

The effect of continuous swimming on physical health

Lu Yanmei^{1, a}, Ye Huabing^{2, b}

¹Heyuan polytechnic, Heyuan, Guangdong, China

²Heyuan sports school, Heyuan, Guangdong, China

^a22544158@qq.com, ^b757608533@qq.com,

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Abstract: Using the literature, physical fitness test, mathematical statistics and other methods, researchers carried out body test and analysis of the swimming association members who have been swimming all the year round in Heyuan City. The results showed that after annual swimming, the BMI of swimmers was slightly higher than that of all the testers, and the vital capacity and the step index were significantly improved. The grip strength was significantly higher than that of all the testers, and the other qualities were not significantly improved. The two indexes of sitting body flexion and standing on one foot with closed eyes were lower than all testers; The overall physical fitness evaluation score is superior to all testers. The overall vascular elasticity of swimmers is better than that of all testers, and the anti-atherosclerotic ability is enhanced, but the low bone mass ratio of bone density is higher than that of all the testers. The author acknowledges that it is related to the lack of weight exercise in the water, and further research is needed.

1. Introduction

Swimming is a physical exercise that is good for your health. Studies have shown that swimming has a good influence on body shape, cardiopulmonary function and various sports qualities [1-4]. However, recent studies often compared before and after short-term swimming effect, and research on continuous swimming is rare. The author conducted a physical fitness test on the members of the Heyuan City Swimming Association for swimming all year round to explore the effects of swimming on the human body, blood vessel elasticity and bone density.

2. Research objects and methods

2.1 Research objects

The 82 members of the Heyuan City Swimming Association who were swimming all year round were studied. The average age is 47.3 years and the average swimming period is 10.5 years. 674 adults who participated in the physical fitness test at the same physical fitness center at the same time period were referred to as reference groups (hereinafter referred to as all testers).

2.2 Research methods

2.2.1 Documentary Method

Search and collect the literature related to the impact of swimming on physical health, and conduct comprehensive analysis and analysis.

2.2.2 Experimental method

Members of the Heyuan City Swimming Association were organized to conduct physical fitness tests. Test indicators include: morphological indicators (height, weight, BMI); functional indicators (lung capacity, step index); physical fitness indicators (grip strength, vertical jump distance, sitting body flexion, one foot standing with closed eyes, selective response, push-ups, abdominal curl). [5] The test data was collected by a computer system of physical fitness testing.

2.2.3 Mathematical Statistics

Using statistical software such as excel2003 and SPSS 20.0, the test results were statistically analyzed, and the mean and standard deviation were obtained. Experimental results $P < 0.05$ was a significant level, and $P < 0.01$ was a very significant level.

3. Results and analysis

3.1 The effect of continuous swimming on body shape

Body shape is the shape characteristic of the internal and external parts of the human body, which affects the health of the human body to a certain extent, especially with chronic non-communicable diseases. The body shape of the members of the Heyuan Swimming Association who had been swimming all the year round and the physical morphology of all the testers in the general population showed that there were significant differences in height, weight and BMI between the two groups. Table 1 shows that, in terms of height, the average height of all testers and swimming association members were 160.4cm and 164.8cm, respectively, and the mean heights of the two groups were significantly different ($P < 0.001$); In terms of body weight, the average body weight of all testers and swimming association members was 60.5kg and 67.3kg respectively. The mean body weight of the two groups was significantly different ($P < 0.001$). In terms of BMI, the mean BMI of all the testers and swimming association members were 23.5 and 24.7, respectively. There was a significant difference in the mean BMI between the two groups ($P < 0.01$).

Table 1. body shape

	N	Height (cm)	Weight (kg)	BMI (kg/m ²)
All testers	674	160.4±8.9***	60.5±10.2***	23.5±4.0**
swimmers	82	164.8±6.8	67.3±9.8	24.7±2.9

Note: significance "*" means $P < 0.05$; "***" means $P < 0.001$; "****" means $P < 0.001$

For the swimmers in the Heyuan City Swimming Association, after swimming continuously, their body weight and BMI were significantly higher than all the testers. This is not consistent with the related research. Xu Xiaofeng et al^[3] found that the weight of the elderly in the swimming group was significantly lower than that in the control group. The author believes that swimming requires maintaining body temperature in water, and storing a certain amount of fat is a physiological adaptation to maintain body temperature; On the other hand, the swimming grounds of the Heyuan City Swimming Association are mostly in the Xinfeng River waters. The water temperature in this water area is low, the annual average water temperature is 22.5 °C, and the water temperature near the Xinfengjiang Dam is lower. Therefore, the swimming association members' BMI is slightly higher than all testers and is the physiological need of swimming.

