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Comparative analysis of body posture in child and adolescent taekwon-do practitioners and non-practitioners

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Abstract

Problem and Method. Contemporary research suggests treating martial arts and combat sports not only as a form of self-defence, sports disciplines, and a leisure activity but also a form of therapy. One of the indicators of an excellent health is the correction of body posture. The experiment group consisted of 41 taekwon-do practitioners, while the control group comprised 46 subjects. **Results and Conclusion.** The collected data and its statistical analysis allow to make an assumption that the traditional taekwon-do training has a positive effect on the body posture change. Some defects of the control group subjects, who did not participate in any form of sports except Physical Education classes, occur in almost 79% of the participants, while in the experiment group the figure is decreased by nearly half (41%). The study demonstrates that the statistically significant ($p < 0.05$) training contributes to a decrease in the number of occurrence of body asymmetry in the shoulders, scapulae, corpus ossa ilii (body of ilium) as well as spinal and knee defects, and scoliosis. Even a short, i.e. for 3-12 months, training improves body posture in children. In the training group as opposed to children who do not perform any form of physical activity regularly, there is less incidence of scoliosis ($p < 0.05$), currently recognised as a civilisation disease. The presented data and the following discussion constitute the comparison of the measurements and the basis for further studies.

Introduction

People take up martial arts and combat sports for various reasons such as to acquire the skill of self-defence, shape the character as well as improve their physical performance and maintain health [Kalina 2000]. Health-related training means the exercise based on the principle ‘I train to stay fit’. Physical activity stimulates all health dimensions: somatic, mental, and social ones [Kalina, Barczynski 2010]. In the health formula of taekwon-do training, an individual is protected. The kicking techniques do not have to be directed towards an opponent, they can be executed ‘in the air’ (formal stance) or towards immovable objects such as bags, shields, and boards [Wasik 2014]. In this case, a number of broken boards is an individual indicator of health and fitness.

Contemporary research tackles the issue of treating martial arts as not solely a way of self-defence, sport and leisure, but also a form of therapy [Tarabanov 2012]. The

therapy through traditional martial arts can help to treat numerous health disorders. This can be advantageous in monitoring children with ADHD [Pelham *et al.* 2000; Kim 2005]. Martial arts provide controlled, less aggressive strategies and techniques than traditional sports [Nosanchuk, MacNeil 1989; Kim 2005]. They put more emphasis on self-discipline, self-control, mental endurance and clarity of mind, relaxation, and finally body and mind balance [Columbus, Rice 1998; Kim 1990, 2005]. The training relies mostly on energy management, both physical and mental. According to Seitz *et al.* [1990], participation in traditional martial arts training promotes mental health development. The effect of taekwon-do training on mental health and overcoming stress was also empirically verified by Park [1995].

One of the elements of good health is the right body posture. It is the movement habit forming on a neurophysiological, osteoarticular, musculoligamentous, and environmental basis [Wilczynski 2003]. The pos-

ture protects the body through the right muscle tone from negative environmental factors [Zeyland-Malawka 1994]. Furthermore, it is one of the indicators of the proper growth, static and dynamic body skills, body functions and fitness as well as the ability to work. The proper posture is obtained through creating proper habits. Advancing civilisation leads to the lack of a habit to take up sports, and thereby it diminishes the resistance to new external factors in young people. Preventive measures mean regular trainings [Hawrylak, Skolimowski 2001; Wojtys, Ashton-Miller 2000]. Accordingly, the risk of a postural defect in adolescence will be lowered if the child is exposed from the early age to the environment where the right posture is of crucial importance [Motow-Czyz 2014].

Forms of certain sports disciplines and the character of trainings influence body posture. The trunk asymmetry has been observed in athletes [Grabara, Handzik 2009]. Diving competitors show body symmetry in the frontal plane [Drzala-Grabiec, Puszczalowska-Lizis 2014]. Young football players, on the other hand, reveal symmetry in the region of the pelvis and scapulae [Grabara 2012].

The question arises whether taekwon-do trainings can constitute the means of creating the right body posture and function as prophylaxis. Therefore, the objective of the research was an attempt to determine the effect of the traditional form of taekwon-do training on a given group of young people. In this study we will address the following research questions:

1. What are the differences in body posture between children and adolescents who practise taekwon-do and children and adolescents who do not practise taekwon-do?
2. Are taekwon-do practitioners characterised by better body symmetry than non-practitioners?

The answers to the questions can contribute to a potential recommendation of taekwon-do exercise as a prophylactic form of postural defects prevention in children and adolescents.

