ANALYSIS OF PHYSICAL TRAINING OF SWIMMERS AT THE COMPETITIVE LEVEL

ANÁLISE DE TREINAMENTO FÍSICO DE NADADORES EM NÍVEL COMPETITIVO

ANÁLISIS DE LA PREPARACIÓN FÍSICA DE NADADORES A NIVEL COMPETITIVO

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Bin Xu[1]
(Physical Education Professional)

1. Changzhou Vocational Institute of Industry Technology, Changzhou, Jiangsu, China.

Correspondence:
Bin Xu
Changzhou, Jiangsu, China.
213164.
asdpoi987@126.com

ABSTRACT

Introduction: Swimming is a sport that requires mastery of muscle groups, breathing, and cardiopulmonary strengthening, being a complete physical activity. To improve the competitive level of its athletes, making possible better results in competitions is a frequent challenge that demands training analysis and frequent adaptations. Objective: Study the effects of current physical training on the competitive performance of athletes. Methods: Twenty-four volunteer swimmers were selected and equally distributed in two groups. The experimental group performed swimming-specific physical training according to the established training plan, and the control group performed general physical training based mainly on running. There was no difference in the duration or intensity of training between the groups. The experimental period was 8 weeks, three times a week. Results: The experimental group was superior to the control group in terms of optimizing physical function, optimizing special fitness, and improving athletic levels. Conclusion: Special physical training for athletes can improve swimmers' physical function more efficiently, improve their competitiveness and sports efficiency, and reduce sports injuries. ***Level of evidence II; Therapeutic studies - investigation of treatment outcomes.***

Keywords: Swimming; Physical Fitness; Athletic Performance.

RESUMO

Introdução: A natação é um esporte que exige domínio dos grupos musculares, respiração e fortalecimento cardiopulmonar, sendo uma atividade física completa. Melhorar o nível competitivo de seus atletas, possibilitando melhores resultados nas competições é um desafio frequente que exige análise de treinamento e para adaptações frequentes. Objetivo: Estudar os efeitos do treinamento físico atual sobre o desempenho competitivo dos esportistas. Métodos: Foram selecionados 24 nadadores voluntários, distribuídos igualmente em dois grupos. O grupo experimental realizou um treinamento físico específico para a natação de acordo com o plano de treinamento estabelecido, e o grupo de controle realizou um treinamento físico geral baseado principalmente na corrida. Não houve diferença em duração ou intensidade do treinamento entre os grupos. O período experimental foi de 8 semanas, três vezes por semana. Resultados: O grupo experimental foi superior ao grupo de controle em termos de otimização da função física, otimização da aptidão física especial e melhoria do nível atlético. Conclusão: O treinamento físico especial para atletas pode melhorar a função física dos nadadores de forma mais eficiente, melhorar seu nível competitivo e eficiência esportiva, além de reduzir lesões esportivas. ***Nível de evidência II; Estudos terapêuticos - investigação dos resultados do tratamento.***

Descritores: *Natação; Aptidão Física; Desempenho Atlético.*

RESUMEN

Introducción: La natación es un deporte que exige dominio de los grupos musculares, respiración y fortalecimiento cardiopulmonar, siendo una actividad física completa. Mejorar el nivel competitivo de sus atletas, posibilitando mejores resultados en las competiciones es un desafío frecuente que exige análisis del entrenamiento y para frecuentes adaptaciones. Objetivo: Estudiar los efectos del entrenamiento físico actual sobre el rendimiento competitivo de los atletas. Métodos: 24 nadadores voluntarios fueron seleccionados y distribuidos equitativamente en dos grupos. El grupo experimental realizó un entrenamiento físico específico para natación según el plan de entrenamiento establecido, y el grupo control realizó un entrenamiento físico general basado principalmente en la carrera. No hubo diferencias en la duración ni en la intensidad del entrenamiento entre los grupos. El periodo experimental fue de 8 semanas, tres veces por semana. Resultados: El grupo experimental fue superior al grupo de control en términos de optimización de la función física, optimización de la condición física especial y mejora del nivel atlético. Conclusión: El entrenamiento físico especial para atletas puede mejorar la función física de los nadadores de forma más eficiente, mejorar su nivel competitivo y eficiencia deportiva, y reducir las lesiones deportivas. ***Nivel de evidencia II; Estudios terapéuticos - investigación de los resultados del tratamiento.***

