

Study on the development of spatial orientation and segmental coordination through judo-specific means in children

Adriana Neofit¹, Dana Bădău^{2*}, Mircea Ion-Ene¹, Adela Bădău³

¹ Department of Individual Sport and Kinetotherapy, Dunărea de Jos University, Galați, Romania

² Department of Human Movement Sciences, University of Medicine, Pharmacy, Sciences and Technology, Târgu Mureș, Romania

³ Department of Physical Education, University of Medicine, Pharmacy, Sciences and Technology, Târgu Mureș, Romania

* All authors have equal contributions to this study.

Abstract

Background. Optimizing sporting performance in children depends on developing psychomotor ability. Spatial orientation and coordination are essential components in judo technique optimization, and that is why their early development is an objective of major importance.

Aims. The purpose of the present study is to identify the level of progress in developing children's spatial orientation and segmental coordination by applying programs specific of judo.

Methods. This pilot study was conducted in the period September-December 2018 in the Galați Sports Club, and involved a group of 24 male children, aged on average 10.68±0.59 years, practicing judo. The study used 3 assessment tests for spatial orientation and segmental coordination.

Results. Statistical analysis evidenced significant differences in all the 3 tests between the results of the initial and final assessment, when $p < 0.05$. The widest gap was recorded in test 3 – Asymmetrical arm movements, i.e. 2.666±.277 points, and the smallest gap in test 1 – Symmetrical arm movements, i.e. .875±.173 points.

Conclusions. 1) All the results of the present research confirmed the hypothesis, i.e. the level of development of spatial orientation and segmental coordination may be improved by practicing certain action means specific to judo for children aged 9-12 years. 2) Data analysis proves that all children reached a superior level in the final stage as compared to the initial stage of the experiment, showing statistically significant progress.

Key words: spatial orientation, segmental coordination, judo, children

Introduction

Investigating aspects related to spatial orientation and segmental coordination in space are key concepts in understanding children's motor development, which may find extensive applicability in physical exercise and relaxation activities (De Landtsheer et al., 2016; Wawrzyniak et al., 2015).

The development of psychomotor ability in children is a crucial objective in physical exercise, and in judo the development level of spatial orientation and segmental coordination are important components that may decisively influence the optimization of sporting performance.

Psychomotor ability is complex in structure, and its components are interconditional, aiming at: balance, laterality, motor dissociation, corporal scheme, visual-motor coordination, spatial orientation, temporal structure,

motor execution, tonic-postural control, respiratory control (Bădău & Paraschiv, 2007; Bădău, 2006).

The ability of spatial orientation is the result of a cognitive process resulting from a prolonged maturation process manifested predominantly in childhood by accumulating motor skills and experiences (Macik, 2018; Liu et al., 2011; Palermo et al., 2008). Achieving notable sporting performance requires a good spatial orientation and segmental coordination in most sports as early as initiation (Wada, 2017; Stoyanova & Ivantchev, 2016).

The concept of spatial orientation includes an estimate of the relation body – objects, distances, sizes, shapes and positions of the body as related to the environment (Ching-Shu, 2016).

Developing corporal coordination depends on the level of the human biological potential, being mainly determined

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Address for correspondence: University of Medicine, Pharmacy, Sciences and Technology of Targu Mures, Gheorghe Marinescu Str. No. 38, 540139, Mures County, Romania

E-mail: dana.badau@umftgm.ro

Corresponding author: Dana Bădău, dana.badau@umftgm.ro

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by the predisposition degree which is genetically transmitted and the variety of motor skills acquired by complex sporting experiences (Bădău, 2006; Ion Ene et al., 2014), as well as the value of these acquisitions. An increase in the difficulty of coordinative ability may be obtained by increasing the requirements of accuracy, complexity, training in various conditions that would require continuous adaptation of movements to the environment, objects, practice partners, adding supplementary conditional and mental tasks, etc. (Manolachi et al., 2010; Moldovan et al., 2012).

Segmental coordination is based on the correlation of the nervous and the muscular systems, involving the kinesthetic, visual, auditory and balance analyzers (Bădău, 2011; Ion Ene et al., 2016).

