INFLUENCE OF THE AEROBIC EXERCISE ON THE BIOLOGICAL AGE OF THE ELDERLY MALES WITH DIFFERENT AGING DEGREES

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ABSTRACT

Objective*: To observe and analyze the influence of aerobic exercise on the biological age of the elderly males with differentaging degrees.*

Methods*: A total of 100 retired elderly males were enrolled in this study. All the elderly males performed theincremental load aerobic exerciseusingcycle ergometer. The physiological parameters of the candidatessuch as the biological age, body shape, cardiovascular and pulmonary function were measured before and after the exercise. Based on the gap between the biological age and the actual age, the 100 cases of elderly males were divided into pro-senescence group (50 cases) and delaying senescence group (50 cases) for comparative study.*

Results*: Before the aerobic exercise was carried out, the elderly males possessed larger biological age as compared to their actualage, however, the difference was not statistically significant (P> 0.05). The elderly males who completed the aerobic exercise showed smaller biological age than the actual age, with P<0.05. Moreover, the pro-senescence group had a larger biological age than their actual age before they performedaerobic exercise. However, after the aerobic exercise was executed, the result indicates thattheir biological age was close to their actual age butwas lower than that of their actual age before accomplishing the aerobicexercise was accomplished (P <0.05). On the other hand, the biological age of delaying senescence group wassmaller than the actual age. In comparison to the biological age of candidates before experienced the aerobic exercise, the biological age of the candidates after aerobic exercise was lower. After aerobic exercise,when P>0.05, the pro-senescence group exhibitedsmaller waist and larger waist-to-hip ratio; as P <0.05, the pro-senescence group showeda smaller skinfold thickness of the upper arm and their physiological function index changed significantly. Furthermore, with P <0.05,the systolic blood pressure and diastolic blood pressure among the cardiovascular and pulmonary function of the two groups decreased, and at the same time, the vital capacity increased,.*

Conclusion*: Aerobic exercise can exert positive impact on the biological age, physiological function and body shape of the elderly males with different aging degree, and delay their senescence.*

Keywords*: Aerobic exercise, aging degrees, elderly males, biological age, influence.*

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Introduction

Senescenceis also known as an aging and irreversible process. Under normal circumstances, the aging after the maturation of the creatures will result in the decreaseof physical function, the stability of the internal environment and the stress capability. Then, the structure and components gradually degenerate and the creatures eventually die[(1)].

At present, there are numerous theories of aging. Generally, most of the studies agree that there is close relationship between aging and free radicals as shown in Figure 1.

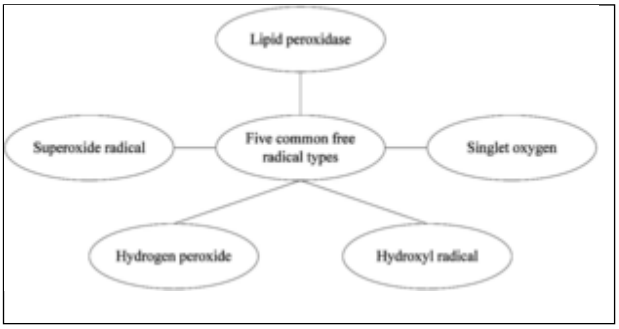

Figure 1: Free radical.

According to this statement, free radicals are important microtransmission factors that play a role inthe aging ofthe body, in which the aging process is the process of increasing free radicals because ofthe reactive oxygen (see Figure 2 below)metabolismdisorder. It is already a common consent that appropriate exercise can delay aging. The reducedproductions of reactive oxygen andmitigation of oxidative damage arethe main mechanismsto delaythe aging through exercising[2]. In addition, mitochondriasare sensitive organelles. They are the main sites for intracellular oxidation, energy storage and energy supply, and are often used as "motors for cell survival and death"[3-5].

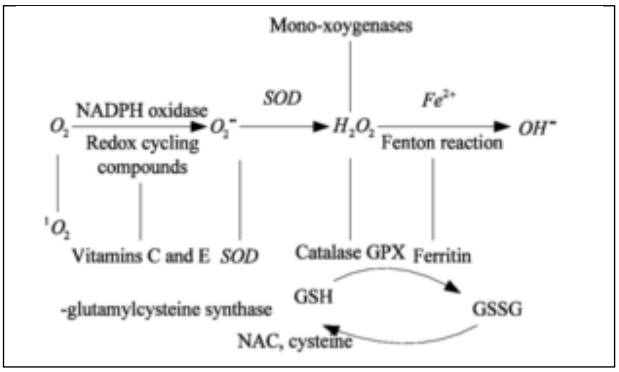

Figure 2: Structure figure of reactive oxygen.

It is generally believed that fitness exercise can significantly improve the health of the elderly, and effectively delay the aging process of the elderly. In this study, the effect of the aerobic exerciseon the biological age and other physical functions of the elderly males with different aging degreeswasobserved. The detailed report is as follows.

Data and method

General data

The study was conducted with the aid of100 retiredelderly males in Changsha, Hunan of China from January 2013 to December 2016.

The age of the selected candidateswasbetween 60 and 78 years old, with an averaging age of 66.8 ± 3.2 years old.All of them had not taken systematic fitness exercise inthe near term when they were involved in this study. At the same time, there was no statistically significant difference in age and physical condition, with a P> 0.05. All selected chad the right to be informed, and had signed the relevant informed consent.

