

Psychophysiological conditions and competition in highly qualified combat sambo wrestlers

RUSLAN TRON¹, IRYNA HRUZEVYCH², SVITLANA SALNYKOVA³, VOLODYMYR KORMILTSEV⁴,
PETRO SARAFYNYUK⁵, YURIY KYRYCHENKO⁶, YULIA YAKUSHEVA⁷, RUSLAN KROPTA⁸
^{1,4,8}National University of Physical Education and Sports of Ukraine, Kyiv, UKRAINE
^{2,5}Vinnitsia State Mykhailo Kotsyubynskyi Pedagogical University, UKRAINE
^{6,7}Vinnitsia National Nicholai Pirogov Medical University, UKRAINE
³Vinnitsia Institute of Trade and Economics, UKRAINE

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Abstract:

The article represents the outcome of the research of the problem of taking control over the specific preparedness of qualified combat sambo wrestlers. The study includes the data of experimental investigation carried out to prove the efficacy of the program developed to monitor the preparedness of the qualified combat sambo wrestlers. The program proposed allows utilizing the data of the level of physical and technical prepared, psychophysiological and the functional cardiovascular system condition's of the qualified combat sambo wrestlers by the testing results and make a prognosis about the secure performance of throws and the other athlete activities at the contest. The overall scale of contest activities and effective throws, informative indicators of physical technical preparedness and psychophysiological state of combat sambo wrestlers have also been determined in the study. The relationships of informative indicators of specific preparedness with the coefficient of secure throw performance and qualified combat sambo wrestlers activities at the contest were defined. The program of monitoring the special preparedness of qualified combat sambo wrestlers that allows the prognostic estimates for secure performance of effective throws and combat sambo wrestlers activities under conditions of the competition has been developed and proven. The data obtained allow choosing the optimal tactics and strategies for the contest where all strengths and weaknesses of combat sambo wrestlers preparedness were accounted for.

Key words: control, combat sambo, specific preparedness, psychophysiological state, contest.

Introduction

Wrestling competitions are characterized by high intensity and complex technical structure of the performed techniques, predetermination significant scientific interest in the problem of studying the physical capabilities of athletes in various forms of wrestling (V. Boyko, 1997; B. Mirzaei, 2008; S. Latyshev, 2013), and martial arts which related with the execution of strikes (M. O'Brien, 2009; A. Blyzniuk, 2011; N. Larson, 2012). At the same time, new types of martial arts are actively developing, distinguished from the other by the high variety of techniques and spectacular fights. One of them is the combat sambo.

Combat sambo is a sport, accumulating the most effective techniques more over from the 52 types of martial arts. Its arsenal included the best techniques taking from the judo, sambo wrestling, freestyle wrestling, jiu-jitsu, karate, boxing, kickboxing and other martial arts (R. Tron, 2013). At this time, many athletes from this sport achieve significant success in professional mixed martial arts, as well as actively working in military special forces. The using of combat sambo either in military training or in professional sports is the headline factor for improving the training of wrestlers.

Well known, that competitive activity is the main indicator of perfect training in sport (S. Jaric, 2003; R. Kropta, 2005). The problem of determination of the indicators of the effective competitive activity of combat sambo athletes is currently solved by assessing their level of physical and technical fitness, and the results, showed by single-fighters in the process of testing speed-strength training, reflect the level of their competitive ability. If we talking about the studying of competitive activities directly, in single combat, most often evaluation process of the effectiveness of actions and analyze the individual phases of the implementation of techniques in a competitive duel without bringing the level of influence of various psychological irritants.

At the same time some authors (Y. Radchenko, 2011; G. Korobeynikov, 2011; M. Latyshev, 2013) indicate on the basis of control of the level of development of exclusively motor function, that's impossible to

assess the ability of an athlete to a successful activity in conditions of high mental tension. Therefore, there is a need to study a special preparation process with an assessment of individual-typological properties and psychophysiological features of the body that have a significant impact on the athlete's performance in combat sambo.