Psychomotor abilities provide the comprehension of the human being from the perspective of the interaction between the mental and motor aspects, with a significant role in the athletes' psycho-behavioral system. From this point of view it is considered that the present study is up-to-date and will contribute to highlighting the importance of diversifying the sports training programs during childhood.

Objectives

The purpose of the study is to identify the progress made in developing children's spatial orientation and segmental coordination by applying programs specific to and adapted from judo.

Hypothesis

The hypothesis of the study is that the level of development that children possess regarding spatial orientation and segmental coordination may be considerably improved by practicing certain action means specific to judo.

Material and methods

Research protocol

The current study obtained the approval of the "Dunarea de jos" University of Galati Ethics Committee. All participants provided an informed consent before entering the study protocol. All subjects agreed to participate and the principles of research ethics were observed.

a) Period and place of the research

This pilot study took place in September - December 2018 at the Galati Sports Club. The research included two assessments, an initial one, which took place on 20-25 September 2018, and a final one, which was scheduled on 10-15 December 2018. In between the two tests, we applied a training program based on means from judo technique and ludic games adapted from judo, aimed at developing spatial orientation and segmental coordination. The program was performed during each training session for 10-15 minutes. Examples of judo-adapted dynamic games used during training: catch judoka, cockroaches, mirror, protector defender, cat and mouse game, rope jump, crawfish and shrimp, asymmetrical movement game, etc.

b) Subjects and groups

The research group included 24 male children aged between 9-12 years, the arithmetic mean \pm SD being 10.68 \pm 0.59 years. The inclusion criteria were the following:

all children had been practicing judo for at least one year and had not sustained any injury in the previous 3 months. The exclusion criteria were: not scoring at least 3 points in the tests, auditory deficiencies, and incomplete attendance to the training program.

c) Tests applied

The present study resorted to three tests in order to evaluate spatial orientation and segmental coordination in children practicing judo. The tests were designed by us to assess spatial orientation and segmental coordination. The tests were aimed at applying the segments on different directions and planes.

The order of test application is described below. Each child was individually assessed, and the best execution out of 2 attempts was recorded. Preparing for the tests, the children visualized the tests, and the testing proper involved executing movements based on the auditory orders of the specialized teacher.

Test 1 - Symmetrical arm movements - with the back against a screen situated at 0.5 m, the following 8 arm movements are performed: laterally down (45°), laterally (90°), laterally up (135°) and up (180°); the same movements, lowering the arms. Each movement is executed in 4 stages. One point is awarded for each accurately performed movement. The exercise is performed against a screen or a graded wall, to which the child's back is turned.

Test 2 - Arm-leg movements - with the back against the screen, the following 8 arm and leg movements are performed: leg laterally at 45°, arms laterally down (45°); leg laterally at 90°, arms laterally (90°); leg laterally at 45°, arms laterally up (135°); leg down, arms up (180°), and the next four steps are executed while the arms are being lowered, and the movement is executed with the other leg. One point is awarded for each accurately performed movement. The exercise is executed against a screen or a graded wall, the child facing the opposite direction.

Test 3 - Asymmetrical arm movements - Ten arm movements are executed against the graded screen in the frontal and sagittal planes, as follows: the right arm laterally down at 45° and the left arm laterally at 90°; the left arm laterally down at 45° and the right arm laterally at 90°; the right arm laterally down at 45° and the left arm laterally up at 135°; the left arm laterally down at 45° and the right arm laterally up at 135°; the right arm laterally down at 90° and the left arm laterally up at 135°; the left arm laterally down at 90° and the right arm laterally up at 135°; the right arm laterally at 90° and the left arm laterally up at 180°; the left arm laterally at 90° and the right arm laterally up at 180°; the right arm laterally up at 135° and the left arm laterally at 180°; the left arm laterally up at 135° and the right arm laterally at 180°. One point is awarded for each accurately performed movement. The exercise is executed against a screen or a graded wall, the child facing the opposite direction.

d) Statistical analysis

The SPSS 24 program was used to process the results of the study, calculating the following: arithmetic mean (X), standard deviation (SD), independent Student test (t), skewness index, the significance level being set at $p < 0.05$ for all analyses. Skewness values for the distribution to be considered normal had to be less than ± 1.0 .