3.2 The effect of swimming all year round on cardiopulmonary function

Table 2 shows that in terms of vital capacity, the mean values of vital capacity of all testers and swimming association members were 2604.8 ml and 3165.9 ml, respectively. The mean difference in vital capacity between the two groups was significant ($P < 0.001$). In terms of the step index, the mean values of the step indices of all the testers and swimming association members were 58.7 and 63.9, respectively. The mean value of the step index of the two groups was significantly different ($P < 0.001$). The results show that swimming all year round has a good effect on cardiopulmonary function, which is consistent with most studies.

Table 2. cardiopulmonary function

	N	vital capacity (ml)	N	Step index
All testers	674	2604.8±914.6***	550	58.7±11.4***
swimmers	82	3165.9±878.2	76	63.9±11.7

Note: significance "*" means $P < 0.05$; "***" means $P < 0.001$; "****" means $P < 0.001$

3.3 The impact of continuous swimming on physical fitness

Table 3 shows that in terms of vertical jump, the average longitudinal hops of all testers and swimming association members were 30.9 cm and 33.1 cm, respectively, and the difference in the mean hops of the two groups of subjects was not significant; In terms of sitting body flexion, the mean values of the sitting flexion of all testers and swimming association members were 6.6 cm and 4.5 cm, respectively. There was no significant difference in the median flexion of the sitting body between the two groups; In terms of closed eyes and one-foot standing, the average values of closed eyes and one foot standing of all testers and swimming association members were 26.5 s and 19.5s, respectively. The mean values were significantly different ($P < 0.05$); In terms of response time, the average response time of the selection reaction of all the testers and swimming association members was 0.6s and 0.6s, respectively, and the mean difference of the selection reaction between the two groups was not significant.

The grip strength of Heyuan City Swimming Association members is significantly higher than that of all testers, which may be related to the need for greater palm stroke in swimming. The vertical jump score is slightly higher than that of all testers but not significant. The results of sitting body flexion and closed eyes standing are lower than that of all the testers. This may be related to the fact that the water movement does not require bearing their own weight, and there is no need to bend the torso. There are fewer balance exercises in waist and legs and flexible stretching exercises. This result is inconsistent with the related study [2].

Table 3. physical fitness 1

	N	vertical jump (cm)	N	sitting flexion (cm)	N	one-legged standing with eyes closed (s)	N	response time (s)
All testers	212	30.9 ± 8.5	674	6.6 ± 9.2	674	26.5 ± 27.2*	673	0.6 ± 0.1
swimmers	18	33.1 ± 6.8	82	4.5 ± 9.3	82	19.5 ± 19.5	82	0.6 ± 0.1

Note: significance "*" means $P < 0.05$; "***" means $P < 0.001$; "****" means $P < 0.001$

Table 4 shows that in terms of grip strength, the average grip strength of all testers and swimming association members was 31.7 kg and 39.3 kg, respectively, and the mean grip strength of the two groups was significantly different ($P < 0.001$); In terms of push-ups, the average values of push-ups of all testers and swimming association members were 25.6 and 27.6, respectively, and the mean values of push-ups of the two groups were not significantly different; In terms of abnormal curls, the average value of all testers and swimming association members were 21.3 and 20.9, respectively. There was no significant difference between the two groups. It can be seen that the continuous swimming exercise failed to improve the strength of the arm flexion and extension and the strength of the supine lumbar muscle, which may be due to the inconsistent force pattern of different sports.

Table 4. physical fitness 2

	N	grip strength (kg)	N	push-ups (one)	N	abnormal curls (one)
All testers	674	31.7 ± 10.4***	119	25.6 ± 12.8	93	21.3 ± 10.1
swimmers	82	39.3 ± 9.7	16	27.6 ± 12.8	8	20.9 ± 10.1

Note: significance "*" means $P < 0.05$; "***" means $P < 0.001$; "****" means $P < 0.001$

3.4 Effect of continuous swimming on physical fitness score

Figure 1 shows that all the testers, the overall score - evaluation of unqualified, qualified, good, excellent proportions were 8.17%, 57.95%, 24.07%, 9.81%; For the members of the swimming association, the proportions of the comprehensive score-evaluation, qualified, good, and excellent were 7.32%, 50.00%, 32.93%, and 9.76%, respectively. The results show that the good proportion of the comprehensive physical fitness scores of swimming in the year is higher than that of all the testers. It can be seen that the swimming exercise has a promoting effect on the overall physical fitness.

