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The relationship of psychophysiological characteristics karate qualifications in light weight category with the effective implementation of kick leg techniques in upper level of the opponent

Abstract. Purpose: set the density of the relationship of psycho-physiological characteristics of karate qualifications in light weight category with the efficiency of the implementation of kick leg techniques in the upper level of the opponent. **Material and Methods:** The study involved thirty highly skilled karatekas in light weight category. Conducted pedagogical and psychophysiological testing, carried out an analysis of competitive actions, carried out a special analysis of scientific and methodical literature, applied the methods of mathematical statistics. **Results:** The degree of correlation between the obtained numerical results of psycho-physiological characteristics and indicators of the effectiveness different types of gradient kicking karate qualifications in light weight category in upper level of the opponent. **Conclusions:** karatekas of high qualifications in light weight category, the higher the strength of neural processes in the processing of information in the imposed rhythm, the more reliable in a competitive match under implementation methods kick leg them with maximum power and speed-up in upper level of the opponent, and at the higher they characteristic of functional mobility of nervous processes in the processing of information in the imposed rhythm, the greater the likelihood of fighters attacking moves fast.

Keywords: Karate, Kyokushinkai, characteristics, psychophysiology, kick, efficiency.

Introduction. Various impact techniques apply in the majority of sports views of karate according to rules of competitions in wrestles by fighters. Its performance influences the efficiency a number of factors which are connected with genetic and physiologic characteristics of a karateka, his physical and psychological preparedness for a concrete fight, a conceived tactical plan and so forth. Specificity of the competitive activity of the chosen type of karate forms a technical arsenal of a power or high-speed orientation at a sportsman. The objective of this research is a type of kyokushinkai karate which personifies competitive fights with techniques which are carried out with the maximum force for the achievement of knock-out effect. However, near power characteristics of karatekas, high-speed carrying out of impact techniques in a fight by the rules of kyokushinkai karate has also the importance for the achievement of a victory. Especially actual it is for karatekas of high qualification of easy weight category where rivals have approximately equal indicators of versatile preparedness, but have no such muscular to a corset as a heavyweight. Therefore, despite of that power kicks have to be priority, their performance has to be carried out with acceleration. The definition of psychophysiological characteristics which influence the speed of performance of concrete impact techniques of karatekas, can promote the increase of efficiency of their general technical realization in a responsible fight.

Oriental martial arts and improving systems took root into the process of physical training and sports activity of modern youth densely [16; 18]. The confirmation of a positive effect concerning the improvement of psychological and psychophysiological characteristics from a regular visit of such training classes by students is directed in works [2; 7; 15]. Problems of diagnosing and correction of similar characteristics at sportsmen of high qualification of different specialization are opened by scientists in sources [1; 4; 8; 19]. In turn, the fundamental subsoil of rather psychophysiological preparation of a wrestler [3] includes only the general bases without specifics of the chosen type of single combats and the regulated rules of competitive fights. Specialists in karate provide [10; 17; 20] data on optimization of the training process and the achievement of a victory in fights on karate. However to the analysis of psychophysiological characteristics of karatekas is still not paid attention. In the previous works we studied separate psychological and psychophysiological characteristics of sportsmen who specialize on kyokushinkai karate [10–14]. In this research the definition of interrelation of psychophysiological characteristics of karatekas of high qualification of easy weight category with the efficiency of realization of impact techniques by a foot is carried out to the top level of an opponent.

The objective of the research: to establish the density of interrelation of psychophysiological characteristics of karatekas of high qualification of easy weight category with the efficiency of realization of impact techniques

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by a foot to the top level of an opponent.

The tasks of the research:

1. To investigate a complex of psychophysiological characteristics of karatekas of high qualification of easy weight category.
2. To record indicators to a gradient of the efficiency of different types of a kick of karatekas of high qualification of easy weight category to the top level of an opponent.
3. To carry out statistical processing and to define an extent of correlation communication between the received numerical results of psychophysiological characteristics and indicators to a gradient of the efficiency of different types of a kick of karatekas of high qualification of easy weight category to the top level of an opponent.

