

THE LEVEL OF SOMATIC DEVELOPMENT AND PHYSICAL FITNESS OF PODLASKIE REGIONAL JUNIOR OLYMPIC TAEKWONDO TEAM MEMBERS

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Abstract: The aim of the study was to determine the level of somatic development and physical fitness characterizing students practising Olympic taekwondo (TKDO) in junior category from Podlaskie regional junior team (PDL). The study was performed in 2017 and included 14 boys at the age of 10 and 11. Eight tests of physical fitness from the International Test of Physical Fitness (MTSF) were implemented. Also, the body mass (BM) and body height (BH) were measured on the basis of which the BMI ratio (Body Mass Index) was calculated. The result of the study analysis was that the students of the PDL regional team had a medium level of physical fitness. The highest levels were presented during speed and suppleness tests, and the lowest in strength tests.

Key words: motor skills, Olympic taekwondo, junior

DOI: 10.19260/PJAS.2019.5.1.01

Introduction

TKDO is a relatively new martial art sport that originates from Korea. After entering the canon of Olympic disciplines in 2000, it has experienced dynamic growth; thus, it has become a discipline that is particularly attractive to researchers from all over the world, who focus, among others, on the analysis of the physical fitness level of students at varying stages of sport training [1–5]. Taekwondo training includes the development of such motor skills as strength, speed, stamina and suppleness as well as their hybrids such as speed stamina or strength stamina [4–8]. TKDO is a sport discipline that, like other martial art sports, presents the students with high coordination demands, as proven by numerous studies on the subject [9, 10]. The significant factors are: reaction time, fast movements of upper limbs and good leg mobility that enables a fast change in position and direction of body movement [4, 11]. What constitutes an important aspect of the training is the adequate control of young adepts' physical development that enables the evaluation of the motor preparation level and is used to assess whether the intended changes take place as a result of training intensity [5, 12, 13]. On the basis of the results obtained during the control, it is possible to consciously manage the development of motor skills of young students by means of a proper selection of means, forms as well as training methods [14, 15].

The main objective of the presented study was to assess the physical fitness level as well as somatic development of the PDL regional junior team members in TKDO.

Material and research methods

The analysis was conducted on a group of 14 students at the age of 10-11 from the Olympic taekwondo regional Podlaskie junior team (PDL TKDO). The group consisted of young adepts of the discipline – their average training time was 2.6 years. Table 1 presents the characteristics of the study group. The study was performed during an interim period of a year long training macrocycle (June 2017). The study involved the implementation of 8 tests (PB) from the International Physical Fitness Test (MTSF) PB1 – 50 meters run, PB2 – standing long jump, PB3 – 600 meters run, PB4 – handgrip strength, PB5 – bent arm hang, PB6 – 4 x 10 m shuttle run, PB7 – sit ups 30 seconds, PB8 – standing forward upper body bend. The study was implemented during one day in the following sequence of tests: PB4, PB8, PB2, PB7, PB6, PB5 – gym, PB1, PB3 – athletic stadium, [16–18]. Additionally, the selected somatic body built measurements were taken i.e. BM and BH, on the basis of which the BMI ratio of the studied group was calculated [19]. BM was measured in kilograms (kg) with 0.1kg accuracy and BH in centimetres (cm) with 0.5cm accuracy. Both the aforementioned parameters were measured with a personal Radwag WPT 60/150 OW electronic scale. Each measurement (except BH and BM) was performed after a warm up with full length breaks between the tests. All tests were performed in sport clothing. The students were informed of the aim of the study and all of them agreed to participate. The results that were obtained in each test were converted to points in accordance with

the calendar age conversion tables [16,18]. On their basis, the assessment of the motor skills level of the students of the PDL TKDO regional team was performed. Research results underwent a statistical analysis and it enabled the determination of the arithmetic average $[\bar{x}]$ value, standard deviation [Sd] and volatility index [V%] [20,21].

Table 1: Characteristics of the Olympic taekwondo study group.

No.	Student's code	Years (age)	Training Experience (years)	BH (cm)	BM (kg)	BMI (kg/m ²)
1.	B1	10	1	143,5	43,5	21,12
2.	B2	10	3	149,0	48,0	21,62
3.	B3	10	1	132,0	30,0	17,22
4.	B4	11	1	146,0	34,5	16,19
5.	B5	11	3	151,0	36,5	16,01
6.	B6	11	5	144,5	42,0	20,11
7.	B7	11	6	138,5	35,5	18,51
8.	B8	11	6	148,5	43,5	19,73
9.	B9	11	2	149,0	39,0	17,57
10.	B10	11	1	154,5	45,5	19,06
11.	B11	11	2	160,0	44,5	17,38
12.	B12	10	2	136,5	36,5	19,59
13.	B13	10	2	143,5	45,0	21,85
14.	B14	10	1	139,5	35,0	17,99
\bar{x}		10,6	2,6	145,4	39,9	18,85
Sd		0,5	1,8	7,1	5,1	1,84
V(%)		4,7	68,5	4,9	12,9	9,75

Research results

On the basis of the MTSF's results, the level of overall physical fitness of the Olympic taekwondo Podlaskie regional junior team members was determined. The results are presented in Table 2.

