ISSN: 1813-4890

Swimming Faster: Based on the Selection of Swimmers and the Technical Perspective

Bin Gong

Guangzhou Bayi Experimental School, Guangzhou, 510000, China

Abstract

With the continuous renewal of swimming world records, human beings are gradually approaching the limit of swimming speed, and at the same time, people are further exploring the science of swimming sports. This study reviews the sports biology of swimming projects from the perspective of technology, physiology, competition and training of swimming projects, and finds that swimming sports have a strong correlation with body morphology, physiological function and sports quality; technical training, body movement control, strength training, flexibility training, rhythm training, and warm-up exercises are the secrets of swimming faster. In the future, we should strengthen the study of the biological characteristics of swimming sports and provide a reference for the development of scientific training plans for swimming sports.

Keywords

Swim Faster; Swim; Biological Characteristics; Athletes.

1. Introduction

Swimming is the use of muscle contraction through the breathing of the body in the water to control water temperature, maintain balance, and eliminate stress [1]. At present, the competition of modern competitive swimming projects is the competition of technical details, in order to improve the competitive ability of swimmers, it is not only necessary to strengthen daily science and long-term training, but also to make swimmers have good physical fitness, which is a basic condition to ensure that swimmers can achieve ideal results [2]. From the perspective of training effectiveness, swimming training involves a lot of physiological knowledge, such as: why can athletes lie prone or float on their backs? Why do different postures require different muscle movements? How do I adjust my breathing rate during exercise? How to improve swimming speed and swimming rhythm? Whether these are closely related to biological knowledge [3]. In order to scientifically improve the performance of swimming sports, it is necessary to analyze the internal relationship between swimming projects and biology from a scientific point of view, in order to provide reference and reference for the selection and training of swimmers.

2. Correlation between Swimming Events and Body Shape

Swimming is a sport that improves speed and endurance, so swimmers must meet the standard requirements [4] . The most ideal body shape is: slender body, well-proportioned body, wide back and long hands, smooth muscles, developed chest, flexible limb joints, etc. The results of the previous review of the previous research can be seen that the basic body shape of swimmers is as follows: (1) the body is slender and symmetrical, and the height of the world's high-level swimming male athletes is more than 1.85 meters, while the height of short-distance swimming athletes is more than 1.95 meters; the general standard of height of the world's high-level female athletes is 1.75-0.85. (2) Adapted weight and higher height; (3) Longer outstretched arms and higher height; (4) Larger bust and body mass index [5].

ISSN: 1813-4890

3. Correlation between Swimming Sports and Athletic Qualities

In sports training, the athletic quality characteristics of athletes are more complex, involving many indicators, such as strength, endurance, speed, flexibility, etc[6]. Regarding the selection of swimming sports quality, the strength of athletes comes from the upper limbs, small limbs and various parts of the body, and the greater the strength, the better [7]. For the tolerability of athletes, it is usually based on age to choose the corresponding reference indicators: 9-10, 11-12, 13-14-year-old athletes refer to the comprehensive results of 400, 800, 1500 meters freestyle respectively; the speed of athletes has a great correlation with explosiveness, generally choose 50 meters fast swimming or any kind of best swimming posture 50 meters as the evaluation item, the faster the better. For the athlete's flexibility evaluation, there are three corresponding methods: (1) the flexion and extension of the ankle joint: the > 180° when the toes are extended, and the < 90° when the toes are flexed; the feet are closed and can be in a straight line; (2) the shoulders are extended, the shoulders are lifted, and the angle between the shoulders and the torso is > 180° is the best; (3) the back arm body is flexed, the fingers are crossed at the back of the body, the body is leaned forward, the upper body is bent, the feet are closed and the legs are straight, and the distance between the hand and the ground is as short as possible when the arm is turned forward [8].

4. Correlation between Swimming Movement and Physiology

Changes in physiology are an important influencing factor in whether swimmers are able to achieve their desired results. During the growth stage of children, their physical development will have a great impact on the physical flexibility, coordination, and imitation of athletes, which is also a key indicator of whether athletes can embark on the path of career development [9].