Descriptores: *Natación; Aptitud Física; Rendimiento Atlético.*

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INTRODUCTION

With the development of swimming events, the training level and training conditions are also gradually improved. Because the goal of modern competitive sports is to develop faster and stronger.[1] The strengthening of the competitiveness of competitive sports has put forward higher requirements for the physical fitness of athletes. Especially in terms of kinematics, the concept of physical training has always existed. For different types of sports, the training content and methods of physical training are also targeted. According to the weak items of athletes' sports attributes, formulate relevant training plans.[2] Among them, special physical training is the main means to improve the athletes' physical ability. As swimming is a competitive event dominated by physical strength, the interaction between athletes' technical actions and the water in the swimming pool makes the body stay still or move in the water.[3] Therefore, the essence of motion is explained through the principle of motion. We need to use the most scientific methods to develop scientific training methods to improve athletes' project performance. At the same time, good physical fitness is the basis of all technical movements and competition tactics. The specific physical training of swimming is to improve the athletes' abilities by using appropriate training methods and training volume.[4] By improving physical fitness, athletes can effectively improve their sports related attributes such as body adjustment ability, body posture, basic metabolism and body energy storage capacity. Because swimmers have to overcome the resistance in the water. Therefore, controlling posture and reducing resistance through training are also the contents of physical training.[5] Swimming is mainly participated by aerobic exercise, and the physical energy consumption of the event is far greater than that of other sports. Therefore, it is an important way to improve the competitive level of athletes through special physical training. Its principle is to improve the level of physical function in order to achieve the goal of improving performance. Moreover, long-term physical training can prolong the professional life of athletes, keep them in peak sports state for a long time, and maintain competitiveness for a long time.[6] Based on this purpose, this paper selects the swimmers of a university swimming team as the research object, carries out special physical training for them, discusses the relationship between competitive level and physical training, and thus provides some ideas for the improvement of athletes' swimming competitive level.

METHOD

According to the principle of complete voluntariness, this paper selects 24 swimmers from a university swimming team as the research object. The study and all the participants were reviewed and approved by Ethics Committee of Changzhou Vocational Institute of Industry Technology (CZVIIT2020-FF21). After 8 weeks of experiment, 24 athletes can complete the relevant exercise plan well, and there is no sudden disease or sports injury, and the whole experiment process has been completed well.

According to the form of random sampling, 24 swimmers were divided into experimental group and control group. There was no significant difference between the two groups. The whole experimental period is 8 weeks, and the relevant physical training is carried out three times a week. The experimental group carries out special physical training for swimming according to the set training plan, while the control group carries out general physical training focusing on running. The training duration and intensity of the two groups of athletes are basically the same. During the whole experiment, the other training conditions of the two groups of athletes were consistent, and the diet and sleep conditions were basically consistent, so as to minimize the interference of unrelated factors and ensure the accuracy of the experimental results.

In order to reduce the influence of on-site exertion on athletes as much as possible, three measurements were made before and after the experiment. The average value was taken as the experimental data of the athlete, and Excel software was used to collate and analyze the data.

RESULTS

The influence of special physical training on athletes' physical function

As shown in Table 1, the influence of special physical fitness on the physical function of athletes was studied. Through the form of intra group comparison, it can be found that the BMI index of athletes in the control group decreased from (22.999 ± 0.466) (kg/m2) before training to (22.458 ± 0.628) (kg/m2) after training; Heart rate index decreased from (78.246 ± 6.699) (times/minute) before training to (76.351 ± 4.374) (times/minute) after training; The vital capacity index increased from (4207.164 ± 620.008) (ml) before training to (4652.270 ± 710.706) (ml) after training. The data of the three groups were P>0.05, indicating that there was no significant difference. The BMI of the athletes in the experimental group decreased from (23.095 ± 1.117) (kg/m2) before training to (22.101 ± 0.898) (kg/m2) after training, P<0.05, indicating that there was a significant difference; Heart rate index decreased from (77.186 ± 1.318) (times/minute) before training to (70.542 ± 0.849) (times/minute) after training, P<0.01, indicating that there was a very significant difference; Vital capacity increased from (4252.763 ± 791.639) (ml) before training to (4891.017 ± 793.755) (ml) after training, P<0.01, indicating that there was a very significant difference.

