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KINESIOLOGY

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Changes in the level of physical fitness on the way to mastery in martial arts according to activity

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Abstract
Problem. In the theoretical framework of the sport sociology and coaching was taken analysis the link of activity undertaken by people practicing martial arts with their physical general fitness and special fitness/efficiency. It was decided to take into account the social factor (activity) and the regular measurement of efficiency.
Method. As an indicator of activity was adopted ranking led by technical director, as an indicator of the special efficiency – held technical level *kyu* or *dan*, awarded on the basis of expert judgment by the practical test. The research was carried in 6-year period 2007-2012. It includes research (purposeful choice) N=14 person practicing in this time martial arts in sections of Rzeszow Centre "Dojo Budokan" (RCDB) – central branch of Idokan Poland Association (IPA); people who are the leaders of ranking lists and winners of high scoring. Researched are practicing under direction the same coach in Rzeszow and Strzyzow. It was employed a method of expert estimate (ranking executed by technical director with assistance of two other experts, 10th dan holders), participant observation and two investigative instruments: 1) International Physical Fitness Test (IPFT); 2) Index of Physical Fitness of K. Zuchora (IPFZ). So an analysis of documents (rankings, the results of indicated tests – measuring efficiency, a central register IPA) were used, too. Statistical analysis included the use of Spearman's rank test.
Results. Calculated the correlation of motor skills (according to the results IPFZ) activity (by ranking) and the results of IPFT. It has been found that there is very strong correlation between all three variables.
Conclusions. Subjects are the best from among researched by the reason of their biggest activities fairest (engagement), diligence and consistency. They achieve high level of development of motor ability and physical efficiency and next technical degrees.

Introduction

Relationship activity in associations of martial arts to the level of performance has not been previously studied, except for awards instructors in relation to other practitioners *jujutsu* e.g. in research by Ambrozy and Miklaszewski [2001]. In contrast, the researchers of Asian martial arts and originating from them combat sports (especially contact) indicate agreed that the condition for achieving a high level of skill is here the high level of overall physical fitness. Especially important, leading skills in martial arts cultivated here (*jujutsu, karate*) are flexibility, the strength of the abdominal muscles and motor coordination skills [*cf.* Sterkowicz 1992, 1998; Cox 1993; Ambrozy, Miklaszewski 2001; Douris *et al.* 2004; Starosta, Pawlowa-Starosta 2004; Cynarski, Obodynski, Litwiniuk 2005; Litwiniuk, Cynarski, Blach 2005; Litwiniuk, Cynarski 2006; Sertic, Vidranski, Segedi 2011].

Martial arts are grown for purposes other than strictly for sport. That is to say, the result in sport is not the most important. Many people practice recreational or treating it as a way of self-improvement. Beginners often have poor physical fitness. In groups where the selection of sports is not conducted, are practicing both advanced practitioners and those less advanced, very fit and less fit physical, men and women of all ages. On the pathway of martial arts also the most vulnerable physically they have the opportunity to develop their potential efficiency. Martial arts training multilaterally shaping physical fitness, developing motor skills [Sterkowicz 1992; Cox 1993; Stanley 1999; Cynarski, Sieber

2006; Cynarski 2009]. How much the involvement of practitioners, measured activity in the activities in their organization, influences the achieved level of fitness?

The authors have undertaken the problem of an individual motor development with activity in the way of martial arts. It was decided to assess the level of activity on the basis of rankings conducted in the specialized sections of the association, according to expert judgment (method of court expert) the technical director and two more people – seniors of the Dan Committee, masters of the highest rank[1]. Points in the ranking of activity are obtained for athletic performance, but also for participation in camps and training seminars, in other organizational projects, and results obtained technical degrees (*kyu, dan*).

Were compared results of the most active and conducted qualitative analysis of the issue. The aim of the study was to determine the relationship between the individual motor development of people who exercise in the IPA sections and their commitment, and activity.

