UDC [796.853.26:796.015.854/616.28-008.14]-055.2

ISSN (English ed. Online) 2311-6374

2021. Vol. 9. No. 4, pp. 56-65

USE OF HIGH-INTENSITY COMPETITIVE EXERCISES AGAINST THE BACKGROUND OF FATIGUE BY AN ELITE KARATEKA WITH HEARING IMPAIRMENTS

Karyna Ianchuk

Oleksandr Tykhorskyi

Oleksandr Volodchenko

Victoria Khudiakova

Kharkiv State Academy of Physical Culture,

Kharkiv, Ukraine

Purpose: to determine the effectiveness of the use of competitive exercises at high speed on the background of fatigue elite karateka with hearing impairments during a four-year cycle.

Materials and methods: the study involved an athlete with hearing impairments, engaged in karate - Deaflympic champion in 2013 and 2017. In the training process, the athlete used high-intensity competitive exercises against the background of fatigue, at the end of the training session. To determine the effectiveness of the program in the study used a number of psychophysiological indicators, such as: work efficiency, mental stability, time of simple reaction to light, reaction to a moving object, tapping test, reaction time of choice, Romberg test, concentration and switching of attention. The number of strikes in different parts of the match was also investigated.

Results: significant improvement of results was observed in the indicator of mental stability ($t=2,02$; $p<0,05$), time of simple reaction to light ($t=2,51$; $p<0,05$), reaction to a moving object ($t=3,79$; $p<0,001$), frequency of movements ($t=3,63$; $p<0,001$), choice reaction time ($t=2,08$; $p<0,05$), Romberg's test ($t=6,96$; $p<0,001$),

switching attention according to the Bourdon's test ($t=2,40$; $p<0,05$). No statistically significant differences were found in the indicator of concentration of attention and efficiency of work on Schulte's tables ($p>0,05$).

Conclusions: there was an improvement in the performance of the athlete when performing offensive actions during the second and third 40 seconds of the fight. This indicates the development of special endurance and increased efficiency against the background of fatigue. The obtained results are confirmed by the improvement of psychophysiological indicators that affect sports performance in karate. The expediency of using competitive exercises against the background of fatigue and their influence on the psychophysiological parameters of the Deaflympic karate champion is proved.

Keywords: karate, psychophysiological indicators, attacking actions, elite female athletes, karate athletes with hearing impairments.

Introduction

Developing training programs for athletes with hearing impairments, one should take into account psychophysiological indicators, the ability to adapt in the social sphere, the ability to cooperate with others [4, 8]. According to scientists, some parameters characterizing physical performance in athletes with hearing impairments are two times lower than in healthy athletes, despite the fact that physical performance correlates with the body's adaptation to performing work at given parameters of speed, duration of work. [2, 9, 12].

The actual psychophysiological indicators in karate are those that are associated with physical properties that are manifested by athletes during a fight and training activity [10, 11]. Motor qualities are closely related to the peculiarities of the human nervous system: strength-weakness, mobility-inertia, balance-imbalance of nervous processes [3]. Each movable quality is provided by several typological features of the nervous system. Also, the rate of onset of fatigue of female athletes during training sessions and competitions depends on the psychophysiological characteristics [5, 6].

It is known that athletes in karate in particular and in martial arts in general, getting tired during the fight, worse maintain balance and fighting stance, the accuracy of striking decreases [7]. This, of course, negatively affects both the conduct of attacking actions and defensive actions. Athletes who better resist fatigue during exercise have an advantage at the end of bouts. Under the influence of training against the background of fatigue, there is an improvement in the support systems for static and dynamic balance during the fight.

Combat athletes with hearing impairments lag behind their healthy colleagues in the development of speed-strenght qualities and accuracy of motor actions fulfillment. Athletes with hearing impairments get tired faster when doing physical exercises [1]. When building training programs for athletes with hearing impairments, individual psychophysiological characteristics, functional characteristics and personal characteristics should be taken into account [13].

When analyzing the scientific and methodological literature, we did not reveal studies of the influence of psychophysiological indicators of athletes with hearing impairments on their competitive performance.

