Development of motor actions in young judokas: strategies for increasing efficiency

UDC 796.853.23

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Received by the editorial office on 26.07.2024

Abstract

Objective of the study was to scientifically support the application of confounding factors of both external and internal origins to enhance the performance of young judo athletes in controlling their movements.

Methods and structure of the study. The research was conducted at the Igor Makarov Judo School in Gomel. The study involved 11- to 13-year-old judo athletes who participated in an eight-week pedagogical experiment. The experimental group (n=14) was subjected to additional exogenous and endogenous loads during training, while the control group (n=15) followed a standard program designed for youth schools of this age range.

The assessment of the agility level of the young athletes included a series of tests that simulated movements commonly used in training and competition scenarios, both in familiar and unfamiliar environments.

Results and conclusions. It was discovered that incorporating confounding factors into the training regimen of young judoists aged 11 to 13 years is a successful strategy for enhancing the specific physical exertion experienced by the participants, fostering the activation of latent capabilities and psychophysiological functions during physical activity. The examination of the outcomes demonstrated an enhancement in the experimental group's capacity to assess the time required to complete a particular task and to minimize time wastage in unforeseen circumstances, as well as an improvement in their ability to swiftly adapt their motor program and anticipate spatial and temporal changes in the environment.

Keywords: *young judokas, confusing factors, motor actions, agility, testing, familiar and unfamiliar conditions.*

Introduction. The effectiveness of motor control in training and competitive activities of judokas largely depends on the level of development of agility and coordination of athletes [7, 9]. It should be emphasized that the concepts of agility and coordination are not identical, although closely related. Agility is the ability to perform effective motor actions in unexpected and complex situations that require resourcefulness and adequate motor reactions [1]. In this case, the factor of surprise, which requires resourcefulness from an individual, making appropriate decisions in the shortest possible time, is the leading one in determining this quality [3, 6]. At the same time, the concept of «coordination» is the ability to perform effective actions with a complex dynamic and spatio-temporal structure in known, more or less practiced conditions, devoid of the factor of surprise and unpredictability [5, 6]. It is noted [8] that the ability to coordinate and effective motor activity without the presence of the factor of surprise differs from the ability demonstrated in unexpected and changeable situations and requiring the manifestation of agility. In order to develop agility, it is recommended to use various types of disturbing factors in the training process of athletes, which are understood as various disturbances that act as interference in the conditions of activity and lead to partial or complete discoordination of movements [2]. According to S.N. Nikitin [4], the development of agility should be an important part of the content of the training process, especially at the initial stages of long-term improvement, which helps to increase the efficiency of controlling motor actions in various types of martial arts. To determine the agility coefficient, the author proposed the formula: CI = t2 / t1, where: CI is the agility coefficient, t1 is the time of performing a motor action in familiar conditions (sec); t2 is the time of performing a motor action in unfamiliar conditions (sec). At the same time, monitoring the effectiveness of the training program, which is aimed at developing agility and is based on the use of various motor tasks filled with unexpected situations that re-

quire quick and adequate decisions, also requires the use of specific tests for this [5].

Objective of the study was to scientifically support the application of confounding factors of both external and internal origins to enhance the performance of young judo athletes in controlling their movements.

Methods and structure of the study. The research was conducted at the Igor Makarov Judo School in Gomel. Young judokas aged 11-13 took part in the eight-week pedagogical experiment. In order to stimulate the development of motor actions necessary in judo, a set of exercises was developed based on the use of disturbing factors that complicate and hinder the activity of various functions of the young athletes' bodies during fights. In the experimental group (EG, n=14), additional exogenous loads (sparring with partners of contrasting weight categories, changing the size of the tatami, a tough manner of conducting a fight, non-standard actions of the opponent, the presence of parents at training, various sound stimuli and mechanical interference during a fight, etc.) and endogenous (emotional state of the athlete, mood, progressive fatigue, etc.) were used as disturbing factors. We proceeded from the fact that the use of confusing factors promotes the involvement of reserve capacities of psychophysiological functions of young athletes in motor activity and, as a result, increases their ability to perform adequate motor actions in unexpected and variable situations. The control group (CG, n=15) trained according to the program developed for the Youth Sports School of this age range, and monitoring the level of agility of young athletes included two tests, which provided for a combination of movements performed in familiar and unfamiliar conditions. The motor program of the first test included recommendations [5] for assessing the agility of martial artists, and the exercises themselves used in the test were developed by us and were specific for judokas of this age. The test was based on the material of various motor actions characteristic of judo and consisted of two parts (Figure 1). In the first part of the test, it was necessary to move to each of the sequentially placed points (from the first to the eighth) in turn, returning to the starting point, where the subject had to assume a prone position, jump back to a standing position, and only then move to the next point. The subjects were familiar with the program of the first part of the test in advance and could test it (familiar conditions).