The authors sought to answer the question about the factors determining achievement in the martial arts. Hypothesised: Best students of martial arts are the best because of their commitment, hard work and perseverance. It is these factors together help to achieve high overall efficiency, skill level, technical degrees, etc. This is not yet a summary of the study, but the preliminary study.

Material and Method

As an indicator of activity was adopted ranking led by technical director, as an indicator of the efficiency of the special – held technical level *kyu* or *dan*, awarded on the basis of expert judgment by the practical test. The research was carried in 6-year period 2007-2012. It includes research (purposeful choice) N=14 person practicing in this time martial arts in sections of Rzeszow Centre "Dojo Budokan" (RCDB) – central branch of Idokan Poland Association (IPA). Researched are practicing under direction the same coach in Rzeszow and Strzyzow. It was employed a method of expert estimate (ranking executed by technical director with assistance of two other experts, 10th dan holders), participant observation and two investigative instruments: 1) International Physical Fitness Test (IPFT); 2) Index of Physical Fitness of K. Zuchora (IPFZ)[2]. So used also an analysis of documents (rankings, the results indicated the tests – measuring efficiency, a central register IPA). These people were the leaders of the ranking lists (most active) and conquerors high ratings in the IPFZ (fittest). It is in this group of two women – P.A. and P.M.

[1] Experts of Dan Committee IPA: L. Sieber 10 dan, J. Slopecki 10 dan, W.J. Cynarski 10 dan.

[2] This research tool was conducted throughout the period 1999-2011, but there were used only data from three years.

The study involved people training *jujutsu, karate* and other martial arts (system Idokan Yoshin-ryu *budo* [Cynarski 2009]). The subjects trained under the guidance of the same coach in Rzeszow and Strzyzow (Poland). At that time, they were regular tested by PEIZ. In addition, a detailed analysis of the results were IPFT three of the most active practitioners of the system indicated martial arts in the years 2007-2012. They were men aged 17-33 years, 8-20 years old trainee, holding degrees from 2 *kyu* (orange belt) to 3 *dan* (black belt, a third master's degree).

There were also the method of expert evaluation (ranking in the points awarded for participation and performance in competitions, participation in events, gained successive stages of technical, active part in sports camp, etc.), and participant observation of the coach. International Physical Fitness Test was used for absolute comparison of the results in individual tests of efficiency. On the other hand, to determine the progress of an individual, was used to measure attempts by IPFZ, which is useful for assessing exercisers' individual progress in fitness, yet easy to use in *dojo*, or martial arts exercise room [Cynarski, Obodynski 2011].

International Physical Fitness Test performed each time in two days to allow time for rest between attempts. In the long jump trials performed with the arm gets done. For runners time was measured separately. In contrast, IPFZ performed always in one training unit. In both cases, the results are established by point standards for these tools.

In statistical analysis Spearman's rank and test were used. Ranks at the level of 1 (weakest result) to 14 (best result). In order to make the calculations used in Microsoft Excel.

In addition, due to the small sample size of the research, the authors decided to qualitative analysis of the results, similar to that used in sociological research case study, without the generalization of the results characteristic of empirical quantitative. However, due to the fact that pitching full test (of all trainees in the central resort IPA), proposals for the test case are justified.

Results

In the table 1 is presented the study of participants in the diachronic perspective (by rating activity-training, led by technical director IPA [Acta IPA 2012]). The rankings take into account the participation in summer camps Idokan Poland Association (IPA), competition (results), training, presentations, exams (obtained degrees), as well as the regularity and reliability of training.

Based on data contained in the table 1 it can be concluded that the most points for the activity acquired S.P., whose score was only 0.5 points better than the result H.A. and 5.5 from C.L. Further places were taken by W.M., W.K., K.W, S.T., S.G, and P.M. Other people have

Tab. 1. Points of activity in years 2007-2012

	BP	CL	HA	KW	KP	MA	NM	PA	PM	SG	SP	ST	WK	WM
Points	32,5	77,5	82,5	60,5	32,5	37	37,5	41,5	51	52,5	83	56,5	66,5	75,5
medium	5,42	12,92	13,75	5,42	5,42	6,17	6,25	6,92	8,50	8,75	13,83	9,42	11,08	12,58

Source: own research.