Methods

Subject

41 taekwon-do practitioners were scrutinized. They were divided into two groups. Group 1 (7.4 ± 0.9) consisted of 23 subjects aged 6-9 years, who had trained for 3-12 months. Group 2 (14.3 ± 2.4) consisted of 18 subjects aged 10-18 years, who had trained for 2-14 years. The scrutinized group was chosen without any pre-selection procedure before the examination. The study was performed in one of the traditional taekwon-do clubs in Silesia, Poland. 46 randomly chosen children and teenagers from Silesia, who had not practised any sports regularly (except Physical Education classes), constituted

the control group. The control subjects were also divided into two groups. Group 1 consisted of 23 subjects aged 6-9 years (7.6 ± 0.9), while Group 2 consisted of 23 subjects aged 10-18 years (14.5 ± 2.2).

The Human Subjects Research Committee of the University scrutinized and approved the test protocol as meeting the criteria of Ethical Conduct for Research Involving Humans. All subjects in the study were informed of the testing procedures and voluntarily participated in the data collection.

Protocol

The body measurements were taken by two people, an experienced physiotherapist and a record keeper. The physiotherapist measured topographic points at the sides of the body, and the other person recorded the data. Neither of the people had ever taken up any martial arts. The examined people, stripped to underwear, were measured by means of the device called Duometer Plus OP-1/DA made by OPIW. The measurements were taken at the acromion, inferior angle of the scapula, the highest point of the body of ilium, and at the greater trochanter. The incidence of scoliosis was assessed by means of Bertrand's test [Buckup 2000], which allows to perceive the spinal asymmetry. The incidence of knee abnormalities was assessed on the basis of measurement of the angle between the ossa cruris axis and the femoral axis. The valgus was estimated as the angle larger than 10-15 degrees, while the varus was estimated as the angle larger than 8-10 degrees. The disorders at the foot were assessed on the basis of the foot positioning at rest (sitting position) and putting stress on the foot (standing position). In both positions the condition of the foot arch was assessed.

Statistics

Descriptive statistics were calculated for the studied parameters, i.e. the mean value and standard deviation. The differences between the tested groups were obtained on the basis of Person's test of statistical significance χ^2 . The statistical significance was put at the level of $p < 0.05$. All the measurements were obtained with the use of MS Excel.

Result

The statistical comparisons are shown in Table 1, 2 and 3. The results reveal that there are significant differences existing in body posture between taekwon-do participants and people with limited physical activities. Such differences are found in both children and adolescents.

Table 1. Comparison of postural defects incidence in the TKD group and the control group

	TKD group n=41		Control group n=46	
	No defect	defect	No defect	Defect
Shoulders	15	26	0	46
Scapulae	22	19	0	46
corpus ossis ilii (body of ilium)	16	25	0	46
flat back	16	25	29	17
round back	23	18	8	38
Scoliosis	26	15	13	33
genu valgum (knock-knee)	35	6	29	17
genu varum (bow-leggedness)	37	4	24	22
flat feet	15	26	21	25

Table 2. Comparison of postural defects incidence in the TKD Group 1 (mean age 7.4±0.9) and the control group (mean age 7.6±0.9).

	TKD Group 1 n=23		Control Group 1 n=23	
	No defect	defect	No defect	Defect
shoulders	0	23	0	23
Scapulae	7	16	0	23
corpus ossis ilii (body of ilium)	6	17	0	23
flat back	3	20	14	9
round back	20	3	3	20
Scoliosis	18	5	7	16
genu valgum	19	4	18	5
genu varum	22	1	20	3
flat feet	11	12	10	13

Table 3. Comparison of postural defects incidence in the TKD Group 2 (mean age 15.4±3.2) and the control Group 2 (mean age 14.5±2.2).

	TKD Group 2 n=18		Control Group 2 n=23	
	No defect	defect	No defect	defect
shoulders	15	3	0	23
Scapulae	15	3	0	23
corpus ossis ilii (body of ilium)	10	8	0	23
flat back	13	5	15	8
round back	3	15	5	18
Scoliosis	8	10	6	17
genu valgum	16	2	11	12
genu varum	15	3	4	19
flat feet	4	14	11	12

Discussion

Although *taekwon-do* belongs to the group of popular Far Eastern martial arts and combat sports, there is little research done on the subject. In literature, little data is found indicating the extent to which martial arts have a positive impact on body posture [Mroczkowski 2013; Mroczkowski, Jaskólski 2007].

Both the data in Table 1 and the statistical analysis allow for the assumption that taekwon-do practitioners

are characterised by better body posture than those who do not train any form of physical activity.