4.1. Correlation between Swimming Exercise and Human Body Density

For the average density of the body, it is equal to the density of water [10]. The body tissue is divided into densities according to the size of the total amount of different elements per unit volume, including three categories, namely: high density, medium density and low density. Among them, high density usually includes bone tissue, calcified foci, etc.; medium density usually includes: cartilage, muscles, nerves, internal organs, etc.; low density usually includes fat groups and gases suspended in the respiratory tract, sinuses, papillomas and other parts. For the above three types of tissues, the reason why swimmers float in water generally depends on the support of low-density tissues, especially some cavity tissues or organs, such as lung tissue, gastrointestinal system, etc. After the above types of cavity tissues or organs are filled with air, they will cause the body volume to expand rapidly, reduce the density, and bring support to the realization of body floating. Therefore, swimmers should strengthen the training of lung capacity and improve their cardiopulmonary function in daily training [11].

4.2. Correlation between Swimming Movement and Breathing

In swimming training, breathing is very critical, as it provides ample oxygen to the athlete, ensuring that they can swim continuously. During exercise, there are two ways to breathe, which are: abdominal breathing and chest breathing. During training, it is necessary to flexibly select and adjust according to the actual situation of the athletes. It follows the principle of promoting breathing without affecting movements of technique or movement [12] .In general, in the process of training such as arms flexion, abduction, external rotation, chest expansion, shoulder lifting, body expansion, and anti-arch, it is ideal to choose the inhalation mode; however, in the process of completing the above actions and performing the opposite action training, the selection of the exhalation mode is very ideal. The reason for this is that swimming is a relatively standard and standardized cyclical movement change, and it is necessary to

ISSN: 1813-4890

adjust the rhythmic and regular breathing changes. If the athlete's breathing rate is stable and the rhythm is relatively coordinated, it can be easier and more efficient in the process of swimming, which will lead to more ideal swimming results [13].

In swimming training, the purpose of breathing exercise is to ensure that athletes fill the alveolar cavity of the lungs with a large amount of aerobic fresh air as much as possible during the inhalation process, but according to the theory of sports anatomy, physiology and so on, this is unrealistic. Through the analysis of physiological structure, the respiratory system includes two major components: (1) anatomical ineffective cavity, which generally refers to the airway tissue of different grades that cannot be exchanged for gas; (2) it is integrated through 600-700 million alveoli and has functions such as free gas exchange [14]. During exercise, the way to gradually reduce the excess gas in the alveolar cavity is to breathe deeply as much as possible, in this regard, many athletes can gradually increase the fresh gas content in the alveolar cavity through rhythmic and powerful deep exhalation, which can greatly improve the body's anti-hypoxia level during exercise. During swimming, it is necessary to gradually improve breathing adaptability through methods such as holding breath, and the corresponding advantages are very obvious [19]. Holding breath during swimming must be artificially regulated to maximize the effect of holding breath during swimming, so as to minimize the adverse effects of its side effects. It is best practiced to maintain a degree of deep inhalation before holding the breath, because there is an internal pressure in the chest and abdominal cavity, which is a slowly decreasing process, and the exhalation needs to be discharged gradually and orderly through the glottis position [14].

During swimming, the use of nasal breathing, oral breathing and other effects are more ideal, and the reason for this is that combined breathing can greatly reduce the ventilation resistance of the respiratory tract and increase the amount of ventilation, which can effectively reduce the resistance of the respiratory tract [16], thereby increasing additional consumption, and can also delay the formation of physical fatigue, completely exposing the mouth full of blood vessels. During swimming, a period of time will cause people to have obvious chest tightness, shortness of breath, dyskinesia, emotional disorders and other manifestations, which is generally called "pole" [17]. The reason for the "pole" is that the body cannot truly adapt to the changes in the body's vigorous movement in the process of respiratory circulation, resulting in a serious lack of oxygen in the body, in this state, the body's metabolism will produce more acidic substances, resulting in a gradual decline in the body's exercise ability. The ideal way to solve this problem is to focus on deep exhalation while maintaining a rhythmic deep breathing, so that you can inhale as much fresh air as possible and greatly increase the amount of oxygen inhaled [18] .

