

**CORRELATION ANALYSIS OF INDICATORS OF PHYSICAL AND TECHNICAL PREPAREDNESS
KARATE SCHOOL AGE**

Sklyar M. S.

Luhansk Taras Shevchenko National University;

Annotation. *Purpose:* identification of basic indicators of physical qualities at karate school age. *Material:* in the experiment involved 30 students, ages 16-18 years, with experience training Shotokan Karate 10 years. *Results:* the density of the relationship of indicators of physical and technical preparedness of the students of the senior classes of secondary school, with long experience of employment Shotokan Karate. Results identified training standards regulated program of physical culture for secondary schools (grades 10-11) and technical characteristics often performed percussion techniques in competitive fights in Shotokan Karate using techniques and specialized shock chronodynamometry ergometer. Correlation analysis revealed that the greatest influence on the formation of shock art of karate techniques at this age is the level of development of high-speed capacity, endurance, strength, complex muscle groups and mobility in the hip joint. *Conclusions:* the landmark data indicators positively affects the formation of karate techniques.

Keywords: students, karate, shotokan, blow, relationship.

Introduction

Consideration of regularities of organism's natural development as per generalization [11], permits to selectively and purposefully influence on pupils by means of physical education for the pupils' physical perfection, their optimal physical progressing and readiness for different kinds of life functioning. In senior forms of comprehensive schools all arsenal of physical education means is used, which is enriched, in comparison with secondary school age, with exercises from different kinds of sports and systems of physical functioning. The process of formation and development of general skills and habits, in opinion of [4], is connected with process of formation and development of educational activity, which is realized during regulated by state academic program for physical culture lessons. Additionally extra-curriculum forms of classes are organized and the main of them are sport circles, facilitating increasing of senior schoolchildren's motion functioning and more effectively form their special skills and habits, which could be used both in everyday life and in further labor, military and sport functioning.

In our opinion special skills and habits, which are formed for pupils' physical perfection and their personal safety are the most important. Realization of these skills' development is promoted by different systems of self-defense and martial arts. At modern stage of society's development different styles of karate, practiced for many years in oriental countries also among children, have become especially popular.

Though program of karate trainings in circles for senior pupils has rather substantial peculiarities concerning dozing of training loads, application of methodic approaches and techniques, education of moral-will qualities and psychological stability, selecting of technical arsenal and so on. That is why for organization of safety by content and effective by structure trainings in karate circles there is an urgent demand in scientific researches, which would be devoted to determination of indicators of main indicators of physical and technical fitness that can expand the existing works for the given age period and facilitate working out of necessary methodic recommendations.

A number of up-to-date scientific works are devoted to optimal physical development, motion functioning and motivation for physical culture trainings [4, 11, 14, 15]. The founders of shotokan karate [12] show positive influence of this mental and physical perfection system's trainings. Researchers [6, 10] determined indicators of interconnections of technical and power fitness of highly qualified karatekas. But researches of school age contingent in this aspect have not been conducted. That is why we offered correlation analysis of physical and technical fitness's indicators of senior school age karatekas.

The work has been fulfilled in compliance with combined plan of scientific-research work of Ministry of education and science, youth and sports of Ukraine for 2010-2014; topic "Theoretical-methodic principles of pupils' physical culture and health culture trainings (subjects of education, who are in normal state and disabled ones)" (state registration number 0110U000394).

Purpose, tasks of the work, material and methods

The purpose of the research is determination of main indicators of physical qualities of senior school age karatekas, which positively influence on formation of techniques.

The tasks of the research: 1. Studying of quantitative indicators of physical and technical fitness of comprehensive schools' senior pupils, who train karate for long time. 2. Poly-dynamometry. 5. Carrying out of correlation analysis of physical and technical fitness of senior-forms' karatekas.

The methods of the research: 1. Theoretical analysis and generalization of scientific-methodic literature's data. 2. Pedagogic control tests. 3. Goniometry. 4. Poly-dynamometry. 5. Chrono-dynamometry. 6. Methods of mathematic statistics.