Purpose of study - to determine the effectiveness of the use of competitive exercises at a high speed on the background of fatigue elite female karate with impaired hearing for the four-year cycle.

Material and Methods of research

The study involved an female athlete with a hearing impairment, is engaged in karate - deflympic champion 2013 and 2017. The study was carried out during a four-year cycle of preparation for the 2017 Deaflympics. In the training process, the athlete used high-intensity competitive exercises against the background of fatigue at the end of the training session. The karateka used exercises using the equipment used in karate (exercises with pears and makiwara, wall cushion, practicing punches with a partner).

The study used a number of psychophysiological indicators, namely: work efficiency, mental stability, simple reaction time to light, reaction to a moving object, tapping test, choice reaction time, Romberg's test, concentration and

attention switching. The number of strikes delivered in different parts of the duel was also investigated.

Results of the research

When constructing a four-year cycle of training female athletes for the Deaflympics, its individual indicators were taken into account.

Trainings using speed training against a background of fatigue traditionally consist of three parts - preparatory, main and final. The athlete used means that are generally accepted in karate: practicing the technique of punches and kicks in the upper sector (Chudan), working out blocks and defensive actions, sparring with partners, exercises for developing endurance and stretching exercises (Table 1).

Table 1

Content of the training session for the development of speed qualities against the background of fatigue

Part of the lesson	Training tools	Time, min
Preparatory	Greeting Warm-up	15
Main	A set of exercises for the development of special endurance A set of exercises for stretching muscles Practice of kicking and punching techniques in the Chudan sector Practice of blocks and protective actions Sparring with partners *Work on bags and makivari with the maximum speed*	10 10 15 15 15 10
Final	Exercises to restore breathing Exercises to relax muscles	3 5
In general, the time of training		98

At the end of the session, the training session included exercises to develop speed against the background of fatigue. The work was carried out on bags and makiwara at the highest possible speed and with the minimum rest time between series. Only technically well-developed exercises and series of exercises were used. The predominant orientation of the work at the end of the lesson was carried out in the range from a mixed zone of aerobic-anaerobic (heart rate - 175-185 beats / min) to anaerobic glycolytic (heart rate - 200 beats / min). Similar exercises were carried out in shock microcycles in the preparatory and competitive periods of training and constituted a large share of all training sessions.

To analyze the changes in the psychophysiological indicators of an elite female athlet with hearing impairments during a four-year cycle, we compared them at the beginning and at the end of training. Each of the indicators has been tested 24 times. The days of the recovery microcycle were selected for testing, when the athlete was in optimal shape and was not tired. A total of 10 indicators were analyzed. The data obtained are presented in Table 2.

Table 2

Comparison of psychophysiological indicators of the Deaflympic champion in karate at the beginning and at the end of a four-year cycle

Indicator	Indicators of an elite female athlete with hearing impairment at the beginning of the study (n=24)			Indicators of an elite female athlete with hearing impairment at the end of the study (n=24)			t	p
	$\overline{X_1}$	±	σ_1	$\overline{X_2}$	±	σ_2		
Efficiency of work on the Schulte test, c.u.	65,0	±	1,6	64,1	±	0,9	1,47	>0,05
Mental stability according to the Schulte test, c.u.	1,00	±	0,05	0,96	±	0,04	2,17	<0,05
Time of simple reaction to light, s	0,28	±	0,01	0,26	±	0,03	2,51	<0,05
Reaction to a moving object, s	0,51	±	0,03	0,49	±	0,02	3,79	<0,001
Tapping test, frequency of movements c.u.	4,88	±	0,19	5,03	±	0,12	3,63	<0,001
Selection response time, s	1,17	±	0,10	1,12	±	0,08	2,21	<0,05
Romberg test, s	10,2	±	0,86	12,2	±	1,09	6,96	<0,001
Concentration of attention according to the Bourdon test, c.u.	241,9	±	8,7	244,9	±	5,56	1,46	>0,05
Switching attention according to the Bourdon test, c.u.	32,5	±	1,7	31,4	±	1,5	2,40	<0,05

A significant improvement in the results was observed in terms of mental stability ($t = 2,17$; $p < 0,05$), time of a simple reaction to light ($t = 2,51$; $p < 0,05$), reaction to a moving object ($t=3,79$; $p<0,001$), frequency of movements ($t=3,63$; $p<0,001$), response time of choice ($t=2,21$; $p<0,05$), Romberg's test ($t=6,96$; $p<0,001$), switching attention with the Bourdon test ($t=2,40$; $p<0,05$). There were

no statistically significant differences in the indicator of concentration of attention and work efficiency on the Schulte tables (p>0,05).