Tab. 2. Points from IPFZ in years 2007-2012

	BP	CL	HA	KW	KP	MA	NM	PA	PM	SG	SP	ST	WK	WM
Points	74	78	84	37,5	32	56	38	71,5	29	39	79,5	14,5	59,5	64,5
medium	12,33	11,33	7,83	4,58	5,33	9,33	3,00	11,92	4,83	4,83	6,58	2,42	9,92	10,75

Source: own research.

Tab. 3. Points from IPFT in years 2007-2012

	BP	CL	HA	KW	KP	MA	NM	PA	PM	SG	SP	ST	WK	WM
Points	316	506	519,5	302,5	374,5	301,5	303	338	373	294	530	343	413	428
medium	52,57	84,33	86,58	37,81	46,81	37,69	37,88	42,25	46,63	36,75	66,25	42,88	51,63	53,50

Source: own research.

won less than half the points of the leader statement. Of course, this was reflected in the average point value.

In 2003, bronze medal of honour Tenth Anniversary IPA for sports results in *jujutsu* was K.W., holder of the green belt (3 *kyu*) in *Zendo karate Tai-te-tao*. In 2008, S.P. (2 *dan*) received for sports scores Kill the fifteenth anniversary of the IPA. But in the ranking in 2009 won H.A. (then 1 *kyu*), awarded for social activities organizational Bronze Medal "Merit for Sport". Taught here the way of martial arts shows other purposes than just achieving sports results [*cf.* Cynarski, Sieber 2006; Cynarski 2009].

Also included is the IPFZ. Were assumed results for the years 2007-2012. The results show a very high or the outstanding performance of training in RCDB [*cf.* Zuchora 2009]. The results point (along with their average) for individual players shows the tab. 2.

Table 2 points earned by players in IPFZ were converted into rank points (1 – the worst result, 14 – the best result). In many cases, there were ranks tied. Based on data contained in the table 2 can be stated that many points IPFZ received H.A., and further positions occupied S.P. and C.L. While the three worst results obtained P.M, K.P and N.M. This was also reflected in the average point value.

For objectification of measuring performance used IPFT [Larson 1969; Pilicz 1969]. These studies were conducted always in the month of June in the distinguished years in the sections RCDB in Rzeszow and Strzyzow. The results point (along with their average) for individual players shows the tab. 3.

Based on data contained in the table 3 can be said that the most points earned in IPFT S.P. and H.A., and C.L. In contrast, three players with the least number of points were M.A., K.W. and M.N. This was also reflected in the average point value.

Based on studies using IPFT analyzed the results of the top three advanced *jujutsu* and *karate* (technical level from orange belt 4 *kyu* to black belt 3 *dan*). They were C.L., H.A., and S.P.

C.L. (17 years old, 2 *kyu*) improved time to 50 m – 9.16 to 7.5 s; jump from space – from 185 to 253 cm; time for the 1000 m – from 272 to 198 sec.; on the rod – from 0 to 12 pullups; the shuttle run from 12.08 to approx. 11 sec; result slope ahead with 61.5 to 68 cm, while the execution of the neighbours lying improved from 34 to 46. The strength of a handshake improved from 28 to 47 (right hand) and 46 kg (left hand). In 2007-2009 (the period of growth [Osinski 2003]) has grown 15 cm and arrived at 9 kg. The scale of progress (for example, 2007 and 2012) based on point values on each trial graphically illustrates the graph in fig. 1.

H.A. (32, 1 *dan*) 50 m obtained times: 7.34 and 7 seconds; in the spring he received 256 and 249 cm; 1000 m – 235 and 228 s; on the rod – from 5 to 10 repetitions; in the course of the shuttle – from 10.84 to 10.35 s; in the sample of the abdominal muscles – from 34 to 37; in an attempt flexibility – 63 to 67 cm. Manual dynamometer score improved from 53 to 65 (right) and of 52 to 58 kg (left). We note here, in spite of asthma, significant progress overall efficiency, individual motor skills and endurance of the body (fig. 2).