Material and methods of the research: pedagogical supervision and analysis of the competitive activity, analysis of data of special, scientifically methodical literature and Internet, methods of mathematical statistics.

30 sportsmen were selected by the qualification of the Master of Sports of Ukraine and the Master of Sports of Ukraine of the international class on karate of easy weight category – to 70 kilograms for the performance of the put tasks. The age of karatekas made from 25 to 33 years old, and the duration of an experience of classes of kyokushinkai karate fluctuated from twelve to twenty years.

The research of highly skilled karatekas was conducted in August, 2014 in Kiev. The definition of results was carried out during a preparatory sports-training camp to the IV weight World Cup of kyokushinkai karate in Durban of the South African republic. Thus, sports preparedness of the tested karatekas was at the highest level.

At the beginning of research karatekas were offered to execute special control tests which recorded their psychophysiological characteristics with the maximum concentration. The testing was held with the use of computer system “Diagnost-1” which is the author’s development of M. V. Makarenko and B. C. Lizogub [5; 6]. The testing was held by the following modes of diagnostics: the sensomotor – the latent period of a simple visually-motor reaction (LP SVMR, ms), the latent period of reaction of a choice of one signal from three (LP RC1-3, ms), the latent period of reaction of a choice of two signals from three (LP RC2-3, ms); the functional mobility of nervous processes when processing information in feedback (FMNP, s), the force of nervous processes when processing information in feedback (FNP, quantity of signals); the functional mobility of nervous processes when processing information in the imposed rhythm (FMNP, sign./min), the force of nervous processes when processing information in the imposed rhythm (% FNP).

Except psychophysiological characteristics, in these research indicators of a gradient of efficiency of a kick (GEB) and its components were defined (force of kick and speed of reaction in a kick on a sound irritant) at karatekas of easy weight category. By means of modern electronic device “Spuderg” and techniques of hronodynamometry [9] it is possible to exercise control of various characteristics of the method of impact techniques of martial artists. For the establishment of GEB of karatekas and its components such types of kicks of a foot to the top level were selected (jap. “jodan”) of an opponent that allowed by rules at sports competitions of kyokushinkai karate: a kick by a direct forward foot (jap. “ oi maye geri “), a kick by a direct hind foot (jap. “ gyaku maye geri “), a kick by a forward foot sideways (jap. “ oi mavashi geri “), a kick by a hind foot sideways (jap. “ gyaku mavashi geri “), a kick by a forward foot from the outside (jap. “ oi kake geri “), a kick by a hind foot from the outside (jap “ gyaku kake geri “), a circular kick by a left foot from a turn (jap. “ hidari ushiro mavashi geri “), a circular kick by a right foot from a turn (jap. “ migi ushiro mavashi geri “).

Processing of the received results was carried out by means of methods of mathematical statistics with the calculation of the determination of reliability of divergences by the t-criterion of Student and by the coefficient of correlation of Brave-Pirson.

Results of the research and their discussion. The complex of psychophysiological characteristics was investigated, after that the indicators to a gradient of efficiency of different types of a kick to the top level of an opponent were defined at the beginning of testing in the group of karatekas of high qualification of easy weight category. All received numerical indicators were processed statistically and the degree of the correlation communication was established between them.

So, the high degree of interrelation (critical value 0,45 for $p < 0,01$) is recorded between the psychophysiological characteristic of FMNP when processing information in the imposed rhythm and a mark of time of reaction in a kick on a sound irritant of all studied types of kicks to the top level of an opponent: a kick by a direct forward

foot (jap. « oi maye geri ") – $r = -0,46$, a kick by a direct hind foot (jap. " gyaku maye geri ") – $r = -0,45$, a kick by a forward foot sideways (jap. " oi mavashi geri ") – $r = -0,49$, a kick by a hind foot sideways (jap. " gyaku mavashi geri ") – $r = -0,49$, a kick by a forward foot from the outside (jap. " oi kake geri ") – $r = -0,48$, a kick by a hind leg from the outside (jap. " gyaku kake geri ") – $r = -0,48$, a circular kick by the a foot from a turn (jap. " hidari ushiro mavashi geri ") – $r = -0,46$, a circular kick by a right foot from a turn (jap. " migi ushiro mavashi geri ") – $r = -0,45$. From such absolute results of the correlation research it is possible to draw a conclusion that characteristics of reaction in a kick on a sound irritant and FMNP in the imposed rhythm beat off an essence of a competitive fight of kyokushinkai karate and allow approving the following: if a karateka has a high level of an indicator of FMNP, then and he has abilities on the realization of fast attacking actions in a competitive fight.