Impact of special physical training on athletes' special physical fitness

As shown in Table 2, the impact of special physical fitness training on athletes' special physical fitness has been studied, and the three selected events are also closely related to the competitive level of swimming. From the intra group comparison, it can be seen that the leg strength of the athletes in the control group increased from (2.680 ± 0.020) (BW) before training to (2.730 ± 0.041) (BW) after training; The balance duration of single foot eye closure increased from (55.364 ± 5.111) (s) before training to (57.320 ± 5.485) (s) after training; The forward bending distance of the sitting posture was increased from (13.065 ± 3.059) (cm) before training to (13.384 ± 2.948) (cm) after training. The data of the three groups were P>0.05, indicating that there was no significant difference. The leg strength of the experimental group athletes increased from (2.673 ± 0.050) (BW) before training to (2.826 ± 0.080) (BW) after training, P<0.05, indicating

Table 1. Effect of special physical training on athletes' physical functions.

Project	Group	Before	After	P
BMI (kg/m2)	Control	22.999±0.466	22.458±0.628	0.538
	Test	23.095±1.117	22.101±0.898	0.046
Heart rate (times/minute)	Control	78.246±6.699	76.351±4.374	0.395
	Test	77.186±1.318	70.542±0.849	0.000
Vital capacity (ml)	Control	4207.164±620.008	4652.270±710.706	0.094
	Test	4252.763±791.639	4891.017±793.755	0.000

Table 2. Effect of special physical training on athletes' special physical fitness.

Project	Group	Before	After	P
Leg Power (BW)	Control	2.680±0.020	2.730±0.041	0.063
	Test	2.673±0.050	2.826±0.080	0.043
Single -foot closed eye balance time (s)	Control	55.364±5.111	57.320±5.485	0.273
	Test	54.799±5.348	64.929±6.104	0.000
Siter forward flexion distance (cm)	Control	13.065±3.059	13.384±2.948	0.389
	Test	13.291±2.214	17.031±1.365	0.000

that there was a significant difference; The balance duration of single foot eye closure increased from (54.799 ± 5.348) (s) before training to (64.929 ± 6.104) (s) after training, P<0.01, indicating that there was a very significant difference; The forward bending distance of sitting posture increased from (13.291 ± 2.214) (cm) before training to (17.031 ± 1.365) (cm) after training, P<0.01, indicating that there was a very significant difference. It can be seen that the general physical training can improve the specific physical fitness of three aspects to a certain extent, but the extent of improvement is small, so it is not applicable to the physical training of athletes.

Influence of special physical training on athletes' competitive level

As shown in Table 3, the impact of special physical training on athletes' action skills has been studied. Athletes' action skills are closely related to their competitive level. Only by mastering good action skills can they complete swimming training more solidly, reduce sports injuries, save physical energy and reduce the risk of foul. In the control group, the waist entry angle decreased from (54.156 ± 4.826) (°) before training to (49.479 ± 3.806) (°) after training; The knee joint angle of the front leg decreased from (126.488 ± 3.289) (°) before training to (120.062 ± 3.368) (°) after training; The knee joint angle of the rear leg decreased from (76.597 ± 7.617) (°) before training to (84.765 ± 7.921) (°) after training. The data of the three groups were P<0.05, indicating that there was a significant difference. It can be seen from the comparison results of the control group before and after that, although a certain degree of optimization has been produced overall, the optimization effect is still not ideal. The waist entry angle of the athletes in the experimental group decreased from (53.463 ± 5.216) (°) before training to (46.207 ± 3.152) (°) after training; The knee joint angle of the front leg decreased from (124.702 ± 4.177) (°) before training to (117.729 ± 3.346) (°) after training; The knee joint angle of the rear leg decreased from (75.324 ± 7.271) (°) before training to (89.951 ± 8.320) (°) after training. The data of the three groups were P<0.05, indicating that there was a significant difference. By comparing the data of the experimental group, it can be seen that special physical training can better optimize the relevant indicators of movement skills, so that athletes can obtain better competitive state in the course of sports and improve their competitive level. (Table 4)