5. Tips for Traveling Faster

5.1. Technical Training

Swimming is known to be not only a physical exercise, but also a technical sport [19]. Therefore, it is very important to strengthen the technical training of athletes, which is also a key point to improve the swimming performance of athletes and promote their physical fitness. It is worth noting that in the process of technical training, it is very important to grasp the core technology, that is to say, it is necessary to focus on the advantages and disadvantages of their swimming training skills, and at the same time, they also need to develop good habits of perseverance, in order to maximize the training effect and promote the swimming speed of athletes to greatly increase [20].

5.2. Body Movement Control Training

In order to improve the swimming speed of athletes and reduce their resistance in the water as much as possible, the choice of streamlined swimming route is the most ideal, which can

ISSN: 1813-4890

strengthen the effective control and adjustment of the movement amplitude in the process of increasing the speed of athletes. For example, for the athlete's head, it is an important hub for controlling the direction, and in the process of stretching, it is necessary to ensure a good streamline, the head is like a steering wheel, and the legs are like an engine. In terms of fluid movement in the body, the direction and speed of movement need to be controlled in the water, and in general, curved movement is the best way to ensure that athletes get the most effective thrust [22]. In the process of paddling, it is necessary to ensure that the hand and the direction of progress form a specific angle, which generates a driving force. Fluid resistance is generally the maximum force that ensures that the body swims forward[23]. Therefore, swimmers must find an ideal point of force support to ensure that the hands and legs can coordinate with each other [24] .

5.3. Strength Training

Swimming is an anti-resistance sport, so swimming must rely on strength support, in the process of strength training, anti-resistance training is one of the most important components, it is conducive to greatly improving the tolerance and explosiveness of muscles, can make muscles in the process of confrontation training become stronger [25]. In order to be able to increase the swimming speed of athletes, it is very important to increase the intensity of strength training. For freestyle, backstroke and other methods, in the process of strength training, it is necessary to strengthen the training of the target muscle groups such as shoulders, arms, back, chest and so on. In order to enable swimmers to have a beautiful upper body line in the process of confrontation training, at this time, not only can the athletes be full of strength, but also to achieve the purpose of flexible control, so that where the athletes are going to exert their strength, they can be weak, and promote the body strength to play a greater and more coordinated role [26].

5.4. Flexibility Training

According to the training standards of professional swimmers, the flexibility training of the ankle is very important, the purpose of which is to be able to generate more thrust through the leg beating action, so that the athlete's swimming speed can be gradually increased in the process of floating board pushing[27]. The flexibility of the ankle must be appropriate, and not too high or too low, only in this way can we ensure that the athlete produces a larger propulsion force in the process of hitting the leg, so as to gradually increase the swimming speed. Generally for some adult swimmers, if you can ensure that the soles of the feet and legs are in a straight line, then this training effect is still enough. Of course, good movement rhythm and control require long-term training to be able to obtain, in the usual training period, it is necessary to consciously repeat the rhythm training, clarify the range of movement of some parts of the action, so as to facilitate targeted stretching and flexion, in order to promote the body's sense of rhythm gradually increased [28].

5.5. Rhythm Training

Professional athletes must control the speed and direction of paddling in the process of swimming, which is an important way to ensure that they float on the surface of the water to achieve a fast rhythm. Generally speaking, the intensity of the athlete's stroke can be gradually increased by the group interval training method. For the grasp of swimming rhythm, it is generally closely related to the sequence of movements, the amplitude of movements, and the size of muscle strength. Therefore, during the paddling speed control and rhythm training, it is necessary to flexibly adjust the action characteristics in combination with the swimming method, and gradually improve the rhythm of force through arm stroke, pushing water, foot beating, pedaling water, etc., so that its paddling effect can be effectively controlled, so that the athlete's movement trajectory can be more coordinated and stable [29].