Right now, the papers, which comprehensively considers the influence of the functional and psychophysiological states of the organism on the adversarial effectiveness of fighters in the special literature, is not evident, the need for development in this direction is obvious.

Purpose of the research

To investigate the influence of the psycho-physiological condition on the success of the competitive activities of the fighters in combat sambo.

Materials and Methods

The following research methods used for solving the purpose and obtaining objective data: theoretical analysis and generalization of data from special scientific and methodical literature, methods of registration and analysis of human movements, methods of anthropometry and dynamometry, psychophysiological methods, physical fitness testing, methods of mathematical statistics.

The research was performed in the two years on the basis of the State Research Institute of Physical Culture and Sports and the Sports Biology Department of the National University of Physical Education and Sports of Ukraine.

The study involved 94 athletes, from 17-26 years old, among them were 30 athletes with the classified level of the Master of Sport of Ukraine, 32 athletes were the Candidates for the Master of Sport and 32 athletes were on the first level by the Ukrainian Sports Fitness Classification.

During the research we have performed the analysis of the competitive activities of the high qualified wrestlers, were determined the effective techniques, informative indicators of physical, technical fitness and psychophysiological status and were created the regression models for prediction the reliability of the implementation of the technical actions and the activity of the sambist in various parts of the competitive duel.

For control the level of the leading motor qualities, determining the special physical fitness of athletes in combat sambo we used a set of pedagogical tests, there are followed: lifting the trunk in the sitting position per 1 minute (rept), running at 600 m (sec), body pulling up on the crossbar per 10 seconds (rept), running at 30 m (sec), long jump without the prerun (m), right and left hand dynamometer indicators (kg), bench press (kg), semi squats with a barbell (kg), barbell jerking (kg), the shot put 4 kg (m), the shot put 4 kg bottom-back (m), running on the bridge (sec), swinging from lay down position (sec), the performing 100 kicks on a punching bag (sec) and the performing 50 kicks on a punching bag (s). Selected tests are characterizing the leading physical qualities of athletes who specialize in combat sambo, and are available for the performing.

The research of individual and typological properties and psychophysiological conditions of the fighter's body was carried out according to the method of the hardware and software psychodiagnostic complex "Multipsychometer-05". The evaluation was carried out according to the latency periods of the simple visual and motor reaction (LP SVMR), the latency period of the complex visual and motor reaction (LP CVMR) and the functional mobility and strength of the nerve processes (FMSNP).

Results

The analysis of the competitive activity of the wrestlers of different qualifications, testing their physical, technical fitness and psychophysiological condition of the organism allowed to establish the features of the psychophysiological condition, impacting on the competitive performance of those athletes.

The duration of a competitive match in combat sambo is 5 minutes, and in the case when the number of participant's points is equal, referees are appointed the additional 2 minutes. However, most of the battles (59%) end early, when one of the fighters is in the "incapacitated" position. Most time of the competitive fight in combat sambo is held by athletes in the parterre position, it is 57.8%, it is possible for performing a painful or suffocating expedient and finish the fight ahead of time. Thus, it is important need for qualitative performance, as the throwings for the transfer of the opponent from the rack to the parterre position and the receipt of scoring points increases.

Based on the analysis of competitive activities, we have determined the most effective throwings, which are often used by high qualified wrestlers. There are follows: passage into the legs and performing from this position throws is 42%, throwings through the back are 11%, throwings through the thigh are 11%. Since the control of technical fitness was conducted in conditions of training activity without the active resistance of the rival, in this study was conducted the duration of the phase of withdrawal of the throw, it registered from the moment the separation of the opponent from the carpet till the complete separation. Time characteristics of the phase of separation during performance of efficient rolls by high qualified sambists are presented in Table 1.

Table 1. The duration of the phase of separation during the performance of efficient throwing performed by qualified sambists of different weight categories.