S.P. (33, 3 dan) improved time to 50 m, and 7 to give 6.45 s; the result of stroke has improved from 256 to 267 cm; time for the 1000 m – from 240 minutes to 235 s; on the rod – from 12 to 18 pullups; the result of running the shuttle remained below 11 s; score in an amount of correctly executed neighbours supine for 30 s – 37 to 40; only in an attempt to flexibility there was a slight setback (from 65 to 56.5 cm). Good preparation performances and such cardiovascular helped the player to pass at a summer camp (OL SIP 2008 [Cynarska 2008]) quite heavy exam on 2 dan in *jujutsu*. Later he scored on successfully exams for 1 dan in *karate*, 3 dan in *jujutsu* and 2 dan in *karate*. In 2012, the results obtained on the

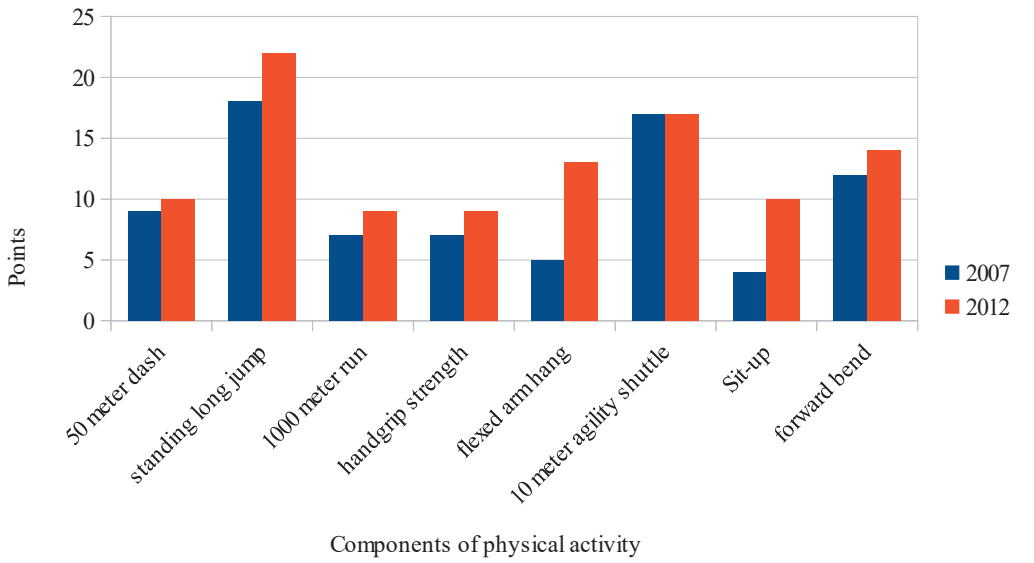

Fig. 1. Results of C.L., International Physical Fitness Test
Source: own research.