The most direct link related to the competitive level of athletes is the sports performance of swimmers. Therefore, this paper discusses the impact of special physical training on swimmers' swimming performance, and chooses the 50 meter performance as the research object. It can be seen from the data comparison in Table 4 that the 50 m freestyle time of the control group athletes decreased from (26.234 ± 0.203) (s) before training to (25.876 ± 0.359) (s), P>0.05, indicating that there was no significant difference; The time of 50 m freestyle in the experimental group decreased from (26.346 ± 0.539) (s) before training to (24.921 ± 0.459) (s) (P<0.05), indicating that there was a significant difference. It can be seen that special physical training for athletes can improve the swimming performance of swimmers more pertinently. Compared with ordinary physical training, it has a higher training effect.

Table 3. Effect of special physical training on athletes' movement skills.

Project	Group	Before	After	P
The angle of the waist in water (°)	Control	54.156±4.826	49.479±3.806	0.029
	Test	53.463±5.216	46.207±3.152	0.013
Ahead of the knee joint (°)	Control	126.488±3.289	120.062±3.368	0.003
	Test	124.702±4.177	117.729±3.346	0.048
H behind knee angle (°)	Control	76.597±7.617	84.765±7.921	0.034
	Test	75.324±7.271	89.951±8.320	0.040

Table 4. Effect of special physical training on swimmers' swimming performance.

Project	Group	Before	After	P
50M Free Swimming (S)	Control	26.234±0.203	25.876±0.359	0.209
	Test	26.346±0.539	24.921±0.459	0.041

DISCUSSION

With the development of kinematics and the constant updating of sports concept, it can be learned that through special physical training, the competitive level of athletes can be effectively maintained or improved. Specific physical fitness training, first of all, is physical fitness training. Physical fitness training is usually the basic physical training. It is the most basic training method to improve the competitive level. The main purpose of basic training is to make athletes have strong physique. Improve the muscle mass, respiratory system function, endocrine system function and nervous system function. Make athletes have enough physical function to complete various technical movements. Excellent physical fitness is also the basic requirement of advanced stage training. Next is targeted physical training. Different athletes have different sports links. Coaches provide targeted training guidance for athletes' weak links. It is an important link in the period of athletes' performance improvement. Targeted physical training mainly focuses on strength training, speed training, endurance training and flexibility training of athletes. Because of the particularity of swimming, it can also be divided into land training and water training. Targeted training is mainly to reduce the weaknesses of athletes. It can better improve the competitive level of athletes. Finally, all-round physical training. The all-round physical training mainly requires the athletes to reasonably allocate their physical strength in combination with the actual sports tactics. The all-round physical training is not only to improve the athletes' single sports ability. Instead, the coaches give reasonable guidance to the athletes to improve their competitive level in an all-round way by analyzing the physical changes in different stages of the athletes' actual competition. Ensure that the athletes have good ability to play on the spot, read the competition ability and various abilities at the level of psychological quality. The physical quality and technical level of athletes can be comprehensively improved through the continuous improvement of each link of special physical training. It is helpful for athletes to improve their competitive level and finally achieve the goal of improving their performance.

CONCLUSION

For swimmers, scientific improvement of their training efficiency is the focus of many scholars and first-line coaches. In this paper, the experimental group and the control group were set up to carry out special physical exercise training and general physical exercise training respectively, and other daily training and diet habits were basically consistent. After 8 weeks of experiments, the experimental results show that the experimental group selected for special physical fitness training is superior to the control group in terms of physical function optimization, special physical fitness optimization and athletic level improvement, and the comparison is obvious, which shows that special physical fitness training for athletes can improve the physical function of swimmers more efficiently, improve their athletic level and efficiency and reduce sports injuries, So that athletes can make greater progress in the field. Of course, there are still some limitations in this study. For example, in the sample selection, only 24 athletes from one university were selected, without analyzing the special situation of professional athletes in different regions and different age groups. Therefore, more and more research objects should be selected in the follow-up research, so as to enhance the applicability of the research results.

The author declare no potential conflict of interest related to this article

AUTHORS' CONTRIBUTIONS: The author has completed the writing of the article or the critical review of its knowledge content. This paper can be used as the final draft of the manuscript. Every author has made an important contribution to this manuscript. Bin Xu: writing and execution.

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