The group of the tested included 30 schoolboys of senior forms, who train karate for 10 year and had 1st sport grade and were members of shotokan karate junior combined team of Luganska region. Selection of such contingent for our research and comparing of results are conditioned by the fact that martial art and karate in particular are commended by different founders [9, 13, 15] for trainings since pre-school age and in 16-18 years old age teenagers have substantial experience: from 10 to 15 years of targeted trainings. Testing procedure was carried out at training camp of Ochakov (Nikolayevskaya region) during trainings before important competitions.

Results of the researches

As it is known traditional acquiring of knowledge, formation of schoolchildren's skills and habits takes place in comprehensive educational establishments during school lessons. In its turn development of rising generation's physical qualities is carried out at lessons of physical culture and level of their formation is determined by academic standards, worked out by profile ministry for specified age period of schoolchildren. That is why, for analysis of the acquired level of physical fitness and conducting of researches, devoted to influence of certain physical qualities on formation of senior pupils' special skills and habits at systemic karate trainings, we selected control normative from physical culture program for comprehensive educational establishments (10 – 11 form) acting from 2010 [8] – 30 meters run from high start, pressing ups in lying position, raising of torso in sitting position for 60 seconds, long jump from the spot, throw of small ball for distance, 30 seconds of skipping with skip rope, 1500 meters run, forward bend in sitting position. The mentioned pedagogic tests were supplemented by studying of characteristic of side and cross splits with the help of goniometry methods and studying of fourteen muscles' groups of senior pupils with the help of poly dynamometry, which, as per conclusions [1, 7, 12] are rather informative with specialization in different kinds of sports. Martial arts and karate are not exclusions.

In their turn, special means of karate are exercises, permitting to master technique, which in any kind of motion functioning is of the first importance, as far as just variety of special motion skills accelerates mastering of complex motion habits. Main technical elements of karate are stance, travelling, defensive actions, attacking actions with leg or arm as well as combinations of the mentioned elements, their fulfillment in different modes and time intervals, and so on. As per rules of shotokan karate competitions [5], which in our research is recommended for systemic application by comprehensive schools' pupils, i.e. sport duel, called in Japanese – "kumite", in the process of which both partners on site can use their technical arsenal, permitting to prove preference within certain period of time. Technical arsenal shall be realized with control of punches and kicks, i.e. without knockout of adversary. That is why for victory effective realization of techniques is the most important.

Preliminary analysis of duels, conducted by rules of competitions in shotokan karate on national and international levels showed the following most frequent technical blows: straight punch with front arm in upper level (Japanese - :Jodan oi tauki"), straight punch with rear arm in upper level ("jodan giaku tsuki"), straight punch with rear arm in middle level ("chudan giaku tsuki"), straight kick with rear leg in middle level ("chudan giaku maye geri"), side kick with rear leg in middle level ("chudan oi mavashi geri"), front leg kick from outside in upper level ("jodan oi uromavashi geri"), rear leg kick from outside in upper level (jodan giaku uromavashi geri"). Rules of competitions in shotokan karate prohibit kicks with maximal strength that is why it is necessary to consider complex of technical actions' characteristics, which reflect their effectiveness. Owing to specialized ergometer "Spuderg", created by professor M.P. Savchin (Lvov) [10] and chrono-dynamometry methodic it is possible to control change of karatekas' technical characteristics and correct them in the course of training process. This methodic was tested in boxing, kickboxing, Thai boxing and different karate systems [2, 3, 11, 16].

Methodic of determination of blow effectiveness gradient (BEG) and its components (strength of blow and quickness of response to sound irritator) stipulated ten maximally quick single blows in dynamometric bag [10]. For fulfillment of blow karateka chose objectively convenient distance to dynamometric bag, which was hold by assistant; by sound signal karateka fulfilled certain blow at maximal speed. The best result from the of such blows was entered in report. To avoid worsening of indicator and for further maintaining of workability and general testing conditions every karateka had rest after ten blows and blows were fulfilled by other karateka.