According to the physical fitness norm for Polish teenagers, all the members of the Olympic taekwondo study group achieved a medium level of physical fitness (Table 2). The highest number of points among the 11 year olds – 474 – was obtained by the B11 student and the lowest number of points – 321 – by the B10 student. The highest number of points among the 10 year old boys – 433, was obtained by the B13 student and the lowest number of points by the B3 student – 369. Interestingly, it has to be noted that taking all of the study group members into account, the highest point values were achieved by an 11 year old and the lowest also by an 11 year old. Taking the training experience into consideration, the students with the highest experience (5–6 years) achieved medium results in comparison to the rest of the group (students B6, B7, B8). The B11 student, who scored the greatest number of points in the International Physical Fitness Test was the tallest in the group – 160cm. However, what seems particularly interesting is the fact that the fittest 10 year old (B13) had the highest BMI ratio from the whole study group of boys (21,85 kg/m²).

Table 2: Point values in the International Physical Fitness Test (MTSF) of the TKDO PDL regional team members for junior students.

No.	Student's code	TESTS								Points Total
		PB1	PB 2	PB 3	PB 4	PB 5	PB 6	PB 7	PB 8	
1.	B1	59	56	48	46	26	53	42	60	390
2.	B2	60	61	44	54	28	51	40	63	401
3.	B3	56	49	42	37	26	53	40	66	369
4.	B4	63	51	50	34	44	53	40	49	384
5.	B5	70	70	46	40	28	59	52	70	435
6.	B6	52	51	42	44	28	58	50	64	389
7.	B7	55	59	49	44	32	61	50	61	411
8.	B8	74	51	52	44	30	59	60	73	443
9.	B9	70	54	53	42	42	60	64	61	446
10.	B10	48	45	38	44	24	45	34	46	321
11.	B11	76	73	55	54	46	62	50	58	474
12.	B12	56	54	44	39	38	53	42	52	378
13.	B13	75	55	50	56	32	59	40	66	433
14.	B14	66	56	48	46	30	59	44	55	404
\bar{x}		62,86	56,07	47,21	44,57	32,43	56,07	46,29	60,29	405,79
Sd		8,76	7,43	4,62	6,22	6,89	4,62	8,14	7,45	36,96
V(%)		13,93	13,25	9,78	13,95	21,26	8,24	17,58	12,36	9,11

The students with the highest scores in each age group had a relatively low training experience of 2 years. The highest average point value was achieved in the 50 m run speed test – 62.86 points, which indicates the level of speed abilities, and in the upper body forward bend test – 60.29 points, which characterises the level of suppleness. The students presented a medium level in the explosive strength of the limbs test (standing long jump) – 56.07 points and in agility test (shuttle run) – also 56.07 points. The lowest average point values were obtained in bent arm hang – 32.43 points, which evaluates upper limb strength, and in handgrip strength test – 44.57 points. The average value in the eight tests from the International Physical Fitness Test amounted to 405.79 points.

Discussion

The aim of the study was to determine the level of physical fitness and somatic development of the juniors in the PDL TKDO regional team on the basis of the MTSF physical fitness tests battery [17].

The study group of the TKDO junior students was characterised by an average BH – 145.5cm and BM of 39.9kg. The average BMI ratio value was 18.85 kg/m², which has placed them in the lean people group [22]. The need for proper body proportions corresponds with the findings of other researchers [4, 5, 23–35]. It can thus be stated that the members were optimally selected when taking into account the studied ratios of body built for the PDL regional

team in order to obtain the highest possible sport results in TKDO. What appears as an interesting and surprising fact is that the relatively high results in the International Physical Fitness Test (the highest in 10 year olds) were achieved by a boy with the highest BMI ratio. The literature on the subject states that, in spite of the general tendency that TKDO students are usually characterised by lean physiques, the students with other proportions may also prove to be successful. Natalia Ivanova (Russia) can serve as a good example of this. Despite her short stature and surprisingly stocky build, she won a silver medal in the 67kg+ category at the Olympics in Sydney (2000) defeated only by a slightly taller Chinese contestant [5].