ISSN: 1813-4890

6. Conclusion

According to the analysis of physiological characteristics, there is a great correlation between the improvement of swimming speed and physical fitness and physiological function. It can be seen from the review of this paper that the athletic quality of swimmers is very important, which is a basic element that affects the improvement of their performance. The physiological function of athletes is also a detail that cannot be ignored, although these have biological genetic characteristics, but can also be improved and enhanced in long-term training. At the same time, in the process of improving swimming speed, technical training, strength training, body control, paddling rhythm training, flexibility training, warm-up exercises and other content should be strengthened.

Acknowledgments

This research was supported by the Zhaoqing University Research Fund Project and the 2020 Guangdong Provincial Education Science "Thirteenth Five-Year Plan" project. Among them, the subject names are the research on the construction and influencing factors of the physical and mental health index of college students from the perspective of physical exercise, and the research on the innovative model of applied talents training for first-class physical education majors in Guangdong Province; the subject numbers are: 202028, 2020GXJK382.

References

[1] Chen Jiexing,Wen Yuhong,Shen Sijia,Peng Yi,Zhang Teng. Research Progress on Swimming Drag Reduction and Propulsion Optimization Technology[J].Sports Science,2021,41(08):79-86.

[2] Zhang Liqing,Liu Daqing,Li Jian,etc. Study on the Special Characteristics of Synchronized Swimming Project[J]. Journal of Beijing Sport University, 2013(9):7.

[3] ZHANG Yong. Experiment on "Exploring the Role of Fish Fins in Swimming"[J]. Teaching Biology, 2011, 036(003):63.

[4] WANG Yongqin. Innovation in Traditional Classical Biology Experiments: A Revolution in exploring the Biological Significance of Organs in Swimming Behavior of Fish Fins[J]. Reading and Writing Arithmetic: Research on Education and Teaching, 2012, 000(085):111-111,112.

[5] ZHANG Bin. Biological knowledge in swimming sports[J]. Biology Teaching in Secondary Schools, 2015(6X):2.

[6] Hu Helen. Biological mechanism of swimming and flight[J]. Introduction to The Review of New Books on Foreign Science and Technology, 2005(10):2.

[7] Chen Wan, Tian Shibin, Liu Qian, et al. Variation characteristics of muscle oxygen content and related indexes in short-term high-intensity interval training of swimmers[J]. Journal of Chengdu University of Physical Education, 2015, 41(5):106-110.

[8] Li Xin,Cai Hengsheng. Characteristics of Athletic Performance of Swimmers at Tokyo Olympic Games 2020[J]. Youth Sports, 2021, (09)73-76.

[9] Xu Li. Analysis on The Current Situation of Swimming Teaching in College of Physical Education[J]. International Journal of Social Sciences in Universities, 2021(03).

[10] Bo Yang; Yufeng Zhang. On the Application of Core Strength Training in Swimming Training[J]. International Journal of Social Science and Education Research,2020(07).

[11] Sánchez-Molina Joaquín;Tronero-Aguilera José F;Clemente-Suárez Vicente J. Psychophysiological respond in a swimming ultraendurance event.[J]. The Journal of sports medicine and physical fitness, 2020(07).

[12] Bong Joon Kwak;Yeon Taek Jeong.Effect of Vacation Swimming Program on Sport Fun, Flow Experience and Participation Satisfaction of the Elementary School Students[J]. Journal of the Korean society for Wellness, 2020(05).

ISSN: 1813-4890

[13] Beat Knechtle;Athanasios A. Dalamitros;Tiago M. Barbosa;Caio Victor Sousa;Thomas Rosemann. Sex Differences in Swimming Disciplines—Can Women Outperform Men in Swimming?[J]. International Journal of Environmental Research and Public Health,2020 (05).

[14] Adriano Sanchez Lastra Miguel;Ivan Martinez Lemos Rodolfo;Diaz Roberto;Villanueva Maria;Ayan Carlos. Effect of a swimming program on physical condition of preschoolers[J]. RETOS-NUEVAS TENDENCIAS EN EDUCACION FISICA DEPORTE Y RECREACION, 2020(01).