With the help of correlation coefficient of Brave-Pirson we determined the degree of interconnection between specified results of physical fitness by academic standards and tests' results of senior pupils-karatekas.

Results of tests:

In process of testing we registered indicators of physical fitness, strength of blow and quickness of response to sound irritator by blow, gradient of effectiveness of the most frequently used in shotokan karate of single punches and kicks (the tested – senior pupils of comprehensive schools with rich experience in karate. Value of correlation coefficient of physical fitness and BEG (in case of punches, fulfilled by senior pupils with 10 years experience in karate) are presented in table 1.

For example, high level of interconnection $r = 0.49$ (with $p < 0.01$) was observed between total indicator of fourteen muscles groups' indicator of senior school age karatekas and gradient of blow effectiveness of front punch in upper level. In spite of first turn purpose of quickness punch's fulfillment by rules of shotokan karate, close degree of interconnection between muscular strength of 16-18 years old karatekas and BEG proves importance of strength component in blow.

High value of correlation coefficient (with $p < 0.01$) was registered between results of senior pupils with 10 years experience in karate in 30 meters run from high start and response time, in case of rear punch in upper level ($r = 0.54$) and middle ($r = 0.53$) level. It is explained by quick start of action with punch and short distance run.

Middle level of interconnection (with $p < 0.05$) was determined between BEG indicators of rear punches in upper level ($r = 0.36$) and middle level ($r = 0.40$) and side split. Closeness of interconnection between punch indicators and side splits is explained by the fact that these punches are fulfilled in battle stance for straight punch of rear arm.

The presence of some correlation values with sign (-) is in direct proportion because improvement of results in running is accompanied by reducing of time quantitative indicators. That is why we registered average degree of interconnection's closeness (with $p < 0.05$) between results of even 1500 meters run and series of punch characteristics in upper and middle levels, that prove significance of acquiring of certain reserve of general endurance with realization of technical tactic actions.

Between indicators of pressing ups in lying positions and BEG components (in case of front arm punch in upper level – strength of punch and time of punch response to sound irritator (-0.36 and -0.50 accordingly) we registered steady interconnection, though with reverse correlation, which reflects sign (-). Analogous negative correlation (-0,38) we registered also between characteristic BEG and results of even 1500 meters run. It was conditioned by significance of general exercises at initial stages of karate trainings, while at more specialized stages they even reduces blow effectiveness.

Interconnection with reverse relation was determined between indicators of pressing ups in lying position and strength of rear arm straight punch in upper and middle levels was (-0.48 and -0.50 accordingly). The same value (-0.37) was registered between results of small ball throw for distance and rear arm straight punch of 16-18 years old karatekas in upper and middle levels.

In researches of interconnection's degree between indicators of kicks in middle level and results of physical fitness of senior school age karatekas we determined the following (see table 2). High correlation coefficient (with $p < 0.01$) between total indicator of strength of 14 muscular groups of senior school age karatekas and BEG in case of front ($r = 0.54$) and rear ($r = 0.59$) kicks from outside and middle interconnection ($r = 0.44$) between strength of muscular groups and BEG of straight rear leg kick. It proves importance of development of muscular groups of senior pupils for effectiveness of not only punches but also kicks.

Mean closeness of interconnection (with $p < 0.05$) was determined between indicators of BEG (straight rear leg kick) and side split ($r = 0.42$). As per bio-mechanics of straight rear kick, the same trajectory is envisaged and involving muscular groups in action like in side split.

Equal interconnection (-0.40) of middle degree (with $p < 0.05$) was registered between indicators of even 1500 meters run and response time to sound signal (response with all tested kinds of kicks in middle level). It reflects demand in karatekas' acquiring optimal level of general endurance in this age.

Interconnection between indicators of kick in upper level (see table 3) was with high degree (with $p < 0.01$); between total indicator of fourteen muscular groups of senior school age karatekas and BEG of front ($r = 0.75$) and rear ($r = 0.74$) side kicks, front ($r = 0.67$) and rear ($r = 0.73$) kicks from outside. It still more stresses planning of significant scope of power trainings for karatekas of this age.

