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THE COGNITIVE FUNCTIONS AND STYLES OF FIGHT IN ELITE FEMALE JUDOKAS

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КОГНІТИВНІ ФУНКЦІЇ І СТИЛІ ВЕДЕННЯ ПОЄДИНКУ У ВИСОКОКВАЛІФІКОВАНИХ ДЗЮДОЇСТОК. Георгій КОРОБЕЙНИКОВ, Леся КОРОБЕЙНИКОВА Наталя ДАКАЛ. *Національний університет фізичного виховання і спорту України, Київ, Україна, e-mail: george651@mail.ru*

Анотація. Мета: дослідження когнітивних функцій і стилів ведення поєдинку у висококваліфікованих дзюдоїсток.

Було обстежено 22 висококваліфіковані дзюдоїстки з різними стилями ведення поєдинку, членів збірної України з дзюдо. Були використані методи: "Перцептивная швидкість", "Порівняння чисел", "Пам'ять на слова" і "Визначення закономірностей».

Результати показали, що когнітивні стратегії у висококваліфікованих дзюдоїсток формуються з урахуванням їхнього стилю ведення поєдинку. Атакувальний стиль ведення поєдинку в жіночому дзюдо характеризується підвищеною продуктивністю когнітивних завдань і збільшенням швидкості аналізу та переробки інформації. Захисний стиль поєдинку характеризується підвищеним рівнем емоційного стресу з одночасним зниженням швидкості переробки інформації.

Ключові слова: висококваліфіковані дзюдоїстки, когнітивні стратегії, стилі поєдинку, сприйняття, переробка інформації.

Introduction. The modern judo presents the high demands to athletes' physical and psychological abilities. Prediction and selection in judo is important and promising task [1, 2]. Competitive activity in combat sport the requires of rapid assessment and decision-making in a complex choice and shortage of time [3, 4].

There are many articles which point to the importance of physiological characteristics in choosing a style in combat sport [5, 6].

But as think of some scientists The effectiveness of perception processes, information processing and decision making the depend on athletes' cognitive organization of their psychophysiological functions [7, 8].

This is more actuality with related to the participation of women in purely male sports [9, 10].

Despite the very long term participation of women in various forms of combat sport, has no reasonable investigation concerning problem of cognitive strategies in female judokas with different styles of doing the fight has not been studied.

The purpose study of cognitive functions and styles of fight in elite female judokas.

Methods. Subject. 22 elite athletes (female), members of the Ukrainian National Team in Judo took part in the research. All of the athletes is a winner or medalists of Ukrainian National Championship. The experimental study were approved by the Ethics Committees for Biomedical Research of the National University of Physical Education and sport of Ukraine with accordance the ethical standards of the Helsinki Declaration. Each athlete completed all test blocks in one day.

To analyze the cognitive functions, the athletes were divided into 3 groups depending on preferred style of fighting. First group with the preference to attacking fighting style – 8 judokas (n=8), second group with the preference to balanced fighting style (attack/defense) – 8 judokas (n=8), third group with the preference to defensive fighting style – 6 judokas (n=6). The preferred fighting of style was determined by the subjective opinion of an athlete and coach, and by analyzing the videotapes of the most important competitions of the year.

Material and methods. Cognitive functions were assessed using computer-hardware complex "Multipsihometr-05". The methods: "Perception speed", "Comparison of numbers", "Word Memory" and "Determining the Trends" were used.

Perception and processing of visual information were studied by using the method "Perception Speed". This method is based on evaluation of speed and accuracy of identifying geometric figures and comparing the given fragments with the set-up targets, which constitute 50%-75% of the whole figure.

The task of the subject is determining the benchmark figures, which consist of the present of piece. During test performance were determined indicators: productivity, speed, accuracy and efficiency. The athlete answers the question by pressing the button (with the according number) on a special digital keyboard, the component of apparatus- program diagnostic complex.