The incidence of postural defects in the control group (who did not take up any sport except PE classes) is almost 79%, while in the group of taekwon-do practitioners the value is decreased by nearly half (41%). The statistically significant ($p < 0.05$) training contributes to a decrease in the number of occurrence of the body asymmetry in the shoulders, scapulae, corpus ossa ilii (body of ilium) as well as spinal and knee defects, and

scoliosis. It is assumed that the conditions result from the character of taekwon-do training which encompasses symmetric movement exercise performed both on the left and right part of the body.

No effect of taekwon-do training was noticed with reference to feet deformity incidence, both in the beginner group (Table 2) and the advanced group (Table 3). The data available suggest that the collapse of longitudinal arches of the foot occurs in young taekwon-do practitioners [Błaszczuk *et al.* 2004]. However, further research on the subject is recommended to be conducted. According to the collected data, long-term training is assumed to be advisable in this aspect as there is a significant difference ($p < 0.05$) in the body posture change between the beginner TKD group and the advanced TKD group. The difference is not observed in the control group. Therefore, long-term training is assumed to affect the body posture improvement. In diving competitors, the same tendency is observed [Drzał-Grabiec *et al.* 2014].

The lower incidence of scoliosis, a disease considered as a civilisation disorder, was noticed ($p < 0.05$) in children training taekwon-do for a short time (3-12 months) than in children who do not take up any regular sports activity (Table 2). In case of longer training the statistical significance was not observed.

The occurrence of scoliosis is also lower in the group of aikido practitioners [Mroczkowski, Jaskólski 2007]. According to the analysis of the thoracic kyphosis in taekwon-do practitioners, round back and flat back occur not so frequently than in the control group. TKD Group 1, on the other hand, showed a statistical significance in occurrence of the defects, as compared to the control group. The statistical significance was not noted in the advanced TKD group.

In Group 1 (beginners) there was no significant effect of the training on the defects of the knees (Table 2), although the defects are the most common at this age [Strojek *et al.* 2014]. However, In Group 2 (long-term practitioners), the statistically significant ($p < 0.05$) beneficial effect is observed (Table 3).

This study constitutes just a part of the issue. It is extremely important to conduct research on the effect of martial arts and combat sports training on body posture. Such type of exercise and physical activity can contribute to the postural defects correction. The presented data and the following discussion constitute the comparison of the measurements and pave the way for further studies.

Conclusions

Data based on the results of this study, the following assumptions could be made:

1. The statistically significant differences were observed in most of the recorded body posture measurements

involving the shoulders, the scapulae, the body of ilium, the spine, the knee, and scoliosis) between the groups of taekwon-do practitioners and the control group.

2. Child and adolescent taekwon-do practitioners are characterized by more symmetric body posture than children and adolescents who are not involved in any form of physical activity.
3. Child and adolescent taekwon-do practitioners are characterized by more correct body posture when compared to children and adolescents who do not take up any sports activity.

References

1. Błaszczuk A., Błaszczuk M., Zagorski T. (2004), *Ocena wysklepienia podłużnego stopy u młodych adeptów taekwon-do ITF*, "Sport Wyczynowy", vol. 11-12, pp. 470-480 [in Polish].
2. Buckup K. (2000), *Testy kliniczne w badaniu kości stawów i mięśni*, PZWL, Warsaw [in Polish].
3. Columbus P.J., Rice D.L. (1998), *Phenomenological meanings of martial arts participation* [electronic version], "Journal of Sport Behavior", vol. 21, no. 1, pp. 16-30.
4. Drzał-Grabiec J., Puszczalowska-Lizis E. (2014), *Analysis of selected parameters of body posture in novice divers*, "Polish J. Sport Med", vol. 2(4), no. 30, pp. 103-111.
5. Grabara M., Handzik A. (2009), *The body posture in young athletes compared to their peers*, "Polish J. Sports Medicine" vol. 2(6), pp. 115-123.
6. Grabara M. (2012), *Analysis of Body Posture Between Young Football Players and their Untrained Peers*, "Human Movement" vol. 13(2), pp. 120-126.
7. Hawrylak A., Skolimowski T., Barczyk K., Biec E. (2001), *Asymmetry of trunk in athletes of different kind of sport*, "Polish J. Sports Med", vol. 17, pp. 232-235.
8. Kalina R.M. (2000), *Teoria sportów walki*, COS, Warsaw [in Polish].
9. Kalina R.M., Barczyński B. (2010), *EKO-AGRO-FITNESS© original author's continuous program of health-oriented and ecological education in the family, among friends or individually implemented – the premises and assumptions*, "Archives of Budo", vol. 6, no. 4, pp. 178-184.
10. Kim P.S. (1990), *History of chayon-ryu (as told to Rick Fine)*, Chayon-Ryu International, Houston.
11. Kim P.S. (2005), *Articles by the grandmaster*, "Chayon-Ryu International", vol. 1, pp. 1-20.
12. Motow-Czyz M. (2014), *Postural defects correction in the process of physical education and sport*, "Physical Activity Review", vol. 2, pp. 31-36.
13. Mroczkowski A., Jaskólski E. (2007), *The effect of vertebral rotation forces on the development of pathological spinal curvatures*, "Polish Journal of Physiotherapy", vol. 1(4), pp. 80-86.
14. Mroczkowski A. (2013), *The effect of aikido exercises on shaping spinal curvatures in the sagittal plane*, "Journal