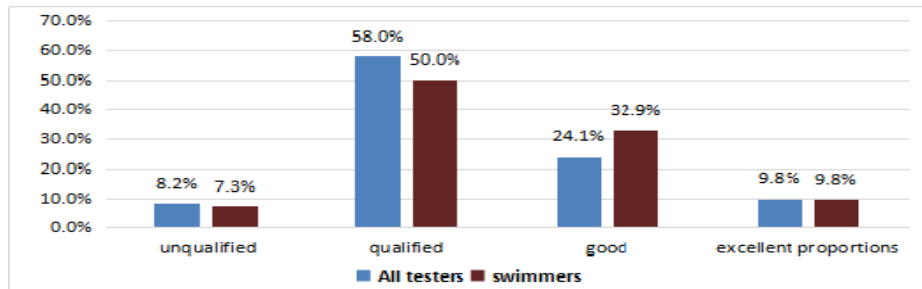


Fig.1. Comprehensive physical fitness score evaluation

3.5 The effect of continuous swimming on the degree of vascular elasticity

Figure 2 shows that in all testers, the overall degree of vascular elasticity is 8.7%, 8.7%, 47.8%, and 34.8% of the hard, hard, standard, and soft, respectively. For members of the swimming association, the overall degree of vascular elasticity was hard, hard, standard, and soft, with ratios of 2.4%, 6.0%, 46.4%, and 45.2%, respectively. The results showed that the continuous swimming exercise had a certain effect on the elasticity of the blood vessels, and the softness ratio was higher than that of all the testers, which enhanced the ability to resist atherosclerosis.

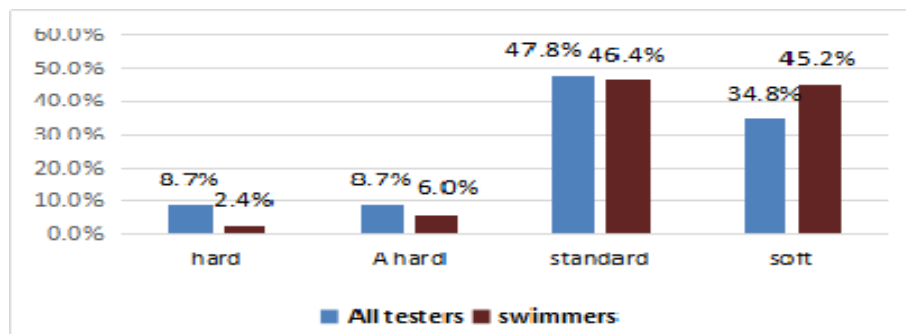


Fig. 2. Vascular elasticity

3.6 Effect of continuous swimming exercise on bone mineral density

Figure 3 shows that, in all testers, the bone mineral density T value _ evaluation of osteoporosis, bone less pores, bone normal proportion were 10.3%, 41.2%, 48.5%; For members of the swimming association, the bone mineral density T value _ evaluation of osteoporosis, bone less pores, normal bone ratio were 14.3%, 44.0%, 41.7%. The results show that after continuous swimming, the normal proportion of bone is lower than that of all testers. The reason and mechanism of this phenomenon need further study. The author believes that it is related to the lack of weight exercise in the water.

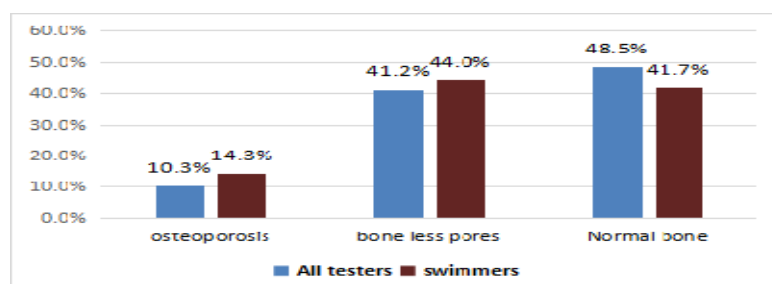


Fig. 3. Bone density

4. Conclusion

The results of this experiment show that the BMI of swimming club members is much higher than that of all testers. It is obvious that swimming needs to store a certain amount of fat. Continuous swimming can effectively promote the cardiopulmonary function of the human body, mainly in the significant increase in vital capacity and step index; In terms of physical fitness indicators, only the

grip strength was significantly higher than that of all the testers, and other qualities were not significantly improved. The two flexibility and balance indicators of sitting body flexion and one foot standing with closed eye were lower than all testers. Overall, the institutional comprehensive evaluation score is superior to all testers. The overall vascular elasticity of continuous swimmers is also superior to all testers, but the low bone mass ratio of bone density is higher than all testers. It can be seen that swimming can effectively improve the health of the human body in some aspects, but the quality is not good in terms of flexibility, balance and supine waist and abdominal muscle strength. It is recommended that swimmers should make alternatives to other forms of exercise in the usual time, such as strengthening flexibility and balance exercises, and appropriately increasing weight-bearing exercises.

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