A criterion of productivity indicates the perception speed and processing information. The higher the productivity the higher is the speed of the perception and cognition. The relative frequency of wrong answers points to the efficiency of perception and processing: the lower this number is, the more effective these processes are. The work's speed is indicate the efficiency of perception and thinking processes. The speed with which athlete fulfills the task is the integral indicator of speed and efficiency of perception and information processing. High variables for speed mean that the specified processes of perception and processing are mobile and effective.

The nature of operational cogitation was studied by results of "Comparison of numbers" method. This test involves consecutive comparing of numbers by its values. Signals – the numbers from 2 to 9 are presented coherently in the middle of the screen. The task of the athlete in research consists in comparing the value of the current number with the value of the previous one. In case the current number is greater the athlete presses the right button block of special keyboard and if the number is lesser – the left button. The test results determine: effectiveness, latency of reaction, accuracy and stability.

The memory function was evaluated with the test "Word Memory". The essence of this method consists in recognizing the targeted word (i.e., the word from a subset of words previously offered for memorizing) from successively presented sets of words and indicating its consecutive number. For the duration of one minute the athlete in research is has the set of 30 words for memorizing. When the time is up she sees on the screen the succession of numbered combinations of 5 words. The task is to recognize in each combination the word, which was previously presented for memorizing, and indicate it by pressing the matching number button on button block of special keyboard. In each presented combination there is only one word from those offered for memorizing. 4 minutes are given to complete the test. Standardized indicators include: productivity, speed, accuracy, effectiveness. The method is intended for research and evaluation of the capacity and stability of short-term memory for verbal material.

The evaluation of overall intellectual abilities was conducted by the method "Determining the Trends". This method is directed on research of certain characteristics of cognitive process (alertness, prehension) and operational memory. In the course of this test the athlete in research is asked to determine which word from the 5 words offered (they correspond to the number buttons 1–5 on the keyboard) could be encoded in previously presented succession of symbols. There is only one right answer to each task. The athlete fulfills the task by pressing the matching number button on special keyboard.

Statistical Analysis. The statistical analysis was performed utilizing the software package STATISTICA 7.0, using the methods of parametric and nonparametric statistics. The criteria of rang sums of Wilkinson was used to estimate the reliability of the differences.

Results. The mean indicators of perceptive speed among elite female judokas with the preference to different fighting styles are presented in the table 1.

According to Table 1, the productivity variables in the first group of athletes with attacking style are significantly higher than in the group of athletes with defending style.

However, the judokas with defending style have higher variables than the ones preferring balanced style of fighting.

Variables of speed have distinctive differentiations between judokas of attacking and balanced styles of fight, as well as between judokas of attacking and defending styles of fight. Also there are discrepancies in speed variables between athletes of balanced and defending styles of fight (Table 1).

This indicates that female judokas with preferred attacking and balanced styles have speed variables higher than the wrestlers with defending style. The accuracy numbers are meaningfully higher in the judokas group of balanced style. The effectiveness variables show tendency to deviation between the judokas groups with attacking and defending styles (Table 1).

Table 1

Meanings of test "perception speed" in elite judokas with different style of fight (Median, Lower, Upper Quarter)

Variables	Attacking style (n=8)			Balanced style (n=8)			Defending style (n=6)		
	Median	Lower Quarter	Upper Quarter	Median	Lower Quarter	Upper Quarter	Median	Lower Quarter	Upper Quarter
Productivity (secret unit)	65,50	53,50	71,00	56,00	49,00	71,00	61,00***	40,00	71,00
Speed (stimuli/min)	17,75	16,13	19,13	18,00	12,50	18,75	16,50***	11,50	18,25
Accuracy (secret unit)	0,95	0,83	0,98	0,98*	0,93	0,99	0,97	0,85	1,00
Efficiency (secret unit)	47,36	36,26	57,57	42,52	35,83	57,15	47,49	25,91	57,00

Note: * – $p < 0,05$, comparing with the athletes of attacking style;
** – $p < 0,05$, comparing with the athletes of balanced style.

Thus, preferring attacking style by female judokas is characterized by higher values of indicators of productivity and speed of processing the information. It means that cognitive functions of this group's athletes have superior aptitudes. The athletes with preferred defending style have higher values of efficiency of brainwork. The judokas with balanced style have higher values of accuracy variables.