- of Combat Sports and Martial Arts”, vol. 2(2), no. 4, pp. 173-177.
15. Nosanchuk T.A., MacNeil M.C. (1989), *Examination of the effects of traditional and modern martial arts training on aggressiveness*, “Aggressive Behavior”, vol. 15, pp. 153-159.
 16. Park Ch.J. (1995), *The moderating effects of taekwon-do training against stress on mental health*, “WTF Taekwondo”, vol. 57, pp. 29-38.
 17. Pelham J., Gnagy E.M., Greiner A.R., Hoza B., Hinshaw S.P., Swanson J.M. (2000), *Behavioral versus behavioral and pharmacological treatment in ADHD children attending a summer treatment program* [electronic version], “Journal of Abnormal Child Psychology”, vol. 28, pp. 507-521.
 18. Seitz F.C., Olsen G.D., Locke B., Quam R. (1990), *The martial arts and mental health: The challenge of managing energy*, “Perceptual and Motor Skills”, vol. 70, pp. 459-464.
 19. Strojek K., Bulatowicz I., Radziminska A., Kazmierczak U., Siedlaczek M., Lipiec M., Dzierzanowski M., Zukow W. (2014), *Evaluation of body posture on preschool children*, “Journal of Health Sciences”, vol. 4(7), pp. 229-240.
 20. Tarabanov A. (2011), *Therapeutic ethos and martial arts*, “Ido Movement for Culture. Journal of Martial Arts Anthropology”, vol. 11, no. 1, pp. 33-36.
 21. Wasik J. (2014), *Three Areas of Taekwon-do Identification and Practice*, “Ido Movement for Culture. Journal of Martial Arts Anthropology”, vol. 14, no. 3, pp. 22-26.
 22. Wilczynski J. (2003), *Postawa ciała, a charakter człowieka*, ”Kultura Fizyczna”, vol. 5-6, p. 7 [in Polish].
 23. Wojtys E.M., Ashton-Miller J.A., Huston L.J., Moga P.J. (2000), *The association between athletic training time and sagittal curvature if the immature spine*, “The American Journal of Sports Medicine”, vol. 28, pp. 490-498.
 24. Zeyland-Malawska E. (1994), *Ćwiczenia korekcyjne*, AWF, Gdańsk, pp. 7-9 [in Polish].

Analiza porównawcza postawy ciała dzieci i młodzieży trenującej i nie trenującej taekwon-do

Słowa kluczowe: wady postawy, taekwon-do, symetria ciała, postawa ciała, duometr plus

Abstrakt

Wstęp. Rozwój cywilizacji, intensywność współczesnego życia, zmiany sposobu żywienia i stylu życia są obecnie czynnikami, które sprzyjają powstawaniu chorób cywilizacyjnych, do których bez wątpienia należą wady postawy ciała. Jedną z sposobów terapii i profilaktyki wad postawy ciała jak pokazują współczesne badania może być trening taekwon-do. Badania naukowe dowiodły, że im bardziej człowiek prowadzi mało ruchliwy tryb życia (zwłaszcza siedzący), tym w szybszym tempie jego układ mięśniowy staje się niewydolny i traci zdolności stabilizacji czynnej kręgosłupa. Wynikiem tej zatraconej stabilizacji czynnej kręgosłupa są zaburzenia w symetrii ciała.

Cel. Przedmiotem badań była postawa ciała dzieci i młodzieży

trenującej i nie trenującej taekwon-do. Celem badań była próba porównania postawy ciała dzieci i młodzieży trenującej tradycyjną odmianę taekwon-do do postawy ciała dzieci i młodzieży nie trenującej żadnej dyscypliny sportowej.