An average degree of interrelation (critical value 0,35 for $p < 0,05$) was recorded between the psychophysiological characteristic of FNP when processing information in the imposed rhythm and an indicator of GEB of all studied types of kicks to the top level of an opponent, namely: a kick by a direct forward foot (jap. « oi maye geri ") – $r = 0,39$, a kick by a direct hind foot (jap. " gyaku maye geri ") – $r = 0,37$, a kick by a forward foot sideways (jap. " oi mavashi geri ") – $r = 0,38$, a kick by a hind foot sideways (jap. " gyaku mavashi geri ") – $r = 0,41$, a kick by a forward foot from the outside (jap. " oi kake geri ") – $r = 0,39$, a kick by a hind foot from the outside (jap. " gyaku kake geri ") – $r = 0,36$, a circular kick by a left foot from a turn (jap. " hidari ushiro mavashi geri ") – $r = 0,39$, a circular kick by a right foot from a turn (jap. " migi ushiro mavashi geri ") – $r = 0,39$. The received results prove that the karateka who has high characteristics of FNP when processing information in the imposed rhythm, can carry out the method of impact techniques with the maximum force and acceleration in a competitive fight, that is the efficiency of its realization will be reliable.

The resistant degree of interrelation is noted between the psychophysiological characteristic of FNP when processing information in the imposed rhythm and a mark of time of reaction in a kick by a direct forward foot (jap. "oi maye geri") on a sound irritant to the top level of an opponent – $r = 0,35$. In a competitive situation without a fast performance of this kick it is impossible to achieve the objectives which can even exceed own growth of the karateka therefore the recorded indicator is reasonable.

The definition of a high degree of interrelation between the psychophysiological characteristic of FMNP when processing information in the imposed rhythm and force to a kick by a forward foot sideways (jap. " oi mavashi geri ") – $r = -0,54$ and force of a kick by a hind leg sideways (jap. gyaku mavashi geri.) – $r = -0,47$ is explained by that when carrying out this kick without appropriate power component it is possible to execute a biting action by a foot without knock-out effect. Apparently, on value of an index of correlation, a kick by a forward foot demands from the karateka a bigger manifestation of force.

The lack of correlation communications of impact indicators of karatekas with characteristics of the sensomotor (simple visually-motor reaction), FMNP and FNP in feedback can explain with the essence maintaining a competitive fight which includes a quick-change situation and an unpredictable rhythm in the movements of both opponents and similar to the imposed rhythm.

Proceeding from the conducted researches, it is certain a degree of the correlation communication between the received numerical results of psychophysiological characteristics and indicators to a gradient of the efficiency of different types of a kick of karatekas of high qualification of easy weight category to the top level of the opponent. Basing on the obtained data, coaches of kyokushinkai karate have an opportunity to pick up to the karateka an optimum technical arsenal on a responsible competitive fight. In the preparatory period, being guided on the karatekas given own psychophysiological characteristics can carry out the improvement of the method of separate impact techniques and form the technical and tactical plan for future competitive fights with opponents of a different anthropometry and a level of skill.

Conclusions:

1. It is investigated the complex of psychophysiological characteristics of karatekas of high qualification of easy weight category – the sensomotor, the functional mobility of nervous processes and the force of nervous processes when processing the information in feedback and in the imposed rhythm.

2. The indicators to a gradient of the efficiency of different types of a kick of karatekas of high qualification of easy weight category to the top level of the opponent and his components – forces of a kick and time of reaction by a kick on a sound irritant are recorded.