The highest average point values were achieved in the speed abilities test and suppleness test. Moreover, the students have demonstrated high level of lower limbs explosive power and agility – understood after Ljach 2003 as a hybrid ability linking the speed and motor coordination components. Their results have placed them in a group of people with high physical fitness, according to the physical fitness norm for Polish teenagers [16]. A similar composition of desired motor skills is present in the so-called 'Master Model' for TKDO. An Olympic taekwondo student should possess such characteristics as: high level of explosive power and speed as well as a good potential of motor skills and suppleness [1–5, 31]. The impact of the explosive power level on the result was widely described by various authors [1] – due to this ability, the students can perform suitably strong kicks and obtain points in the Olympic taekwondo competitions.

Taking the provided information into account, in order to increase the level of physical fitness of the students, the trainers need to apply more exercises that improve motor skills and pay special attention to those, where the average achieved point values were at the lowest level [13]. It should be remembered that the 'Master Model' in TKDO as well as in other sport disciplines is not a rigid one, which a person should uncompromisingly aim at, but is only a certain pattern, which the trainers should bear in mind when managing the training process [13]. The level of particular abilities should be adequate to the fighting style and the contestant's possibilities. It is of utmost importance that the leading motor skills do not fall below a certain minimum – such a situation may discredit in obtaining high scores in a given sport discipline.

This article showed that the training process of the PDL TKDO regional team members is properly conducted when taking into account the level of physical fitness. Their selection was also properly performed so that the studied group could achieve the highest sport results. The authors are aware that MTSF tests may not fully reflect the specificity of the discipline and that they are not a perfect research

tool. However, when taking into account that the tests are easy to conduct, widely implemented and that their implementation is demanded for regional teams by the Ministry of Sport and Tourism, it is understood that for the purpose of children and adolescents sport, it is important to publish and analyse them, so that club trainers studying MTSF could have a reference point for the control of the training process of young contestants.

Conclusions

On the basis of the collected and analysed study material and its theoretical interpretation, it is possible to formulate the following conclusions:

1. The PDL TKDO junior students were optimally selected when taking into account the studied characteristics and the somatic built ratio.
2. The highest average point values were achieved in the test that assesses speed abilities and suppleness – at a high fitness level according to the International Physical Fitness Test (MTSF) as well as at a relatively high level: lower limbs explosive power and agility. This composition corresponds to the so-called 'Master Model' in TKDO.
3. In order to increase the level of physical fitness of the students, the trainers need to apply more exercises that improve motor skills (lower limbs explosive power, suppleness, speed and agility) and also pay special attention to those, where the average achieved point values were at the lowest level (upper limbs strength).

Literature

- [1] Miller J.F., Bujak Z., Miller M. Sports result vs. general physical fitness level of junior taekwondo athletes. *Journal of Combat Sports and Martial Arts.*, 1(2):39–44, 2011.
- [2] Santos V.G., Franchini E., Lima-Silva A.E. Relationship between attack and skipping in Taekwondo contests. *Journal of Strength and Conditionings Research*, 25:1743–51, 2011.
- [3] Tornello F., Capranica L., Chiodo S. Minganti C. Tesitore A. Time–motion analysis of youth Olympic Taekwondo combats. *Journal of Strength and Conditionings Research*, 27:223–8, 2013.
- [4] Sadowski J., Miller J.F. *Monografie i opracowania*, chapter Czynniki warunkujące wynik sportowy w taekwondo olimpijskim. AWF Warszawa, Wydział Wychowania Fizycznego i Sportu w Białej Podlaskie, 2016.
- [5] Remiszewska M. *Identyfikacja składowych stanu wytrenowania w taekwondo olimpijskim kobiet*. PhD thesis, AWF Warszawa, 2017.

