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Physiological Characteristics of Taekwondo Athletes

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Abstract

Taekwondo, as an Olympic sport, has always been attached to great importance by all sectors of society, but the physiological demand of this sport is still relatively short of research. Therefore, there is still a lack of theoretical support for the actual needs of Taekwondo athletes for special training and physical training. Through searching the previous literature, the research found that (1) there is a lack of research on the aerobic capacity of Taekwondo athletes; (2) Athletes need a lot of reserves and the ability to quickly synthesize ATP, have the ability to tolerate lactic acid, and the aerobic ability to quickly eliminate lactic acid for post-competition recovery; (3) Aerobic training should be arranged in the training class or added at the end of each class; (4) LDH level can be one of the factors to evaluate the level of Taekwondo athletes.

Keywords: Taekwondo athletes, physiological characteristics, aerobic capacity, anaerobic capacity, training methods

1. Introduction

Taekwondo is a kind of human unarmed combat sports event that focuses on leg techniques, supplemented by boxing, and pays attention to etiquette. In the competition, the athletes look for a reasonable strike opportunity in the fight through technical actions such as turning kick, back kick, reverse kick, and swinging kick, and use effective technical actions to hit the scoring position of the other side, so as to defeat the opponent by higher score. Since Taekwondo is a kind of confrontational projects in the same field, and its athletic performance largely depends on the exertion of strategy and tactics and technical level, but the energy supply level of the athletes' body energy metabolism system and psychological state plays an important role. Therefore, it is necessary to clarify the special features of the body energy metabolism system of Taekwondo athletes, find out the shortcomings of the existing Taekwondo training system in improving the energy supply ability of athletes, and put forward measures to improve the training methods.

In previous studies, the exploration of the unique physiological characteristics of Taekwondo athletes is relatively lacking. In the limited research that has been retrieved, most of them are related to the two words of strength training and lactic acid. There are few literatures on aerobic ability and lack of suggestions on aerobic training. This review will attempt to provide insights into its physiological characteristics by reviewing existing studies. It is

hoped that this information will provide some basis for improving the way athletes train.

2. Method

With "Taekwondo and physiological" as the keywords, the subject words were searched in the CNKI and Web of Science (the deadline is February 1, 2023), and 22 Chinese and 148 English documents were obtained. Finally, a total of 41 Chinese and English articles on sports biology were sorted out, and then read and sorted out.

3. Results

During training and competition, Taekwondo is powered by three kinds of energy metabolism system. The time of each attack and defense is only 0.41 to 0.54s (Gao Binghong, 2004), indicating that Taekwondo technique requires explosive muscle exertion in a short period of time. Therefore, Taekwondo athletes are required to have a good storage and energy supply capacity of ATP and CP, that is, the energy supply capacity of high-energy phosphates. (Santos Jonatas Ferreira da Silva PhD1, Dias Wilson Vinicius PhD1, Herrera-Valenzuela, Tomas PhD2,3 & Sander Mansur Machado Frederico PhD1., April, 2020) A series of explosive exertion after a short interval will lead to the participation of glycolysis energy supply to a certain extent, which will inevitably lead to the accumulation of BLA. This also indicates that Taekwondo athletes should also have a certain level of lactic acid tolerance ability, that is, a strong glycolysis energy supply ability.

Research by Janowski, Michał and others shows that we can find that Taekwondo is increasingly showing the characteristics of greater physical movement range, higher intensity and greater post-exercise fatigue in the process of constantly improving and adjusting the competition rules. (Janowski Michał, Zieliński Jacek & Kusy Krzysztof, August, 2021) High-intensity training needs excellent anaerobic ability of athletes, and recovery after competition needs aerobic ability of athletes as support. Therefore, the changes of the rules put forward higher requirements for high-intensity training and post-match recovery of Taekwondo. Only one Taekwondo match will not last long, but due to the arrangement of the competition system, the same kilogram competition will win the championship in one day, so the intensity of the competition will be relatively high. It means that athletes need to have multiple competitions in one day. Therefore, Taekwondo athletes should have strong aerobic endurance as the basis, so that the aerobic energy supply system can constantly supplement ATP and CP, and accelerate the elimination of lactic acid in the body. Otherwise, it will be difficult to ensure that athletes have sufficient physical strength and explosive power to complete technical movements and all competitions. (Gao Binghong, 2004)

3.1 Aerobic Capacity

Taekwondo athletes not only need to have anaerobic metabolism ability, but also need to have a strong aerobic metabolism ability, with a high maximum oxygen uptake value, in other words, good cardiopulmonary function. (Bridge, C.A., Ferreira da Silva Santos, J., Chaabène, H. et al., 2014) According to Lenetsky, Seth's research literature report, the maximum aerobic capacity of Taekwondo is higher than that of today's excellent endurance athletes, such as elite athletes and speed skaters (Lenetsky Seth & Harris Nigel PhD., February, 2012). There is no significant difference between the maximum oxygen uptake of excellent Taekwondo athletes and that of excellent track and field endurance athletes (Hong Shanglai, 1997), which indicates that the VO_2max value of Taekwondo athletes is large and their aerobic capacity is strong. And the higher the level of athletes, the greater the VO2max, suggesting that Taekwondo sports require athletes to have strong aerobic metabolism capacity (Chen Lin, Zhao Bing, Liu Xiaoqian & Huang Ningning, 2007).

Melhim's research shows that Taekwondo practice can promote the development of male teenagers' anaerobic ability, but it has no obvious effect on the improvement of aerobic ability. (Melhim AF., 2001) However, excellent Taekwondo athletes need aerobic ability as support. Therefore, in addition to special training, athletes also need to add aerobic training as a supplement to better improve sports performance.