Efficient throwings	Indicator value, ms					
	First class wrestlers (n=32)		Candidates for the Master of Sport (n=32)		Master of Sport of Ukraine (n=30)	
	\bar{x}	S	\bar{x}	S	\bar{x}	S
Light weight						
Throwing through the thigh	149,8 ^{b)}	10,8	138,3	10,7	129,2 ^{b)}	8
Throwing through the back	163,4 ^{b)}	16,8	147,5 ^{c)}	12,6	123,4 ^{b) c)}	11,7
Passage to the legs	153,3 ^{b)}	11,3	146 ^{c)}	11,6	129 ^{b) c)}	10,1
Medium weight						
Throwing through the thigh	163 ^{a) b)}	18	143,5 ^{a)}	13,2	134,9 ^{b)}	13,3
Throwing through the back	185,7 ^{b)}	16,6	164,3 ^{c)}	20,6	141,2 ^{b) c)}	15,2
Passage to the legs	183,5 ^{b)}	23,3	164,2 ^{c)}	15	139,4 ^{b) c)}	14,2
Heavy weight						
Throwing through the thigh	171,4 ^{b)}	17,2	164,7	16,3	145 ^{b)}	12,3
Throwing through the back	202 ^{b)}	21,4	188,9	20,4	171,8 ^{b)}	23,1
Passage to the legs	201,7 ^{b)}	23,9	191 ^{c)}	19,5	168,2 ^{b) c)}	8,4

Notes: ^{a)} – the statistical difference between the rankings of the 1st class wrestlers as compared with the wrestlers of the CMS level is statistically significant at the level $p < 0,05$; ^{b)} – the statistical difference between the rankings of wrestlers of the 1st class wrestlers as compared with the wrestlers of the MS level is statistically significant at the level $p < 0,05$; ^{c)} – the statistical difference between the rankings of the CMS wrestlers as compared with the MS level fighters, is statistically significant at the level $p < 0,05$

The comparative analysis of the duration of the phase of separation of the effective throwings at athletes of different sports skills has revealed the increasing the level of athletic skill in all weight categories as well as a tendency to reduce the time of technical action. Differences are statistically significant at the time of the phase of separation when performing the passage to the legs, throwing through the back, and throwing through the thigh between the high qualified wrestlers and the 1st class wrestlers ($p < 0,05$). We can talk about the effectiveness of competitive activities is depending on the reliability of the performed throwings, that is closely related to the dynamics of the duration of the initial phases of the technical action.

During the research process was determined that psychophysiological conditions have a high influence on the athlete's performance (Table. 2). It is determined that LP SVMR has probable differences ($p < 0,05$) at athletes of all levels of sport qualification, while the indicators of the FMSNP in the wrestlers of Master of Sport level are significantly higher ($p < 0,05$), than at the 1st class athletes and CMS wrestlers. A comparative analysis shows that all the surveyed psychophysiological indicators of the MS athletes on the day of the competition are significantly higher ($p < 0,05$) than athletes of the 1st class.

Table 2. The indicators of the psychophysiological condition of the qualified wrestlers at the day of competitions (n=94)

Psychophysiological condition indicators	Indicator value					
	First class wrestlers (n=32)		Candidates for the Master of Sport (n=32)		Master of Sport of Ukraine (n=30)	
	\bar{x}	S	\bar{x}	S	\bar{x}	S
LP SVMR, ms	290,2 ^{a) b)}	22,7	274,8 ^{a) c)}	22,9	254,4 ^{b) c)}	21,7
LP CVMR, ms	439,1 ^{a) b)}	33,41	418,7 ^{a)}	28,21	399,1 ^{b)}	21,18
FMNP, sec	65,2 ^{b)}	3,98	63,8 ^{c)}	3,8	61,2 ^{b) c)}	3,66
SNP, rept	692,1 ^{b)}	29,3	706,1 ^{c)}	31	728,9 ^{b) c)}	29,4