Table I

Test frequency and percentage function of assessment score								
Tests	Evaluation	4 p.	5 p.	6 p.	7 p.	8 p.	9 p.	10 p.
		n (%)	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)
Test 1	Ti	-	3(12.5)	15(62.5)	6(25)	-	-	-
Symmetrical arm movements	Tf	-	-	4(16.7)	16(66.7)	4(16.7)	-	-
Test 2	Ti	2(8.3)	10(41.7)	9(37.5)	3(12.5)	-	-	-
Arm-leg movements	Tf	-	-	6(25)	13(54.2)	5(20.8)	-	-
Test 3	Ti	4(16.7)	6(25)	9(37.5)	5(20.8)	-	-	-
Asymmetrical arm movements	Tf	-	-	-	6(25)	6(25)	11(45.8)	1(4.2)

n - frequency, % - valid percent

Table II

Descriptive statistics in assessment tests for spatial orientation and segmental coordination								
Tests	Evaluation	Min.	Max.	X	SD	Kurtosis		
						Statistic	Std. error	
Test 1	Ti	5.00	7.00	6.125	.612	-.092	.918	
Symmetrical arm movements	Tf	6.00	8.00	7.000	.589	.299	.918	
Test 2	Ti	4.00	7.00	5.541	.832	-.371	.918	
Arm-leg movements	Tf	6.00	8.00	6.958	.690	-.712	.918	
Test 3	Ti	4.00	7.00	5.625	1.013	-.927	.918	
Asymmetrical arm movements	Tf	7.00	10.00	8.291	.907	-1.105	.918	

Max – maximum statistic, Min – minimum statistic, X – mean, SD – standard deviation, Ti – initial test, Tf – final test

Table III

Descriptive statistics of differences between initial and final tests in assessing spatial orientation and segmental coordination

Tests	t	p	X Difference	SD Difference	95% CI	
					Lower	Lower
Test 1	-5.042	.000	-.875	.173	-1.224	-.525
Symmetrical arm movements						
Test 2	-6.415	.000	-1.416	.220	-1.861	-.972
Arm-leg movements						
Test 3	-9.601	.000	-2.666	.277	-3.225	-2.107
Asymmetrical arm movements						

X - mean, SD - standard deviation, t - value of Student test, p - Sig. (2-tailed), CI - confidence interval of the difference

Results

The main descriptive results of the study are shown in Tables I, II and III.

Discussions

According to Table I, in test 1 - Symmetrical arm movements, it can be seen that in the initial testing children scored between 5-7 points, and after the application of the independent variable the results improved, the score being 4-8 points. In test 2 - Arm-leg movements, it can be seen that initially the children scored between 4-7 points, while after the introduction of the independent variable the results improved to a score between 6-8 points. The same phenomenon occurred in test 3 - Asymmetrical arm movements, where the initial score was 4-7 points, and the final score was 7-10 points (Table I), which means visible progress.

Upon analyzing the results shown in Table II, the values of the Kurtosis statistic index were below 1, with only one exception at the final test 3 - Asymmetrical arm movements, which evidences a normal distribution of values. The lowest initial values were found in test 2 - Arm-leg movements, and the best values were recorded in the final assessment of test 3 - Asymmetrical arm movements (Table II).

According to Table III, statistical analysis points out

significant differences in all the 3 tests between the results obtained in the final and initial assessment, for $p < 0.05$. The greatest difference was found in test 3 - Asymmetrical arm movements, i.e. $2.666 \pm .277$ points, and the smallest difference was obtained in test 1 - Symmetrical arm movements, i.e. $.875 \pm .173$ points. Result analysis shows that the implemented program proved to be efficient in optimizing the ability of spatial orientation and segmental coordination of children practicing judo.

Conclusions

1. All the results of the present research confirmed the hypothesis that the development level of spatial orientation and segmental coordination may be improved by practicing judo-specific action means by children aged 9-12 years.
2. Data analysis demonstrates that all children reached a higher level in the final test compared to the initial test, making statistically significant progress.
3. Educating spatial orientation and segmental coordination, important components of psychomotor abilities, should be a permanent concern of specialized teachers by diversifying the means and adapting them to as many sports as possible.

Conflicts of interest

Nothing to declare.

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