To determine the effectiveness of the work of the hearing impaired karate women in different parts of the bout, the number of attacking actions during the first, second and last 40 s of the bout was investigated. The data are presented in Table 3.

Table 3

Indicators of the number of strikes delivered at the beginning, in the middle and at the end of the fight (n fights = 14) at the beginning of the study

Part of the fight	Number of attacking actions			t; p
	$\overline{X}$	±	σ	
First 40 seconds	6,29	±	0,66	$t_{I-II} = 3,71$; p<0,001
Second 40 s	5,33	±	0,71	$t_{II-III} = 6,91$; p<0,001
Third 40 s	3,53	±	0,65	t_{I-III} =11,04; p<0,001

Thus, there is a statistically significant decrease in the number of strikes in the middle and at the end of the fight, caused by the athlete's fatigue. During the first 40 seconds the athlete showed the result of 6,29 ± 0,66 attacking actions, during the second 40 seconds – 5,33±0,71 attacking actions ($t_{I-II} = 3,71$; p<0,001).

To study the influence of the author's methodology on the sports performance of athletes with hearing impairments, there was a comparatively number of strikes delivered at the beginning and at the end of the study in different parts of the fight (Table 4).

Table 4

Indicators of the number of strikes delivered at the beginning, in the middle and at the end of the fight (n fights = 14) at the end of the study

Part of the fight	The number of attacking actions at the beginning of the study			The number of attacking actions at the enf of the study			t	p
	$\overline{X}$	±	σ	$\overline{X}$	±	σ		
First 40 seconds	6,29	±	0,66	6,71	±	1,24	1,10	>0,05
Second 40 s	5,33	±	0,71	6,16	±	1,02	3,61	<0,01
Third 40 s	3,53	±	0,65	5,69	±	1,72	4,38	<0,001

Thus, statistically significant differences were found in the middle of the fight, during the second 40 s ($t=3,61$; $p<0,01$) and at the end of the fight, during the third 40 s ($t=4,38$; $p<0,001$).

Conclusions / Discussion

During the four-year cycle, progress was found in most indicators of the psychophysiological state of the female athlete with hearing impairments. These indicators have a direct impact on training and competitive activity in karate. The improvement of psychophysiological indicators indicates an increase in the level of the sports form of an elite female athlete and shows that at the end of the four-year cycle she was in an optimal psychological and physiological state.

The results obtained make it possible to expand knowledge on the preparation of athletes with hearing impairments for high-level competitions. The expediency of using competitive exercises against the background of fatigue and their influence on the psychophysiological indicators of the Deaflympic Karate Champion has been proved.

An improvement in the effectiveness of athletes was revealed when performing attacking actions during the second and third 40 s of the fight. This indicates the development of special endurance and increased efficiency against the background of fatigue. The results obtained are confirmed by the improvement of psychophysiological indicators affecting sports performance in karate (mental stability, time of a simple reaction to light, reaction to a moving object, frequency of movements, reaction time of choice, Romberg's test, switching attention with the Bourdon test).

Prospects for further research are to determine the correlation relationship between psychophysiological indicators and indicators of the speed of striking in karate.

Conflict of interests. The authors declare that no conflict of interest.

Financing sources. This article didn’t get the financial support from the state, public or commercial organization.

References

1. Mishin, M., Petrenko, I., Kiyko, A. (2020), "Optimization of the process of physical training of 10-11-year-old hearing-impaired athletes engaged in jiu-jitsu", Slobozhansky scientific and sports herald, №4 (78), pp. 17-23, doi: 10.15391 / snsv.2020-4.003 (in Ukr.).