3. It is certain the degree of correlation communication between the received numerical results of psychophysiological characteristics and the indicators to a gradient of efficiency of different types of a kick of

Correlation matrix of interrelation of psychophysiological characteristics of karatekas of high qualification of easy weight category and indicators to a gradient of efficiency of performance by them of different types of a kick to the top level of the opponent (n=30)

Psychophysiological characteristics	Kick by a direct forward foot («oi maye geri»)			Kick by a direct hind foot («gyaku maye geri»)			Kick by a forward foot sideways («oi mavashi geri»)			Kick by a hind foot sideways («gyaku mavashi geri»)		
	kick force	reaction time in kick	GEB	kick force	reaction time in kick	GEB	kick force	reaction time in kick	GEB	kick force	reaction time in kick	GEB
LP SVMR, ms	0,07	-0,23	0,19	0,00	-0,03	0,11	0,13	0,00	0,22	0,15	-0,01	0,21
LP RC1-3, ms	-0,09	0,23	-0,23	-0,05	-0,19	0,01	0,08	-0,18	0,05	0,04	-0,18	0,03
LP RC2-3, ms	-0,09	0,05	0,06	-0,06	0,04	0,18	-0,04	-0,03	0,24	-0,07	-0,03	0,24
FMNP, s	0,00	-0,15	-0,03	-0,04	-0,25	-0,08	-0,28	-0,23	-0,28	-0,31	-0,24	-0,28
FNP, quantity of signals	-0,32	-0,19	-0,21	0,20	0,02	-0,09	0,06	-0,15	-0,07	0,04	-0,15	-0,12
FMNP, sign./min	-0,02	-0,46**	-0,21	0,09	-0,45**	0,27	-0,54**	-0,49**	-0,09	-0,47**	-0,49**	-0,05
% FNP	-0,06	0,35*	0,39*	0,15	-0,21	0,37*	0,11	-0,20	0,38*	0,15	-0,19	0,41*

Psychophysiological characteristics	Kick by a forward foot from the outside («oi kake geri»)			Kick by a hind foot from the outside («gyaku kake geri»)			Circular kick by a left foot from a turn («hidari ushiro mavashi geri»)			Circular kick by a right foot from a turn («migi ushiro mavashi geri»)		
	kick force	reaction time in kick	GEB	kick force	reaction time in kick	GEB	kick force	reaction time in kick	GEB	kick force	reaction time in kick	GEB
LP SVMR, ms	-0,06	-0,01	0,03	-0,01	-0,01	0,04	0,27	-0,03	0,21	0,25	-0,03	0,20
LP RC1-3, ms	0,09	-0,18	0,03	0,09	-0,17	0,02	-0,02	-0,19	0,01	-0,01	-0,18	0,01
LP RC2-3, ms	0,09	-0,04	0,25	0,18	-0,04	0,28	0,17	0,04	0,27	0,17	0,04	0,28
FMNP, s	-0,09	-0,23	-0,17	-0,21	-0,24	-0,23	0,24	-0,25	0,04	0,22	-0,25	0,02
FNP, quantity of signals	-0,15	-0,14	-0,18	-0,28	-0,15	-0,24	-0,26	0,02	-0,29	-0,24	0,01	-0,27
FMNP, sign./min	-0,06	-0,48**	0,05	-0,02	-0,48**	0,08	0,12	-0,46**	0,23	0,14	-0,45**	0,23
% FNP	-0,08	-0,20	0,39*	-0,22	-0,19	0,36*	0,20	-0,21	0,39*	0,21	-0,20	0,39*

Note. ** – a high degree of interrelation (critical value 0,45 for p<0,01); * – an average degree of interrelation (critical value 0,35 for p<0,05).

karatekas of high qualification of easy weight category to the top level of the opponent.

4. It is established that at karatekas of high qualification of easy weight category, the highest indicators of force of nervous processes are, when processing information in the imposed rhythm, the more reliably in a competitive fight enables the realization of impact techniques by them by a foot with the maximum force and the acceleration to the top level of the opponent is, and the higher the characteristic of the functional mobility of nervous processes is in them when processing information in the imposed rhythm, the bigger reliability of carrying out the fast attacking actions by fighters is.

Prospects of the subsequent researches. The establishment of interrelation of psychophysiological characteristics of karatekas of high qualification with the efficiency of realization of impact techniques by a hand is planned.

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