The mean variables of the test "Comparing the numbers" conducted with the elite female judokas with the preference to different fighting styles are presented in the Table 2.

Table 2

Meanings of test "comparison of numbers" in elite judokas with different style of fight (Median, Lower, Upper Quarter)

Variables	Attacking style (n=8)			Balanced style (n=8)			Defending style (n=6)		
	Median	Lower Quarter	Upper Quarter	Median	Lower Quarter	Upper Quarter	Median	Lower Quarter	Upper Quarter
Efficiency (secret unit)	1043,91	943,98	1125,10	990,06	858,30	1038,10	1169,70*	911,96	1915,60
Reaction latency (ms)	971,03	842,33	1039,65	966,86	844,90	997,59	1114,80*	854,96	1633,00
Accuracy (secret unit)	0,95	0,88	0,98	0,98	0,97	0,98	0,95	0,94	0,98
Stability, %	25,90	22,18	27,81	21,44	18,74	25,31	31,92***	25,81	43,05

Note: * – $p < 0,05$, comparing with the athletes of attacking style;
** – $p < 0,05$, comparing with the athletes of balanced style.

A conducted analysis demonstrates that there are significant discrepancies between judokas with attacking and balanced styles of fight in indicators of efficiency, reaction latency and stability (Table 2). Moreover, all these indicators are better among the athletes who prefer attacking style. However, stability indicators in athletes with defending style are considerably higher than in the group of wrestlers with preferred balanced style (Table 2).

The fact that efficiency and stability indicators in the test "comparing the numbers" are higher among elite judokas with preferred attacking style of fight demonstrates the better quality information processing of visual information in this group. In the same time, the reduced stability indicators

among athletes with defending style signify high level of psycho-emotional stress. Reduced values of reaction latency indicators among judokas with attacking style attest to the high speed of analysis and processing information needed for decision-making.

The mean variables of the test "Word Memory" conducted with the elite female judokas with the preference to different fighting styles are presented in the Table 3.

Table 3

Meanings of test "word memory" in elite judokas with different style of fight (Median, Lower, Upper Quarter)

Variables	Attacking style (n=8)			Balanced style (n=8)			Defending style (n=6)		
	Median	Lower Quarter	Upper Quarter	Median	Lower Quarter	Upper Quarter	Median	Lower Quarter	Upper Quarter
Productivity (secret unit)	19,50	18,00	22,00	20,00	16,00	24,00	20,00*	16,00	22,00
Speed (stimuli/min)	12,96	11,04	16,14	12,04*	8,58	13,46	10,66***	9,21	12,06
Accuracy (secret unit)	0,69	0,62	0,77	0,68	0,54	0,80	0,67*	0,53	0,73
Efficiency (secret unit)	41,32	32,15	54,31	40,84	22,36	60,00	38,89*	22,22	48,89

Note: * – $p < 0,05$, comparing with the athletes of attacking style;
** – $p < 0,05$, comparing with the athletes of balanced style.

The obtained results in Table 3 show that there are distinctive differences in all indicators of the given test between judokas with attacking and balanced styles of fight. Moreover, productivity indicators are higher in the group of athletes with preferred defending style. The indicators of speed, accuracy and efficiency are higher among the judokas preferring to attack (Table 3).

The Indicators of speed are notably different in judokas with attacking and balanced styles of fight, as well as they are different in judokas of balanced and defending styles of fight. In a group with attacking inclinations the values of speed indicators are higher in comparison with group of balanced style (Table 3).

Therefore, the formation of short-memory function in female judokas develops with due consideration of preferred style of fighting. The indicators of accuracy, speed and efficiency of short-term memory are higher in the group with attacking style while defending style is exemplified by a higher productivity.

The mean variables of the test "Determining the Trends" conducted with the elite female judokas with the preference to different fighting styles are presented in the Table 4.