Notes: ^{a)} – the statistical difference between the rankings of the 1st class wrestlers as compared with the wrestlers of the CMS level is statistically significant at the level $p < 0,05$; ^{b)} – the statistical difference between the rankings of wrestlers of the 1st class wrestlers as compared with the wrestlers of the MS level is statistically significant at the level $p < 0,05$; ^{c)} – the statistical difference between the rankings of the CMS wrestlers as compared with the MS level fighters, is statistically significant at the level $p < 0,05$; LP SVMR – the latency periods of the simple visual and motor reaction; LP CVMR – the latency period of the complex visual and motor reaction; FMNP – the functional mobility of the nervous process; SNP – the strength of the nervous process

The using of correlation analysis between the results showed by the athletes during the testing process of technical skills, physical fitness, psychophysiological condition and the level of qualification allowed to determine informative indicators of special fitness in combat sambo. The comparative analysis of the results of the correlation analysis of the indicators of technical fitness with the level of sports qualification shows that during the training without partner's resistance, the duration of the phase of separation in the performance of a throwing through the back, passage to the legs and throwing through the thigh in the fighters of light and medium weight categories has a closer interconnection with a level of skill than in a heavyweight class. Through the using of the correlation analysis we determined the tests that can be considered as an informative for martial arts of all weight categories, there are follows: dynamometry of the right and left hands (kg), bench press (kg), semi squats with a barbell (kg), barbell jerking (kg), the shot put 4 kg (m), the shot put 4 kg bottom-back (m), running on the bridge (sec), swinging from a lay down position (sec). For fighters of light and medium weight categories testing are follows: the body pulling up on the crossbar per 10 seconds (rept), lifting the trunk in the sitting position per 1 minute (rept), the performing 100 kicks on a punching bag by hands (sec) and the performing 50 kicks on a punching bag by legs (s), there are also informative.

On the basis of the results obtained from the informative testing, there were developed differential scales for assessing the levels of physical and technical fitness and psychophysiological condition, it was calculated for each qualifying and weight group of fighters on the basis of sigmoid scales. With these developed scales, the levels of special training fitness of qualified fighters were determined during the informative testing, there are presented in a scoring points: 1 point is responsible to low level; 2 points are responsible to level lower than medium; 3 points are responsible to medium level; 4 points are responsible to the level higher than medium; 5 points are responsible to the high level. On the basis of the obtained results, correlation analysis was conducted between the indices of reliability of the performing of the throwings (R, %), the activity on the 1st minute of the fighting match (A_{1min} , rept·min⁻¹), from the 2nd to the 4th minute of the fighting match (A_{2-4min} , rept·min⁻¹), at the 5th minute of the fighting match (A_{5min} , rept·min⁻¹) and the levels of physical and technical fitness and the psychophysiological condition (Table. 3).

Table 3. The correlations between the indicators of competitive activity with levels of special fitness training of the qualified athletes in combat sambo (n=94)

Indicators of the specific fitness training, бай	Correlation coefficient			
	R, %	A_{1XB} , rept·min ⁻¹	A_{2-4XB} , rept·min ⁻¹	A_{5XB} , rept·min ⁻¹
Level of physical fitness	0,155	0,558 ^{a)}	0,534 ^{a)}	0,594 ^{a)}
Throwing through the thigh	0,548 ^{a)}	0,107	0,147	0,11
Throwing through the back	0,582 ^{a)}	0,196	0,134	0,075
Passage to legs	0,546 ^{a)}	-0,128	-0,125	0,056
LP SVMR	0,512 ^{a)}	0,528 ^{a)}	0,26	0,148
LP CVMR	0,526 ^{a)}	0,594 ^{a)}	0,526 ^{a)}	0,44 ^{a)}
FMNP	0,504 ^{a)}	0,421 ^{a)}	0,578 ^{a)}	0,364 ^{a)}
SNP	0,581 ^{a)}	0,47 ^{a)}	0,516 ^{a)}	0,644 ^{a)}
HR _{exer}	0,072	-0,061	0,043	0,549 ^{a)}
HR _{recov}	0,207	0,278 ^{a)}	0,505 ^{a)}	0,548 ^{a)}
T _{120bpm}	0,273	0,29 ^{a)}	0,422 ^{a)}	0,501 ^{a)}