Middle degree of closeness of interconnection was registered (with $p < 0.05$) between results of senior forms' pupils with 10 years karate experience in 30 meters run from high start and strength of side rear leg kick in upper level ($r = -0.32$), as well as between indicators of even 1500 meters run and strength of front leg kick from outside in upper level ($r = -0.36$) that conditions demand in application of running exercises at karate trainings.

With reverse correlation close interconnection was registered between cross split indicators and strength of rear leg side kick in upper level (-0.37). Such definition of coefficient can be explained by significance of acquiring of mobility in spherical joint up to certain level, because further progressing of mobility reduces speed power qualities of the kick.

Conclusions:

1. It was determined that leading factors of formation of senior pupils – karatekas include training means, oriented on formation of quickness, running exercises, which facilitate acquiring proper level of general endurance, development of muscular group complex and mobility in spherical joint. Karatekas of senior school age, who have insufficient flexibility, have also less strong blow, reduced quickness and general effectiveness. In their turn just power exercises from general training, jumps, throws and exercises for proper mobility in joints are required at initial stages of karate trainings.

2. It was found that under influence of regular karate trainings senior forms comprehensive schools' pupils showed increased degree of formation of special skills and habits. It was proved both by tested indicators of effectiveness of most frequently used in shotokan karate techniques' fulfillment and by demand in proper level of physical fitness for realization of technical arsenal.

3. Orientation on determined indicators facilitates more effective organization of karate training process, increases objectiveness of control over training loads, optimization of preparation for competitions and prognostication of further karatekas' progress in this kind of martial art in next age periods.

The prospects of further researches are oriented on analysis of psycho-physiological functions of senior pupils with rich karate experience.

Correlation coefficients of physical fitness and BEG (in case of punches) of senior forms pupils with 10 years experience in karate (n=30)

Control tests	Straight front arm punch in upper level ("Jordan oi tsuki")			Straight rear arm punch in upper level ("Jordan giaku tsuki")			Straight rear arm punch in middle level ("Jordan giaku tsuki")		
	Strength of punch	Time of punch response	BEG	Strength of punch	Time of punch response	BEG	Strength of punch	Time of punch response	BEG
	30 m run from high start	0.11	-0.19	0.24	-0.04	0.54	-0.30	-0.01	0.53
Pressing ups in lying position	-0.36	-0.50	0.02	-0.48	-0.24	-0.25	-0.50	-0.23	-0.26
Chin ups	0.07	-0.11	0.08	-0.21	-0.26	0.05	-0.16	-0.24	0.07
Torso rising in sitting position for 60 seconds	0.17	0.16	0.01	0.14	0.03	0.00	0.03	0.02	-0.08
Long jump from the spot	0.04	-0.14	0.10	-0.01	-0.28	0.20	-0.03	-0.29	0.20
Throws of small ball for distance	0.10	-0.13	0.19	-0.37	-0.21	-0.04	-0.37	-0.17	-0.05
Skipping for 30 seconds	0.16	-0.20	0.22	0.11	-0.14	0.14	0.10	-0.15	0.13
Even 1500 meters run	-0.29	0.34	-0.38	-0.41	-0.43	-0.11	-0.43	-0.41	-0.10
Forward bent from sitting position	-0.29	0.20	-0.14	0.17	0.07	0.17	0.13	0.07	0.12
Side split	-0.19	0.21	-0.10	0.07	-0.24	0.36	0.14	-0.23	0.40
Cross split	0.02	0.17	-0.18	-0.04	-0.18	0.02	0.06	-0.18	0.09
Total strength of 14 muscular groups	-0.08	-0.15	0.49	-0.15	0.07	0.31	-0.14	0.09	0.32

**Quantitative data, colored in red mean high degree of interconnection (critical value 0.46 for $p < 0.01$), yellow - middle (critical value 0.36 for $p < .05$), orange- steady correlation degree with reverse correlation.*