Metoda. Przebadano 41 zawodników taekwon-do. 23 osoby w wieku od 6 lat do 9 lat stanowiły I grupę (7.4 ± 0.9) trenującą od 3-12 miesięcy. 18 osób w wieku od 10 do 18 lat (14.3 ± 2.4) – II grupa, trenująca od 2-14 lat. Badania przeprowadzono w jednym ze śląskich klubów tradycyjnego taekwon-do. Grupę kontrolną stanowiło 46 dzieci i młodzieży ze śląska wybranych losowo nie uprawiająca systematycznie sportu (poza lekcjami wychowania fizycznego w szkole). W skład I grupy wchodziły 23 osoby w wieku 6 lat do 9 lat (7.6 ± 0.9), a II grupy 23 osoby w wieku 10 lat do 18 lat (14.5 ± 2.2). Do analiza postawy ciała wykorzystano aparat Duometr Plus OP-1/DA firmy OPIW, test Berntranda oraz ocenę kąta zawartego między osią podudzia, a osią uda, jak również ocenę kąta wysklepienia stopy. Za pomocą niego wykonano pomiary symetrii ciała (barków, łopatek), pomiar pochylenia miednicy w płaszczyźnie strzałkowej, koślawości i szpotawości kończyn dolnych, kształtu kręgosłupa oraz asymetrii tułowia. Do analizy danych wykorzystano statystyki opisujące zbiorowość tj. średnia i odchylenie standardowe. Różnice między porównywanymi grupami oceniono za podstawie testu istotności χ^2 Pearsona. Istotność statystyczną przyjęto na poziomie $p < 0.05$.

Wyniki. Wyniki badań pokazują występowanie obniżenia sklepienia stopy u 26 osób trenujących taekwon-do. W grupie kontrolnej obniżenie sklepienia miało 25 osób. W przypadku analizy symetrii punktów topograficznych ciała asymetrię barków miało 26 zawodników, łopatek 19 zawodników i talerzy biodrowych 25 zawodników. W grupie kontrolnej wszyscy badani mieli zaburzenia w symetrii barków, łopatek i talerzy biodrowych (46). Wyniki badań grupy ćwiczącej 3-12 miesięcy prezentują występowanie u tej grupy osób najczęściej asymetrii barków (23 osób) i pleców płaskich (20 osób). Wśród grupy trenującej taekwon-do 2-14 lat najczęstszymi zaburzeniami w obrębie ciała są obniżone sklepienie stopy (14 osób) i plecy okrągłe (15 osób). Zaburzeniami występującymi bardzo rzadko są zaburzenia symetrii ciała w obrębie barków i łopatek. I tak asymetrie ciała barków i łopatek miało 4 zawodników trenujących taekwon-do 2-14 lat.

Dyskusja. Wyniki badań oraz analiza statystyczna pozwalają na stwierdzenie, że osoby trenujące tradycyjną odmianę taekwon-do charakteryzują się poprawniejszą postawą ciała w stosunku do osób nie trenujących. Wady w grupie kontrolnej (nie uprawiającej sportu poza lekcjami wychowania fizycznego) występują prawie 79%, natomiast u trenujących taekwon-do prawie o połowę mniej (41%). Osoby trenujące taekwon-do charakteryzują się większą symetrycznością ciała w obrębie barków, łopatek i talerzy biodrowych niż te nie trenujące ($p < 0.05$). Można przypuszczać, że wpływ na to ma specyfika treningu taekwon-do. Wiąże się ona z ćwiczeniami opierającymi się na symetrycznych ruchach, wykonywanych równomiernie na lewą i prawą stronę ciała. Z danych dotyczących występowania wad stóp można wnioskować, że u

trenujących taekwon-do nie stwierdza się istotności statystycznej w obrębie tego aspektu w stosunku do grupy kontrolnej. Można jednak odnaleźć w literaturze prace stwierdzające, że u młodych adeptów trenujących taekwon-do dochodzi do obniżenia łuku podłużnego stopy. Dlatego uzasadnione wydaje się być pogłębienie badania w tym zakresie. Być może, aby poprawić tego rodzaju wadę potrzeba dłuższego treningu. Analiza badań prezentuje mniejsze występowanie skoliozy ($p < 0.05$) u osób uprawiających taekwon-do w stosunku do responden-

tów nie uprawiających systematycznie aktywności fizycznej. Wnioski. Analiza pokazała znaczące różnicę w postawie ciała osób trenujących i nie trenujących taekwon-do. Zauważa się istotne statystycznie różnice w większości zbadanych parametrów postawy ciała (tj. barków, łopatek, talerzy biodrowych, pleców, skoliozy i kolan) między grupą trenującą taekwon-do, a grupą kontrolną. Dzieci i młodzież trenująca taekwon-do charakteryzuje się poprawniejszą postawą ciała w stosunku do dzieci i młodzieży nie trenującej.