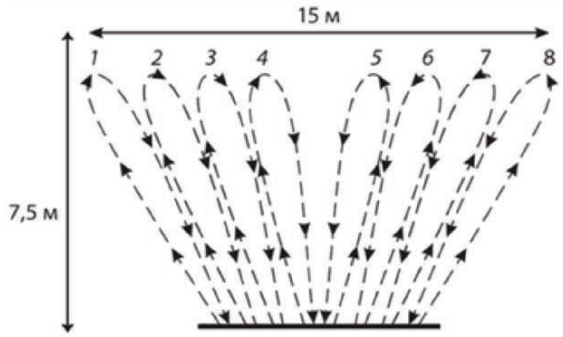

Figure 1. Testing area
Motor actions: 1 – forward roll, backward roll; 2 – Burpee; 3 – bridge run; 4 – jumping from prone position; 5 – jumping from foot to foot; 6 – touching chips; 7 – uchikomi without a partner to the right and left; 8 – forward jump from a standing squat, 180° turn, forward jump; - - - – athletes' movement trajectory during testing.

The program of the second part of the test is identical to the first, however, the movements to each of the points could be carried out in any sequence. The single requirement was to complete the program of all eight points, which was significantly complicated by the fact that four athletes were tested simultaneously, forming individual schemes for passing different points and thereby creating unforeseen situations (unusual conditions) for each other. The test required not only attention, concentration, reaction speed and working memory, but also the manifestation of characteristic features of dexterity – in space and time, static-dynamic stability, the ability to quickly correct the motor program, spatio-temporal anticipation. The second test was based on the motor action of the specific SJFT test proposed by S. Sterkowich [9]. Three judokas of the same weight category take part in the test, which is carried out on the tatami. The judoka being tested stands in the center of the tatami, and the sparring partners are in a three-meter radius from him (Figure 2). On the command «Hajime», the subject begins throwing his partners «Ippon Seoinage» and carries out 10 such throws, which must be performed at maximum speed and technically correctly (usual conditions).

The program of the second part of the test is identical to the first, however, when performing the throw, the free partner changes his location, moving in a circle with a radius of 3 m. After performing the throw, the subject must return to the center, and only then to the other partner (unusual conditions).

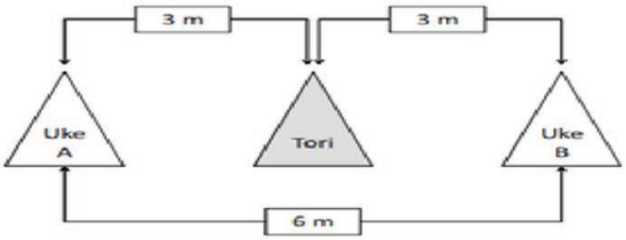

Figure 2. SJFT test execution

Changes in the efficiency indicators of motor control of young judokas aged 11-13 years at the beginning and end of the pedagogical experiment

Confounding factors	Experimental group (n=14)			Control group (n=15)		
	Start ($\bar{X} \pm m$)	The end ($\bar{X} \pm m$)	p	Start ($\bar{X} \pm m$)	The end ($\bar{X} \pm m$)	p
First test						
Familiar conditions, s	36,32±3,17	31,61±2,74	>0,05	35,97±2,97	34,91±2,87	>0,05
Unusual conditions, s	40,66±3,47	34,15±3,86	<0,05	40,43±2,76	38,90±2,99	>0,05
Agility coefficient, conventional units	1,12±0,15	1,08±0,04	>0,05	1,12±0,04	1,11±0,07	>0,05
Second test						
Familiar conditions, s	68,41±2,79	64,47±2,80	>0,05	68,17±3,78	66,58±3,09	>0,05
Unusual conditions, s	74,77±3,97	67,09±3,25	<0,05	74,15±3,49	72,02±3,24	>0,05
Agility coefficient, conventional units	1,09±0,05	1,04±0,03	<0,05	1,09± 0,03	1,08±0,03	>0,05

Results of the study and discussion. The use of various exogenous and endogenous distracting factors, applied three times a week for 20 minutes during sparring, demonstrated their effectiveness in developing control over motor actions of young judokas (see table). Analysis of the results obtained in the first test revealed an improvement in the EG reaction to a quick and adequate assessment of the situation and the ability to make a prompt motor response depending on the actions of other partners over two months. Thus, the performance of actions in unusual conditions decreased by 6.51 s in this group, and in the CG only by 1.53 s. At the same time, the dexterity coefficient improved by 0.04 conventional units in the EG, and by 0.01 conventional units in the CG. The latter indicates that in the control group there were less significant changes in the ability of young athletes to promptly correct the motor program, spatio-temporal anticipation, reaction speed and working memory.

In the second test in the EG, a decrease in the agility coefficient by 0,05 conventional units is observed, which indicates a decrease in time losses in unusual conditions. In other words, young judokas training with the use of various confusing factors began to react faster to a change in the environment, unlike in the CG, where the agility coefficient remained virtually unchanged. It should be emphasized that in the EG, the time to complete the second part of each test (unusual conditions) at the end of the experiment became even slightly better than it had been in the first part of the test (usual conditions).

Conclusions. The analysis of the obtained results allowed us to identify an improvement in the experimental group of judokas aged 11-13 years in the ability to measure the time for performing a certain task and reduce time losses in unusual conditions, optimize the athletes' capabilities for prompt correction of the motor program and spatio-temporal anticipation when changing the environment. At the same time, the widespread use of exogenous and endogenous factors in the process of training young martial artists is an effective means of increasing the specific load on the body of those involved, promotes the involvement of reserve capabilities and psychophysiological functions in motor activity and, as a result, increases their ability to adequate motor actions in unexpected and variable situations during competitive fights.

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