Correlation coefficients of physical fitness and BEG (in case of kicks in middle level) of senior forms pupils with 10 years experience in karate (n=30)

Control tests	Rear leg straight kick (giaku maye geri)			Side front leg kick (oi mavashi geri)			Side rear leg kick (giaku mavashi geri)		
	Strength of punch	Time of punch response	BEG	Strength of punch	Time of punch response	BEG	Strength of punch	Time of punch response	BEG
30 m run from high start	-0.05	0.27	-0.13	-0.03	0.27	-0.10	-0.03	0.26	-0.07
Pressing ups in lying position	0.24	0.09	-0.01	-0.09	0.09	-0.13	-0.09	0.08	-0.11
Chin ups	0.09	0.05	0.03	-0.28	0.05	-0.14	-0.26	0.06	-0.12
Torso rising in sitting position for 60 seconds	-0.11	-0.11	0.01	-0.17	-0.11	-0.03	-0.19	-0.11	-0.07
Long jump from the spot	-0.08	-0.18	0.10	-0.18	-0.18	0.03	-0.18	-0.18	0.01
Throws of small ball for distance	-0.26	0.25	-0.13	0.10	0.25	0.06	0.13	0.25	0.07
Skipping for 30 seconds	0.13	-0.11	0.11	-0.26	-0.11	-0.07	-0.26	-0.13	-0.07
Even 1500 meters run	0.05	-0.40	0.20	0.04	-0.40	0.18	0.05	-0.40	0.15
Forward bent from sitting position	-0.24	-0.05	0.09	-0.18	-0.05	0.10	-0.18	-0.06	0.10
Side split	0.17	-0.27	0.42	-0.12	-0.27	0.25	-0.10	-0.27	0.26
Cross split	0.04	-0.19	0.05	0.29	-0.19	0.13	0.32	-0.18	0.12
Total strength of 14 muscular groups	-0.17	0.12	0.44	0.01	0.12	0.54	0.01	0.13	0.59

Correlation coefficients of physical fitness and BEG (in case of kicks in upper level) of senior forms pupils with 10 years experience in karate (n=30)

Control tests	Front leg side kick (oi mavashi geri)			Side rear leg kick (giaku mavashi geri)			Front leg kick from outside (oi uromavashi geri)			Rear leg kick from outside (giaku uromavashi geri)		
	Strength of punch	Time of punch response	BEG	Strength of punch	Time of punch response	BEG	Strength of punch	Time of punch response	BEG	Strength of punch	Time of punch response	BEG
30 m run from high start	-0.20	0.13	-0.05	-0.32	0.12	-0.10	0.28	0.12	0.20	0.28	0.12	0.19
Pressing ups in lying position	-0.06	0.02	-0.03	-0.08	0.02	-0.06	-0.10	0.02	-0.08	-0.15	0.02	-0.09
Chin ups	0.19	0.07	0.10	0.24	0.08	0.10	-0.24	0.08	-0.17	-0.17	0.08	-0.07
Torso rising in sitting position for 60 seconds	0.14	0.01	0.00	0.20	0.01	0.04	-0.18	0.00	-0.15	0.09	0.00	0.05
Long jump from the spot	0.29	-0.08	0.22	0.34	-0.08	0.24	-0.05	-0.08	-0.01	0.05	-0.08	0.04
Throws of small ball for distance	-0.01	0.24	0.04	0.06	0.26	0.07	0.05	0.26	0.07	0.14	0.26	0.14
Skipping for 30 seconds	-0.13	-0.07	-0.05	-0.12	-0.07	-0.04	0.27	-0.07	0.19	0.28	-0.07	0.15
Even 1500 meters run	0.10	-0.29	0.11	0.16	-0.27	0.11	-0.36	-0.27	-0.19	-0.23	-0.27	-0.09
Forward bent from sitting position	0.15	0.08	0.25	0.16	0.07	0.28	-0.11	0.07	0.04	0.00	0.07	0.12
Side split	-0.11	-0.26	0.31	-0.10	-0.26	0.31	0.08	-0.26	0.29	0.04	-0.26	0.25
Cross split	-0.33	-0.25	-,19	-0.37	-0.25	-0.21	-0.02	-0.25	-0.04	-0.13	-0.25	-0.11
Total strength of 14 muscular groups	-0.08	0.02	0.75	-0.13	0.02	0.74	0.22	0.01	0.67	0.32	0.02	0.73