2. Tykhorskyi, O. (2016), "Peculiarities of building the training process of highly qualified bodybuilders in the competitive period of training", Pedagogy, psychology and medical and biological problems of physical education and sports, №6, pp. 26-34 (in Ukr.).

3. Shestak, Yu., Mulyk, V., Okun, D. (2020), "The impact of the use of special exercises on the psychophysiological parameters of young boxers 15-16 years", Slobozhansky scientific and sports herald, № 6 (80), pp. 46-51, doi: 10.15391 / snsv.2020-6.007 (in Ukr.).

4. Ianchuk, K., Tykhorskyi, O., Piven, O. (2021), "Morpho-functional features of karate girls with hearing impairments", Collection of scientific works SCIENTIA. URL: https://ojs.ukrlogos.in.ua/index.php/scientia/article/view/13608 (in Ukr.).

5. Ianchuk, K., Tykhorskyi, O., Petrenko, I. (2020), "Analysis of percussion techniques of highly qualified karatekas with hearing impairments", Slobozhansky Scientific and Sports herald, № 2 (76), pp. 91-103, doi: 10.15391 / snsv.2020-2.006 (in Ukr.).

6. Güler, M. (2017), «The Evaluation of balance performance for elite male karate athletes after fatigue», International Journal of Sport Exercise and Training Sciences-IJSETS, T. 3., №. 4, pp. 161-168. (in Eng.).

7. Hadad, A. (2020), «Postural control in karate practitioners: Does practice make perfect?», Gait & posture, №77, pp. 218-224. (in Eng.).

8. Herrera-Valenzuela, T. (2019), «Physiological responses of elite karate athletes during simulated competition», Ido Movement for Culture. Journal of Martial Arts Anthropology, №. 4, pp. 45-50. (in Eng.).

9. Koropanovski, N. (2011), «Anthropometric and physical performance profiles of elite karate kumite and kata competitors», Journal of human kinetics, №.30, pp.

107-121. (in Eng.).
10. Piepiora, P., Kazimierz, W., Piepiora, Z. (2018), «Personality profiles of karate masters practising different kumite styles», Archives of Budo, №14, pp. 87-101. (in Eng.).
11. Sánchez-Puccini, M. (2014), «Anthropometric and physical fitness characterization of male elite karate athletes», Int. J. Morphol, №. 3. C. 1026-1031. (in Eng.).
12. Urbinati K. (2017), «Physiological and biomechanical fatigue responses in Karate: A case study», The Open Sports Sciences Journal, №. 1, pp. 10-22. (in Eng.).
13. Vuljanić A., Tišma D., Miholić S. J (2017), «Sports-Anamnesis Profile of Deaf Elite Athletes in Croatia», 8th International Scientific Conference on Kinesiology, the University of Zagreb, pp. 102-112. (in Eng.).

Received: 03.08.2021.
Published: 31.08.2021.

Information about the Authors

Karyna Ianchuk: graduate student; Kharkiv state Academy of Physikal Culture: Klochkivska str. 99, Kharkiv, 61058, Ukraine.
ORCID: https://orcid.org/0000-0002-3481-346X
E-mail: karina.yanchuk@gmail.com

Oleksandr Tykhorskyi: PhD (Physical Education and Sport); Kharkiv state Academy of Physikal Culture: Klochkivska str. 99, Kharkiv, 61058, Ukraine.
ORCID: https://orcid.org/0000-0003-1779-0849
E-mail: tihorskiialeks@gmail.com

Oleksandr Volodchenko: PhD (Physical Education and Sport); Kharkiv state Academy of Physikal Culture: Klochkivska str. 99, Kharkiv, 61058, Ukraine.
ORCID: https://orcid.org/0000-0002-1189-3524
E-mail: kh_alex.kick@ukr.net

Victoria Khudiakova: PhD (Physical Education and Sport); Kharkiv state Academy of Physikal Culture: Klochkivska str. 99, Kharkiv, 61058, Ukraine.
ORCID: https://orcid.org/0000-0003-1376-6761
E-mail: vitochka2004@hotmail.com