Notes: ^{a)} – the correlation coefficient is statistically significant at the level $p < 0,01$; R – the reliability of the throwings performing; A_{1min} – the activity level on the 1st minute of the fighting match; A_{2-4min} – the activity level from the 2nd till the 4th minute of the fighting match; A_{5min} – the activity level on the 5th minute of the fighting match; LP SVMR – the latency periods of the simple visual and motor reaction; LP CVMR – the latency period of the complex visual and motor reaction; FMNP – the functional mobility of the nervous process; SNP – the strength of the nervous process; HR_{exer} – heart rate on 60th second of the performing exercise; HR_{recov} – heart rate at the 60th second of the fighter's recovery; T_{120bpm} – time of the heart rate recovering to the 120 bpm.

Using the correlation analysis it was established that the reliability of the performing throwings related to the indicators of technical fitness and psychophysiological condition ($p < 0,01$). The level of physical fitness affects the activity of wrestlers throughout the competitive match ($p < 0,01$), thus, the functional condition of the athlete's body makes it possible to carry out the extremity of the battle with high intensity ($p < 0,01$).

The psychophysiological condition of qualified athletes, specializing in a combat sambo influences on the reliability of performed throwings and activity in different parts of the competitive match. Correlation analysis between the levels of special training fitness and indicators of the reliability of the performing throwings and the activity of wrestlers in various parts of the competitive match of qualified athletes in a combat sambo allows to effectively predict such components of competitive activity, there are follows:

the reliability of the performing throws in terms of competition is the basis of the relationship between the level of technical fighting fitness and psychophysiological condition by indicators of the LP SVMR, LP CVMR, FMNP, SNP;

activity level on the 1st minute of the fighting match is the basis of the relationship between the level of physical fitness and psychophysiological condition by the indicators of the LP SVMR, LP CVMR;

activity level from the 2nd till the 4th minutes of a competitive duel is the basis of the relationship of the level of physical fitness and psychophysiological condition (by indicators of the LP SVMR, LP CVMR, FMNP, SNP) and the functional state of an athlete's body ((by indicator of the HR_{exer});

activity level on the 5th minute of the match is the basis of the relationship between the level of physical fitness and the functional state of the athlete's body by the indicators HR_{exer} , HR_{recov} , T_{120bpm} .

Interestingly enough is the fact that the significance of the indicators of the psychophysiological condition during a competitive duel is diminishing, that indicates their significant dependence on fatigue and the level of combat fitness.

The validity of the presented models is checked by comparison of model and actual indicators of competitive activity of athletes, represented in Table 4. The obtained results show that the most valid models are the dependence on the reliability of the performing throwings from the levels of technical fighting fitness and psychophysiological condition (as a 77.8% variation) and the activity of wrestlers on the 5th minute of the match from the levels of physical fitness, functional and psychophysiological condition of the body of single fighters (as a 78, 1% variation).

Table 4. Model and actual values of competition activity of the qualified athletes in combat sambo (n=94)

Statistical indicator	Model value				Actual value			
	R, %	A_{1min} , rept·min ⁻¹	A_{2-4min} , rept·min ⁻¹	A_{5min} , rept·min ⁻¹	R, %	A_{1min} , rept·min ⁻¹	A_{2-4min} , rept·min ⁻¹	A_{5min} , rept·min ⁻¹
Average arithmetic value	65,8	8,13	6,47	6,09	63,6	7,94	6,84	5,89
Validity coefficient					0,882	0,823	0,744	0,883
Determination coefficient					0,778	0,677	0,553	0,781

Notes: R – the reliability of the reforming throwings; A_{1min} – activity level on the 1st minute of the fighting match; A_{2-4min} – activity level from the 2nd till the 4th minutes of a competitive duel; A_{5min} – activity level on the 5th minute of the match

During the determination of the difference between the arithmetic value of the model and actual value of the studied indicators, using the Student's criterion, the insignificance of the differences were revealed in the reliability indices of the performed throwings and the activity at the beginning and the end of the match (on the 1st and on the 5th minutes of a competitive duel) at the level as $p > 0,05$, in the middle of the fighting match it was (from the 2nd till the 4th minutes of a competitive duel) at the level as $p > 0,01$.