- [6] Jagiełło W. *Przygotowanie fizyczne młodego sportowca*. COS Warszawa, 2000.
- [7] Bujak Z. *Sprawność fizyczna ćwiczących taekwon-do i jej uwarunkowania*. Rocznik kulturowy Ido – Ruch dla kultury. Tom 5., 2005.
- [8] Miller M. *Wybrane aspekty kultury fizycznej – stan i perspektywy*., chapter Charakterystyka taekwondo olimpijskiego. Konin PWSZ., 2009.
- [9] Wolska-Paczoska B. *Sprawność fizyczna a poziom sportowy zawodniczek judo na wybranych etapach wieloletniego szkolenia*. PhD thesis, Gdańsk, AWFiS., 2012.
- [10] Lech G., Sertić H., Sterkowicz S. Sterkowicz Przybycień K. Jaworski J. Krawczyk R. Effects of different aspects of coordination on the fighting methods and sport skill level in cadet judo contestants. *Kinesiology*, 46(1):69–78, 2014.
- [11] Sterkowicz S. *Podstawy teorii i technologii treningu sportowego*., volume 2, chapter Specyfika treningu w sportach walki. AWF, Warszawa–Biała Podlaska, 2015.
- [12] Górniak K. *Podstawy teorii i technologii treningu sportowego. Tom 2.*, chapter Właściwości rozwojowe dzieci i młodzieży – biologiczne uwarunkowania treningu sportowego. AWF, Warszawa–Biała Podlaska., 2015.
- [13] Sozański H. *Podstawy teorii i technologii treningu sportowego*., volume 2, chapter Projektowanie procesu szkolenia sportowego, periodyzacja treningu. AWF Warszawa Filia w Białej Podlaskiej, 2015.
- [14] Ljach W. *Kształtowanie zdolności motorycznych dzieci i młodzieży. Podręcznik dla nauczycieli, trenerów i studentów*. COS Warszawa, 2003.
- [15] Sadowski J., Gierczuk D. *Podstawy teorii i technologii treningu sportowego*., volume 2, chapter Kontrola jako czynnik kierowania i indywidualizacji treningu. AWF Warszawa Filia w Białej Podlaskiej, 2015.
- [16] Pilicz S., Ulatowski T. *Zastosowanie metod naukowych na potrzeby sportu*., chapter Testowanie sprawności ogólnej. Biblioteka PTNKF, Warszawa, 2002.
- [17] Pilicz S., Dobosz J., Przewęda R. *Punktacja sprawności fizycznej młodzieży polskiej wg Międzynarodowego Testu Sprawności Fizycznej. Kryteria pomiaru wydolności organizmu Testem Coopera*. AWF Warszawa, 2005.
- [18] Przewęda R., Dobosz J. *Kondycja fizyczna polskiej młodzieży*. AWF Warszawa, 2007.
- [19] Łaska-Mierzejewska T. *Antropologia w sporcie i wychowaniu fizycznym*. COS Warszawa, 1999.
- [20] Stupnicki R. *Biometria. Krótki rys*. Wydawnictwo Margos. Warszawa., 2000.
- [21] Wawrzynek J. *Metody opisu i wnioskowania statystycznego*. Wydawnictwo Akademii Ekonomicznej im. Oskara Langego we Wrocławiu., 2007.
- [22] Tatarczuk J., Asienkiewicz R., Wandycz A. *Dobrostan w różnych fazach życia*., chapter Charakterystyka wskaźnika smukłości populacji dzieci i młodzieży Ziemi lubuskiej w wieku 7 – 18 lat. Wydawnictwo Naukowe Neuro-Centrum Lublin., 2008.
- [23] Taaffe D., Pieter W. Physical and physiological characteristics of elite taekwondo athletes. In *Commonwealth and International Conference Proceedings*, 1990.
- [24] Pieter W. Performance characteristics of elite taekwondo athletes. *Korean Journal Sport Science*, 3:94–117, 1991.
- [25] Pieter W., Bercades L. *The second international symposium for taekwondo studies*., chapter Strength correlates of kicking force in young taekwondo in., pages 247–254. Seoul: Daekyung Books, 2009.
- [26] Pieter W. Talent detection in Taekwondo Practitioners. *Journal of Asian Martial*, 19(3):9–29, 2010.
- [27] Gao B., Zhao Q., Liu B. Measurement and evaluation on body composition and figure of taekwondo athlete. *Journal of Xi 'an Institute of physical Education*, 15:29–33, 1998.
- [28] Bujak Z. *Współczesne kierunki rozwoju kultury fizycznej w formacjach obronnych*., chapter Rozwój fizyczny i sprawność fizyczna osób trenujących taekwon-do., pages 39–46. PTNKF, Warszawa, 2000.
- [29] Olds T., Kang S. *Proceedings of the 1st Olympic Taekwondo Scientific Congress*, chapter Anthropometric characteristics of adult male Korean taekwondo players., page 69-75. Korean National University of Physical Education, Seoul, 2000.
- [30] Gao B. H. Research on the somatotype features of Chinese elite male taekwondo athletes. *Sport Science*, 21:58–61, 2001.
- [31] Toskovic N.N., Blessing D., Williford H.N. Physiologic profile of recreational male and female novice and experienced taekwondo practitioners. *Journal of Sports Medicine and Physical Fitness*, 44:164–172, 2004.
- [32] Markovic G., Misigoj Duraskovic M., Trninic S. Fitness Profile of Elite Croatian Female Taekwondo Athletes. *Collegium Antropologicum*, 29:93–99, 2005.
- [33] Kazemi M., Waalen J., Morgan C. White A.R. A profile of Olympic Taekwondo competitors. *Journal of Sports Science and Medicine*, pages 114–121, 2006.
- [34] Fritzsche J., Raschka Ch. Body composition and the somatotype of german taekwondo practitioners. *Paper Anthropology XVIII*, 2008.
- [35] Cular D., Krstulovic S., Tomljanovi T. The differences between medalists and non-medalists at the 2008 olympic games taekwondo tournament. *Human Movement*, 12(2):165- 170, 2011.

Received: 2019

Accepted: 2019