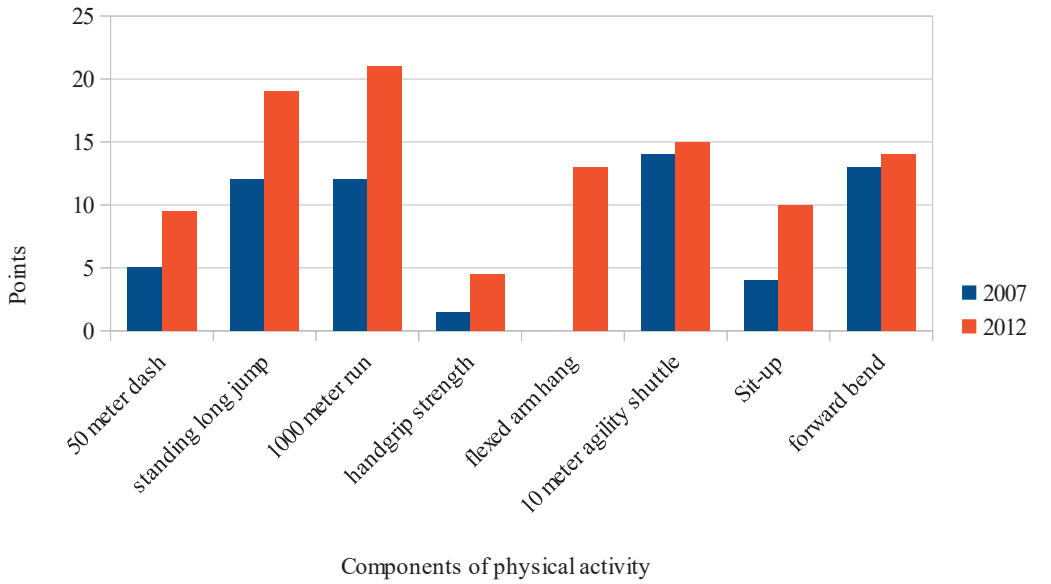

Fig. 2. Results of H.A., International Physical Fitness Test
Source: own research.

dynamometer similar to earlier: the left hand 70 kg (formerly 68), the right is a 70 kg (formerly 71 kg) (fig. 3).

In order to verify the hypothesis mentioned earlier made three statements: between activity and IPFZ, activity and IPFT, IPFZ and IPFT. In the first and third case occurred correlation strength of 0.93, the second – 0.95. This means that each of them was very strong, that is – as indicated at the beginning of this preliminary study - the best students of the martial arts are the best because of their commitment, hard work and perseverance.

Top athletes are also the fittest. Contender S.P. reached the top of the national sport in *jujutsu* (1 sport class), and the 3 dan in style *jujutsu* (*Idokan Yoshin-ryu*), 2 *dan* w *Zendo karate Tai-te-tao*, 3 *kyu* in *judo* and powers of self-defence instructor (later, in 2015 – 4 dan in *jujutsu*). While H.A. currently has technical grades 1st dan in *jujutsu* (*Idokan Yoshin-ryu*) and 3 *kyu* in *Zendo karate Tai-te-tao*. The other train continues with a similar commitment and using similar load as years before their master teacher. About achieve high degrees decides perseverance. S.P. the longest trains – during the examination of approx. 20 years, and C.L. (2 kyu *karate*, 3 kyu *judo*, 3 kyu *jujutsu*) – 11 years.

Rapid technological advances have been involving students at the orange belt (4 *kyu*), as the three mentioned here, who train 8-11 years. Technical skills are built on the basis of a high overall efficiency and targeted. Constantly pursued is to work on further development of motor skills or keeping them optimal level.