Table 4

Meanings of test "determining the trends" in elite judokas with different style of fight (Median, Lower, Upper Quarter)

Variables	Attacking style (n=8)			Balanced style (n=8)			Defending style (n=6)		
	Median	Lower Quarter	Upper Quarter	Median	Lower Quarter	Upper Quarter	Median	Lower Quarter	Upper Quarter
Productivity (secret unit)	16,50	16,00	18,50	20,00*	16,00	21,00	20,00*	15,00	22,00
Speed (stimuli/min)	4,79	4,30	6,64	5,07	3,83	6,03	4,81***	4,37	4,92
Accuracy (secret unit)	0,70	0,64	0,82	0,84*	0,80	0,89	0,80**	0,76	0,88
Efficiency (secret unit)	43,80	35,20	62,04	60,00*	55,11	67,20	60,00*	43,65	74,80

Note: * – $p < 0,05$, comparing with the athletes of attacking style;
** – $p < 0,05$, comparing with the athletes of balanced style.

Analysis of the data in Table 4 revealed the following: there are distinctive differences of all variables between judokas of balanced and defended styles of fight. Moreover, all the indicators have a higher value in the group of judokas with preferred balanced style of conducting the combat. This result confirms that athletes of this group have a higher level of prehension, ability to perceive and recode the information, and higher level of attention and operational memory.

Athletes with preferred balanced style are quicker to learn skills needed to non-standard information processing. There are distinct differences in indicators between judokas of attacking and balanced style of fight - the athletes with preferred balanced style have higher indicators of productivity, accuracy, and efficiency (Table 4). However, the speed indicator is higher in the group of preferred defending style in comparison with the group with preferred attacking style (Table 4). This means that those athletes are quicker to learn new skills.

Conclusions:

1. Cognitive strategies in elite female judokas is formed with taking into account their style of conducting the fight.
2. The attacking style of fight in female judo is characterized by increased performance of cognitive tasks and increase the speed of analysis and information processing. Defended style of fight is characterized by increased levels of emotional stress, with a simultaneous decrease in the speed of information processing.
3. The balanced style of fight is characterized by a high level of expression of the potential for the perception and encoding of information, a higher level of attention and speed to development of skills and abilities.

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КОГНИТИВНЫЕ ФУНКЦИИ И СТИЛЬ ВЕДЕНИЯ ПОЕДИНКА В ВЫСОКОКВАЛИФИЦИРОВАННЫХ ДЗЮДОИСТОК

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Аннотация. Цель: исследование когнитивных функций и стилей ведения поединка у высококвалифицированных дзюдоисток.

Было обследовано 22 высококвалифицированных дзюдоисток с различными стилями ведения поединка, членов сборной Украины по дзюдо. Были использованы методы: "Перцептивная скорость", "Сравнение чисел", "Память на слова" и "Определение закономерностей».

Результаты показали, что когнитивные стратегии у элитных женщин-дзюдоисток формируются с учетом их стиля ведения поединка. Атакующий стиль ведения поединка в женском дзюдо характеризуется повышенной производительностью когнитивных задач и увеличением скорости анализа и переработки информации. Защитный стиль поединка характеризуется повышенным уровнем эмоционального стресса с одновременным снижением скорости переработки информации.

Ключевые слова: высококвалифицированные дзюдоистки, когнитивные стратегии, стили поединка, восприятие, переработка информации.

THE COGNITIVE FUNCTIONS AND STYLES OF FIGHT IN ELITE FEMALE JUDOKAS

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Abstract. The purpose of the study was to analyze cognitive functions and styles of fight in elite female judokas.

Twenty two elite female judokas with different fighting styles, members of the Ukrainian National Judo Team took part in the research. Methods of the study included "Perceptual speed", "Comparison of numbers", "Memory for words" and "Definition of regularities".

The obtained results showed that cognitive strategies in elite female judokas are formed based on their style of conducting the fight. The attacking style of fight in female judo is characterized by the increased performance of cognitive tasks and the increase analysis speed and information processing. Protective style of the fight is characterized by increased level of emotional stress alongside with simultaneous decrease of the information processing speed.

Keywords: elite female judokas, cognitive strategies, styles of fight, perception, information processing.

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