Discussion

The research of the relationship between the effectiveness of competitive actions of fighters with individual and typological properties and psychophysiological condition of the body of the fighters confirmed the fundamental positions of the authors regarding the effectiveness of the control of various aspects of the fitness and functional condition of the body of the athlete in the process of preparation for the competition. There were confirmed the results of the researches performed by V. Boyko (1997), B. Mirzaei (2008), A. Blyzniuk (2011), G. Korobeynikov (2011), N. Larson, (2012) et al., about the high-speed training has a significant impact on the performance of single-fighters in the competition and this is determining an influence of the dynamics of the duration of the initial stages of performed throws on the reliability of their performance.

On the basis of the relationship between the psychophysiological condition and the level of sports qualification and indicators of competitive activities of martial arts, for the first time were founded informative indicators of the special fighting fitness of the high qualified fighters, which have a close relationship between the level of the special athletic skills and the effectiveness of competitive activity;

The data, that we obtained as a result of the performed research, allows to optimize the training process of the single fighters to the competitive match on the basis of the determination of the features of its special training and timely adjustments to improve the training process and the quality of training for athletes to the competition.

Conclusions

Control process of special training fitness in combat sambo requires the introduction of an assessment of informative of indicators of physical, technical fitness and psychophysiological condition for mixed martial arts. But, scientific data about the main approaches to controlling the competitive activities of fighters in the scientific and methodical literature are presented fragmentarily on the cases about the training in the martial arts, sports physiology and management in sport. Also insufficiently studied is the question of the relationship of indicators of special fighting fitness with the level of sports qualification and the effectiveness of fighters in the competition.

The most effective throwings in combat sambo are passage to the legs (41 %), fulling (11 %), throwing through the thigh (11 %) and throwing through the back (7 %). Temporary characteristics of the main phase of

the passage to the legs, throwing through the back and throwing through the thigh without resistance of the partner in the training conditions are informative indicators that characterize the level of technical fitness of the high qualified wrestlers and have a close relationship with the level of sports qualification $r > 0,5$ ($p < 0,01$).

The psychodiagnosis should be performed on the day of the competition for the assessment of the psychophysiological condition of the single fighters, specializing in combat sambo. The information related to the level of athletic qualification, there are followed: the latency periods of the simple visual and motor reaction $r = -0,548$ ($p < 0,01$), the latency period of the complex visual and motor reaction $r = -0,391$ ($p < 0,01$), the functional mobility of the nervous process $r = -0,403$ ($p < 0,01$) and the strength of the nervous process $r = 0,45$ ($p < 0,01$).

The activity of fighters throughout the match is interconnected with (on the 1st minute of the fighting match $r = 0,558$ ($p < 0,01$), from the 2nd till the 4th minutes of a competitive duel $r = 0,534$ ($p < 0,01$), on the 5th minute of the match $r = 0,594$ ($p < 0,01$)) the level of physical fitness of the athletes. Level of functional condition of an athlete's body by the HR index has a correlation with a medium power between the activity level from the 2nd till the 4th minutes of a competitive duel $r = 0,513$ ($p < 0,01$) and in the end of fight $r = 0,585$ ($p < 0,01$).

The levels of the psychophysiological condition by the indicators of the latency periods of the simple visual and motor reaction, the latency period of the complex visual and motor reaction, the functional mobility of the nervous process and the strength of the nervous process have an influence on the reliability of the performing throwings and the activity of athletes at the beginning of the competitive match. With the activity of fighters at the end of the fight is most closely interconnected the strength of the nervous process in the competitive day ($r = 0,581$ ($p < 0,01$)).

Conflicts of interest – If the authors have any conflicts of interest to declare.

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