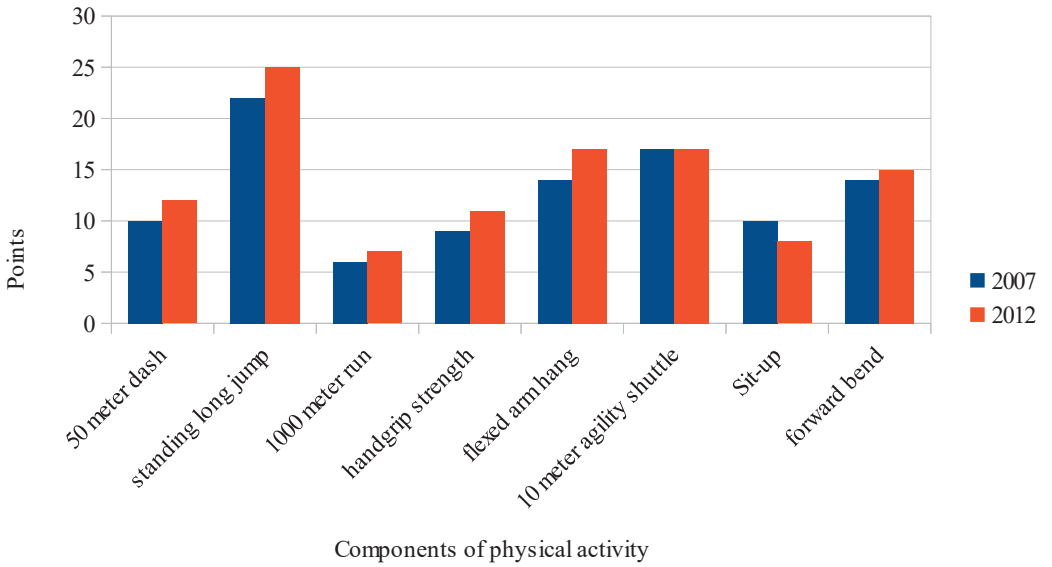

Fig. 3. Results of S.P., International Physical Fitness Test
Source: own research.

Representatives of martial arts is characterized in particular 1) a high level of strength endurance abdominal muscles (slopes of lying), and 2) flexibility (bend the trunk forwards). Significant is also the level of development of explosive strength, coordination, and speed (by speed trial IPFZ – a 10-second run clapping knees).

Utilitarian value of the training system of martial arts Idokan Yoshin-ryu *budo* taught in IPA involves the selection of the profession of a soldier or a policeman, which concerns two women and two men belonging to the test group. One of these is a professional soldier, the other – a policeman. Furthermore, as follows from relationship coach, achieving high multilateral efficiency and good results educational causing the popularity of this form of creation and recreation psycho among children, adolescents and their parents.

Discussion

Specialists in the field of traditional martial arts of Japanese origin according indicate the diversity of ways of martial arts sport of roads careers due to other goals of *budo* and sports [Kiyota, Kinoshita 1990; Stanley 1999; Cynarski 2009]. This implies a different specificity of training, the preparation process of psychophysical and for specific technical and tactical skills. The main objective here is the man himself and his personal development, and not the result in sports competition [*cf.* Cox, 1993; Cynarski, Sieber 2006]. The results of testing the efficiency of people practicing martial arts do not differ significantly from the results of combat sports athletes, unless you count the pros – the elite sports [*cf.* Sterkowicz, Ambrozy 1992; Ambrozy, Miklaszewski 2001; Starosta, Pawlowa-Starosta 2004; Demirkan *et al.* 2014].

Very positive impact of this kind of activity in children and adolescents is confirmed by theorists in physical education and social sciences [Brown, Johanson 2000; Cynarski, Obodyński, Cieszkowski 2007]. Results of some works set forth the positive effects of martial art training on health-related physical fitness for adolescents. Compared to team sports participation, martial arts has a more positive effect on muscular endurance and flexibility in adolescents [*cf.* Cynarski 2009; Kayihan 2014]. Besides, "judokas training in Japan was based on cultivating symmetry and equal abilities of the right and left hand" [Starosta 2015]. The same phenomenon is also observed in IPA.

In addition, it is difficult to overestimate the value of utilitarian gained here melee skills and wielding traditional weapons, which is useful in self-defence and work in the uniformed services [Cynarski, Litwiniuk 2003; Boychenko, Wojnar, Boychenko 2006].

Are known works on fitness profiles of elite sports representatives, for example *judo* [Franchini *et al.* 2007] and *karate* [Sterkowicz 1992]. Definitely there is less work, which would be presented buds fitness level of activity in the environment of martial arts (social factor). Martial arts are studied usually either from the perspective of biotech, or humanistic (social, psychological).

Comparison of the level of efficiency comes out in favour of the representatives of martial arts from RCDB apparently in an attempt to strength endurance abdominal muscles (slopes of lying). It is one of the leading motor skills for *karate* and *jujutsu*. The results of outstanding Idokan athletes are here at the level of 74-79 points according to norms age for IPFT and better than in the same sample of the test Eurofit in different sports in research by Ozimek [2007].

There is little point in comparing the level of flexibility, because IPFT and Eurofit only allow us to evaluate the development of this capability in the sagittal plane, while in *karate* and other martial arts, it is also important for optimal flexibility in the frontal plane (straddle splits), and it is still practiced. While the level of motor coordination capacity requires only been here a comprehensive investigation.