References:

- 1 Akhmetov R.F., Maksimenko G.M., Kutek T.B. *Legka atletika* [Track and field athletics], Zhytomyr, 2013, 340 p.
- 2 Vachev S.M. *Sportivnij visnik Pridniprov'ia* [Dnipro Sports Bulletin], 2004, vol.7, pp. 39-41.
- 3 Klichko V.V., Savchin M.P. *Nauka v olimpijskom sporte* [Science in Olympic Sport], 2000, vol.2, pp. 23-30.
- 4 Kopytova L.N. *Municipal'noe obrazovanie: innovacii i eksperiment* [Municipality education: innovation and experiment], 2010, vol.2, pp. 43-45.
- 5 Kusij V.M. *Pravila provedennia zmagani' z karate ta kobudo* [Rules of competitions in karate and kobudo], Odessa, 2001, 100 p.
- 6 Maksimenko G.M., Saienko V.G. *Teoriia ta metodika fizichnogo vikhovannia* [Theory and methods of physical education], 2008, vol.1, pp. 462-467.
- 7 Maksimenko I.G. *Teoretiko-metodichni osnovi bagatorichnoi pidgotovki iunikh sportsmeniv u sportivnikh igrakh* [Theoretical and methodological foundations of many years of training young athletes in sports games], Lugansk, DZ "LNU", 2009, 352 p.
- 8 Zubalij M.D. *Osnovi zdorov'ia i fizichna kul'tura* [Fundamentals of health and physical education], Kiev, Primary School, 2001, 26 p.
- 9 Savchin M.P. *Nauka v olimpijskom sporte* [Science in Olympic Sport], 2004, vol.2, pp. 41-48.
- 10 Saienko V.G. *Moloda sportivna nauka Ukraini* [Young sport science of Ukraine], 2010, vol.14(1), pp. 278-282.
- 11 Krucevich T.Iu. *Teoriia i metodika fizichnogo vikhovannia* [Theory and methods of physical education], 2008, vol.2, 368 p.
- 12 Funakoshi G. *Karate-do: moj sposob zhizni* [Karate-do: my way of life], Moscow, Sofia, 2000, 112 p.
- 13 Iarenko M.O. *Teoriia ta metodika fizichnogo vikhovannia* [Theory and methods of physical education], 2003, vol.3, pp. 21-25.
- 14 Seabra A., Mendoza D., Maia J. Gender, weight status and socioeconomic differences in psychosocial correlates of physical activity in schoolchildren. *Journal of Science and Medicine in Sport*, 2013, vol.16(4), pp. 320-326.
- 15 Standage M., Gillison F.B., Ntoumanis N., Treasure G.C. Predicting students' physical activity and health-related well-being: A prospective cross-domain investigation of motivation across school physical education and exercise settings. *Journal of Sport & Exercise Psychology*, 2012, vol.34, pp. 37-60.

Information about the author:

Sklyar M. S.: ORCID: 0000-0002-3975-8834; olimpiian_max@mail.ru; Luhansk Taras Shevchenko National University; Defense str. 2, Lugansk, 91011, Ukraine

Cite this article as: Sklyar M. S. Correlation analysis of indicators of physical and technical preparedness karate school age. *Pedagogics, psychology, medical-biological problems of physical training and sports*, 2014, vol.4, pp. 56-62. doi:10.6084/m9.figshare.950956

The electronic version of this article is the complete one and can be found online at: <http://www.sportpedagogy.org.ua/html/arihive-e.html>

This is an Open Access article distributed under the terms of the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited (<http://creativecommons.org/licenses/by/3.0/deed.en>).

Received: 01.02.2014
Published: 05.02.2014