3.2 Anaerobic Capacity

Taekwondo is a competition with high exercise intensity and short exercise time mainly based on glycolytic metabolism for energy supply. In this intense exercise, the proportion of glycogen in skeletal muscle undergoing anaerobic metabolism to supply energy increases, generating a large amount of lactic acid, and diffusing it into the blood, so that the blood

lactic acid increase. The research results from the aspect of blood lactic acid showed that the intensity of Taekwondo competition was slightly lower than that of other antagonistic events, and the proportion of anaerobic glycolysis energy supply was correspondingly less than that of other antagonistic events.

The reasons for this situation may be as follows: (1) The short time and high-intensity explosive force (6s-8s) are mainly powered by the maximum output power of the phosphagen system, namely ATP-CP system, with less lactic acid accumulation; (2) The number of lactic acid elimination in the competition is more than that in other rival events;(3) The characteristics of technical movements are different; (4) The competition time is long, and aerobic metabolism participates in energy supply. Therefore, Taekwondo athletes should have the strong energy supply capacity of phosphate and glycolysis. (Chen Lin, Zhao Bing, Liu Xiaoqian & Huang Ningning, 2007)

LDH activity increased significantly after exercise, which was conducive to glycolysis to produce lactic acid and ATP. After Taekwondo competition, the LDH activity of Chinese athletes increased by 108.87 IU/L ($P<0.01$), with an increased rate of 131.8%. The increase of LDH after exercise in high-level athletes is smaller than that in low-level athletes. This is because the athletes with high training level have more ATP and CP stored in the muscle, and in the same intensity exercise, the athletes with high training level have less LDH leakage in the muscle fiber membrane (Lin Geyou, 2000).

4. Discussion

First of all, in the existing literature, there are few studies on the physiological characteristics of Taekwondo athletes, and the relevant literature mainly focuses on strength training and lactic acid and other indicators, lacking the research on aerobic capacity.

Secondly, from the analysis of Taekwondo's competition time characteristics, competition system and competition rules, Taekwondo athletes need to have the ability to quickly synthesize ATP, the ability to tolerate lactic acid, and the aerobic ability to quickly eliminate lactic acid for post-competition recovery.

Thirdly, research shows that special training cannot effectively develop the aerobic ability of athletes, so it is necessary to add separate aerobic training courses or aerobic training content after each class in the training plan.

Fourth, the maximum aerobic capacity of excellent Taekwondo athletes is higher than that of today's excellent endurance athletes, the intensity of Taekwondo competition is slightly lower than that of other antagonistic events, and the proportion of anaerobic glycolysis energy supply is less than that of other antagonistic events. The increase in LDH after exercise in high-level athletes is smaller than that in low-level athletes.

5. Conclusions

Although a lot of research has been done on Taekwondo in the existing literature, there are still a lot of data from simulated matches rather than real matches, so the data obtained by the research is still different from the actual matches. Although this review failed to analyze the impact of various physiological indicators on Taekwondo sports, it also proved again the importance of the three energy supply systems of the human body for Taekwondo athletes, and put forward some suggestions on the training plan, hoping to help the faster development of this project.

References

Bridge, C.A., Ferreira da Silva Santos, J., Chaabène, H. et al. (2014). Physical and Physiological Profiles of Taekwondo Athletes. *Sports Med*, *44*, 713–733. https://doi.org/10.1007/s40279-014-0159-9.

Chen Lin, Zhao Bing, Liu Xiaoqian, Huang Ningning. (2007). The development characteristics and scientific research status of Taekwondo in China and its suggestions. *Hubei Sports Science and Technology*, (03), 249-252.

Gao Binghong. (2004). Study on the time structure and energy metabolism characteristics of taekwondo match. J*ournal of Beijing Sport University*, (05), 639-641. DOI:10.19582/j.cnki.11-3785/g8.2004.05.021.

Hong Shanglai. (1997). Research on some physiological and biochemical characteristics of Korean excellent taekwondo athletes (to be continued). *Journal of Beijing Sport University*, (01), 22-29. DOI:10.19582/j.cnki.11-3785/g8.1997.01.005.

Janowski, Michał; Zieliński, Jacek; Kusy, Krzysztof. (August, 2021). Exercise Response to Real Combat in Elite Taekwondo Athletes Before and After

Competition Rule Changes. *Journal of Strength and Conditioning Research, 35*(8), 2222-2229, DOI: 10.1519/JSC.0000000000003110.

Lenetsky, Seth; Harris, Nigel PhD. (2012, February). The Mixed Martial Arts Athlete: A Physiological Profile. *Strength and Conditioning Journal, 34*(1), p 32-47. DOI: 10.1519/SSC.0b013e3182389f00.

Lin Geyou. (2000). Research on the changes of maximum oxygen consumption, blood lactic acid and serum LDH activity of taekwondo athletes before and after competition. *China Sports Science and Technology*, (11), 41-42. DOI:10.16470/j.csst.2000.11.014.

Melhim AF. (2001). Aerobic and anaerobic power responses to the practice of taekwon-do. *British Journal of Sports Medicine*, *35*, 231-234.

Santos, Jonatas Ferreira da Silva PhD1; Dias Wilson, Vinicius PhD1; Herrera-Valenzuela, Tomas PhD2,3; Sander Mansur Machado, Frederico PhD1. (2020, April). Time-Motion Analysis and Physiological Responses to Taekwondo Combat in Juvenile and Adult Athletes: A Systematic Review. *Strength and Conditioning Journal, 42*(2), 103-121. DOI: 10.1519/SSC.0000000000000517.