For advanced students and faculty instructors, people aged 25-45 years, more reasonable to compare their fitness level with the level of performance in middle-aged trainees other martial arts in other centres. Such a comparison comes here quite favourably [*cf*. Douris *et al*. 2004]. Improved efficiency and performance in tests speed endurance and endurance resulting from more intense workouts than e.g. in *aikido* recreational exercise or *taiji quan* health training.

Conclusions

Representatives of sections of *karate* and *jujutsu* IPA achieved the best results in the test of strength endurance abdominal muscles (slopes of lying) test IPFT. It is characteristic of people who practice martial arts and contact combat sports. Similarly, high scores they obtained in flexibility tests (bend the trunk forwards), explosive strength (standing long jump), coordination and speed.

Top adepts developed the most progress in terms of overall physical efficiency/fitness. Long-term observation and studies lead to the conclusion that the best of the respondents are the best because of their greatest activity (involvement), diligence and perseverance (systematic training in the 12-year study period). This confirms the hypothesis that the best students of the martial arts are the best because of their commitment, hard work and perseverance.

It is not enough to achieve a high level of development of motor skills and physical fitness. Way of learning martial arts leads to gain practical skills proven technical degrees. Best achieve master's degrees, a kind of "on the road" include success in competitive sports. They also come to the instructor endorsement.

Correlation between individual motor development of people who exercise in the sections IPA, and their commitment and activity, and to identify the determinants of achievement in the martial arts require further studies.

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Zmiany poziomu sprawności fizycznej na drodze do mistrzostwa w sztuce walki według aktywności

Słowa kluczowe: sztuki walki, sprawność fizyczna, ranking, ocena ekspercka, Międzynarodowy Test Sprawności Fizycznej

Abstrakt

Problem. W perspektywie socjologii sportu i teorii treningu podjęto analizę związku aktywności osób trenujących sztuki walki z ich sprawnością fizyczną – ogólną i specjalną. Postanowiono uwzględnić czynnik społeczny (aktywność) i regularne pomiary sprawności.

Metoda. Za wskaźnik aktywności przyjęto ranking prowadzony przez dyrektora technicznego, za wskaźnik sprawności specjalnej – posiadany stopień techniczny *kyu* lub *dan*, przyznawany na zasadzie oceny eksperckiej w drodze egzaminu praktycznego. Badanie zostało przeprowadzone w 6-letnim okresie 2007-2012. To dotyczy badania (próba celowa) N=14 osób uprawiających w tym czasie sztuki walki w sekcjach Rzeszowskiego Ośrodka „Dojo Budokan" (RODB) – centralnego ośrodka Stowarzyszenia Idokan Polska (SIP), będących liderami list rankingowych i zdobywcami wysokiej oceny punktowej. Badani ćwiczą pod kierunkiem tego samego trenera w Rzeszowie i Strzyżowie. Została zastosowana metoda oceny eksperckiej (ranking był ustalany przez direktora technicznego z pomocą dwóch innych ekspertów, posiadaczy stopni 10 dan), obserwacja uczestnicząca oraz dwa jeszcze narzędzia badawcze: 1) Międzynarodowy Test Sprawności Fizycznej (MTSF); 2) Indeks Sprawności Fizycznej (ISF) K. Zuchory. Czyli zastosowano także analizę dokumentów (rankingi, wyniki wskazanych testów – pomiarów sprawności, rejestr centralny SIP). Opracowanie statystyczne obejmowało zastosowanie testu rang Spearmana.

Wyniki. Obliczono korelację zdolności motorycznych (wg wyników ISF Zuchory) z aktywnością (wg Rankingu) oraz wynikami MTSF. Stwierdzono, że zachodzą bardzo silne korelacje pomiędzy wszystkimi trzema zmiennymi.

Wnioski. Najlepsi spośród badanych są najlepszymi z racji swojej największej aktywności (zaangażowania), pracowitości i wytrwałości. Osiągają oni wysoki poziom rozwoju zdolności motorycznych i wydolności fizycznej, i uzyskują kolejne, wyższe stopnie techniczne.