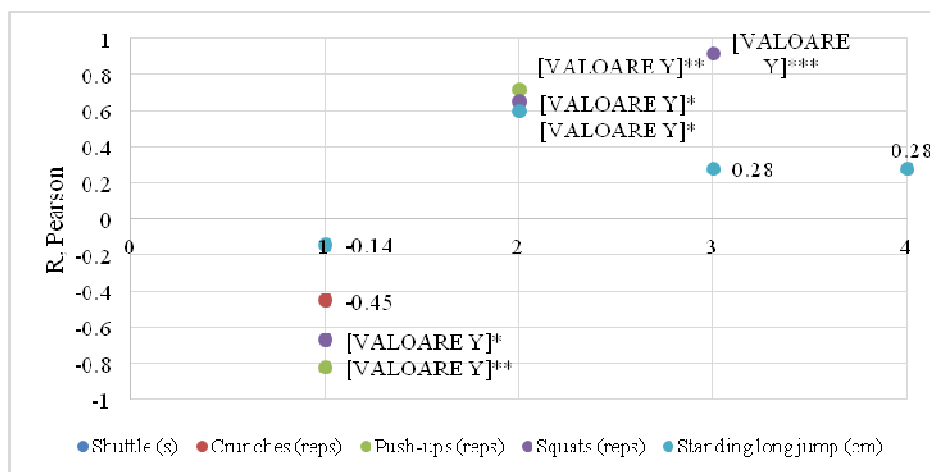


Fig. 2. Results of correlation analysis of physical training indices in the experimental group at final testing

All these significant correlations and negative connections show the significance degree between the analyzed indices and their influence on general physical fitness. It is an evident finding especially in EG, where a specialized program with means of judo was used.

Discussion

Our cross-sectional study involved a sample formed of 8-10-year-old students from a rural area school. The subjects were equally divided into a control group and an experimental group. The instructional-educational activity for the control group was carried out traditionally, in classes of physical education and sport. As for the experimental group, they benefited from a supplementary specialized program of general physical training specific to judo. Thus, it was possible to record a series of data regarding the evolution of the selected variables. This study intended to monitor if there are significant differences between the two groups in terms of general motor ability.

Following the comparative analysis of the general physical fitness indices, better performances were observed in the experimental group at the final testing. The differences between groups were significant at the administered tests ($p < 0.05$, $p < 0.01$, $p < 0.001$). Therefore, it was proven that traditional physical education lessons can influence the level of motor qualities, abilities and skills in students. But this influence is much higher when a specialized training program specific to a sports branch is used, such as judo.

The specialized literature reveals cases in which technical training in judo uses non-specific means, taken from different sports branches, like gymnastics (Boisteanu, 2018; Potop et al., 2022). But judo technical training for the athletes aged 8-10 years can also use specific means of general physical training (Shuba L & Shuba V, 2021; Borisenko, Loginov & Lubysheva, 2013) and methods adapted for different age categories (Dustmurodov, 2019; Demiral, 2011). Moreover, there are training methods in judo based on modular technology as well (Borisenko, Loginov & Lubysheva, 2015).

Special physical qualities such as speed and coordination are absolutely necessary for playing judo. As it is a combat sport, judo involves short and intense attacks. Some specialists studied the effects of a training based on coordination, adapted to 10-12-year age group, on the speed development in judokas (Zeghari et al., 2019). The analysis of the scientific research reveals significant differences in the opinions about the selection criteria

in judo schools. The physical superiority of some boys compared to their peers at the moment of selection is not an objective criterion. It does not guarantee achieving significant sports results in short time. Sports selection must take into account the coordination and the abilities to quickly master the judo techniques. Different opinions can be also identified in the entire structure of junior athletes' training (Osipov et al., 2017).

Sharma, R. K. (2016) made a thorough review of the scientific literature related to physical fitness and anthropometric characteristics. Thus, authors like Cvejic et al (2013) showed that physical fitness is a very good indicator of health condition in children and adolescents and also predicts future health. Sharma et al (2012) analyzed the correlations of anthropometric characteristics with isotonic strength, lower limbs strength, aerobic strength and skill tests. Singh (2012) assessed the anthropometric measurements of the 6-9-year-old boys etc. Although there are a few studies on the physical fitness of young martial arts athletes, some authors dealt with this topic. The physical fitness levels of adolescents according to sports participation (martial arts, team sports and non-sports) were analyzed (Kayihan, 2014). The influence of Sambo training on the physical fitness and training of the children aged 8-12 years was assessed by means of Quetelet and Erisman indices, with normal results. The increase and development of speed, strength and flexibility at this age group were demonstrated (Mykaevna et al., 2023). Specialists also focused on judo training effects on the physical fitness of 7-year-old boys. Height and weight of the body, muscular and cardiovascular endurance, flexibility, speed, agility and coordination were assessed for this purpose. The comparison with the recreational sports training proved the effectiveness of judo training in terms of physical fitness development (Sekulic et al., 2006).

It is important to know the composition and other data on the general and special physical fitness of elite athletes. This information may be helpful for the development of individual training programs of Ju-jitsu athletes. A comparative study between the judo and ju-jitsu practitioners was conducted to investigate their manual abilities. In that regard, there were measured the reaction time to a visual stimulus and the handgrip force (Ambroży et al., 2017; Cynarski et al., 2021). Although very popular among children, judo was not known enough regarding its impact on the health of these ones. Some specialists studied the effects of a 12-week judo training period on blood pressure, body composition and cardiorespiratory system in the obese or overweight children aged 8-13 years (Brasil et al., 2020). In school, the Physical Education subject is mandatory for all students. This happens regardless of their motor abilities development level, physical activities performed in free time or previous experiences in sport. But students are different from a psycho-neuro-motor point of view and the pace of motor learning may be different (Djordjević, 2021). Some authors focused on the process of optimizing the general methodology of training young judokas at the initial stage. Characteristics of the physical and psychological qualities individual development, general indicators of children's functional training must be taken into consideration (Khitaryan, 2017). Other authors analyzed the effort parameters and the importance of their planning in the training of elite male judokas. In that regard, the influence of effort parameters on the fitness tests indices was assessed according to the variables of training components (Manolachi et al., 2021).

Given the facts above, we consider both important and very motivating to take an increased interest in the "Judo in school, in rural area" program. This program enables the students from rural area to have access to the logistics that can help them to practice this sport. By running this program "Judo in school, in rural area" a large number of students will be attracted to do physical activity in general and judo especially. It was also taken into account that it is imperative to develop in athletes the personality, will, perseverance and love of movement.

We believe that the goals of the project must be directly correlated with the general competences of the program. It is necessary to express what the children are expected to acquire at the end of the program by implementing judo in physical education and sport classes. It is well known that judo can ensure a harmonious and multilateral development of children.

Conclusions

The comparative analysis of the administered tests highlights differences in the value of the descriptive indices and of comparison of the means recorded for each test. It shows that the variables could not significantly influence the results of the assessment in CG. Using the specialized training program in EG produced significant differences.

The results of the research confirm the significant differences between the means of the groups. They highlight the degree of connection estimated between the indices of the general physical fitness. The effectiveness of applying judo methods in the physical education lessons for 8-10-year-old students of rural area schools is demonstrated.

The results obtained at the end of the research reveal that the entire physical capacity of the subjects was significantly improved. They proved the superiority of the contents selected from judo compared to classic contents. All these contents were used throughout a school year in the physical education classes for 8-10-year-old students of rural area.

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Conflicts of Interest

The authors declare no conflict of interests.

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