[15] Kang Hyo Min;Choi Yun Joo;Choi Suk Hwan. The Structural Relationship among enjoyment factor, physical self-efficacy and resilience of Participation in Survival Swimming Program of Elementary School[J]. Korean Journal of Sports Science. 2019(12).

[16] Lee Jaehyung;Kim Jaehwa. Development of Survival Swimming Curriculum for Prevention of Drowning[J]. Journal of Coastal Research. 2019(07).

[17] Roberto Baldassarre;Maddalena Pennacchi;Antonio La Torre;Marco Bonifazi;Maria Francesca Piacentini. Do the Fastest Open-Water Swimmers have A Higher Speed in Middle- and Long-Distance Pool Swimming Events?.[J]. Journal of Functional Morphology and Kinesiology, 2019, (03).

[18] Jaehyung Lee;Jaehwa Kim. Development of Survival Swimming Curriculum for Prevention of Drowning: Delphi Method[J]. Journal of Coastal Research,20,19(01).

[19] Bartolomeu Raul F;Costa Mário J;Barbosa Tiago M.Contribution of limbs' actions to the four competitive swimming strokes: a nonlinear approach.[J]. Journal of sports sciences, 2018(08).

[20] De Jesus Kelly;Sanders Ross;de Jesus Karla;Ribeiro João;Figueiredo Pedro. The Effect of Intensity on 3-Dimensional Kinematics and Coordination in Front-Crawl Swimming.[J]. International journal of sports physiology and performance. 2016(09).

[21] GuofangHao;JingZhang. Design and Practice of the Competition Schedule Arrangement System of Swimming Sports Based on Artificial Intelligence[J]. Journal of Residuals Science & Technology. 2016(06).

[22] Röhl C;Batke M;Damm G;Freyberger A;Gebel T. Blood pressure behaviour in pre-hypertensive men engaged in a regular swimming program.[J]. Archives of toxicology, 2022, (04).

[23] Alejandro Rodriguez Montero;Maria Morera;Kristy Barrantes Brais;José Alexis Ugalde Ramírez. Relation between Motivational Factors, Age, and Gender of Individuals Participating in a Swimming Project[J]. MHSalud, 2014(08).

[24] Luciela Vasile. Theoretical and Methodical Aspects Regarding the Stroke Strategy in Swimming[J]. Procedia - Social and Behavioral Sciences, 2014(06).

[25] Zhao Weimin;Guo Yezhou. Retraction Note to: Big data detection of marine biological characteristics and juvenile swimming based on massive data[J]. Arabian Journal of Geosciences, 2021(11).

[26] Mondelli Cecilia;Lari Giacomo;Dapsens Pierre;Perez Ramirez Javier. From biomass to chemicals: Swimming lessons for heterogeneous catalystst.[J]. ABSTRACTS OF PAPERS OF THE AMERICAN CHEMICAL SOCIETY, 2020(,12).

[27] Bong Joon Kwak;Yeon Taek Jeong.Effect of Vacation Swimming Program on Sport Fun, Flow Experience and Participation Satisfaction of the Elementary School Students[J]. Journal of the Korean society for Wellness, 2020(05).

[28] WillcoxPidgeon Stacey M;Peden Amy E;Scarr Justin. Exploring children's participation in commercial swimming lessons through the social determinants of health.[J]. Health promotion journal of Australia : official journal of Australian Associati2020(03).

[29] Zamparo Paola;Cortesi Matteo;Gatta Giorgio. The energy cost of swimming and its determinants.[J]. European journal of applied physiology, 2020, (01).

[30] Szájer Péter;Tóth László;Szemes Ágnes;Nagy Nikoletta;Zala Borbála. A comparative analysis of national Olympic swimming team members' and para-swimming team members' psychological profiles[J]. Cognition, Brain, Behavior. An interdisciplinary journal. 2019(12).