Method

In order to develop a scientific and rational exercise program: First of all, the cycle ergometer wasused for theincremental load aerobic exercise. The whole experimental period wasunder the serious supervision by anexperienced specialized staff with relatively high comprehensive quality; secondly, the exercise intensity and time werereasonably controlled. Among it, the training intensity was75% of the exercise load which corresponding to the maximum heart rate. The experimental period for the elderly maleswasset as 12 weeks. The exercise intensity wasre-determined at the end of the fourth week and the end of the eighth week. In addition, the new load wasset as the load for the fitness exercise fromthe fifth to the eighth week as well asduring the ninth and twelfth week[6,7]. This exercise wastaken for four times a week. In the beginning of two weeks, the exercise time was only 20 minutes, and it increased by 5 minutes forevery 2 weeks[8]. As the exercise program was determined, the biological age wasexamined with a set of test measurement. At the same time, the changes of the biological age of the elderly males wereobserved after the aerobic exercise[9]. Based on the gap between the biological age and the actual age, 100 elderly maleswere equally divided into the pro-senescence group and the delaying senescence group.

Observation indicators

Assoon as the aerobic exercisewas accomplished, the observation and statistic on the changes of the physiological functions of the elderly males with differentaging degrees(biological age, body shape, lung function, cardiovascular system and other indicators) were made.

Statistical methods

The data wasanalyzed and processed by SPSS 21.0 statistical software. The measurementdata was

expressed in the form of ($\bar{x}$± s) and tested by t. The difference can be considered statistically significant when P <0.05.

Results

Changes of the biological age of the elderly males after taking aerobic exercise

According to the statistic shown in Table 1 below, the elderly men exhibited larger biological age than their actual age before taking exercise, but P> 0.05. After the aerobic exercise, their actual age was smaller as compared totheir biological age with P> 0.05. It should be noted thatafter theaerobic exercise, thebiological age of candidates was significantly lower than that of their biological age before taking exercise with P <0.05.

Time	Actual age (years old)	Biological age (years old)
Before taking aerobic exercise	66.78±3.25	67.18±6.45
After taking aerobic exercise	66.83±3.28	65.21±5.46
P	>0.05	<0.05

Table 1: Changes of the biological age of the elderly males after taking aerobic exercise ($\bar{x}$± s)

Influence of aerobic exercise on the biological age of the elderly males with differentaging degrees

According to the statistic listedin Table 2 below, the elderly males of the pro-senescence group possessedgreaterbiological age than their actual age before taking exercise.

Grouping	Time	Indicators	
(n=50) Pro-senescence group	Before taking exercise	Actual age	68.11±5.06
(n=50)	After taking exercise	Biological age	71.09±6.78
		Actual age	68.45±5.06
		Biological age	69.73±6.68
(n=50) Delaying senescence group	Before taking exercise	Actual age	64.25±4.98
		Biological age	62.08±7.35
	After taking exercise	Actual age	64.79±4.96
		Biological age	61.34±6.67

Table 2: Influence of aerobic exercise on the biological age ($\bar{x}$± s).

After the elderly male undergone theaerobic exercise, their biological age was similar to their actual age, with P < 0.05.While the elderly males fromthe delaying senescence group were havingsmallerbiologicalage than their actualage before they carried out the aerobic exercise.However, their biologicalage after the aerobic exercisewas getting smaller than their biological age before taking exercise and actual age after taking exercise, with P < 0.05.

Influence of aerobic exercise on body shape and function of the elderlymales with differentaging degrees

As presented in Table 3 below, after taking aerobic exercise, the body mass index of the pro-senescence aging group decreased, whereastheir body shape tended to be healthy. Their waist-to-hip ratio increased compared to that of before taking exercise, with P <0.05. Although there were benign changes of physiological function indicators, with P <0.05, the physiological function indicators showedsignificant changes, and the maximal oxygen uptake also increased.Moreover, the time of standing on one leg with closed eyes was extended, with a significant difference(P < 0.05).

Indicators	(n=50) Pro-senescence group		(n=50) Delaying senescence	
	Before taking aerobic exercise	After taking aerobic exercise	Before taking aerobic exercise	After taking aerobic exercise
Body mass index (kg/m²)	26.33±2.42	25.58±2.37	24.59±1.65	24.88±1.76
Fat mass(kg)	21.69±3.78	19.77±2.69	19.07±2.03	19.33±2.34
Waist–hip ratio	0.93±0.05	0.96±0.05	0.91±0.05	0.92±0.03
Chest circumference (cm)	94.17±7.69	94.72±5.26	93.94±2.68	93.02±2.11
Skinfold thickness of the upper arm (mm)	15.32±2.54	10.22±3.94	14.25±2.36	11.23±2.16
Sit-and-reach (cm)	29.93±6.31	28.27±3.42	29.26±6.18	29.89±7.65
Time of standing on one leg with closed eyes(s)	8.09±7.16	7.42±3.06	12.38±14.76	28.16±18.32
Maximum oxygen uptake (ML)	27.69±4.14	30.79±6.35	30.25±2.24	36.08±5.42
Grip strength(kg)	34.28±6.73	34.51±7.32	41.02±4.45	41.58±4.17

Table 3: nfluence of aerobic exercise on body shape and function ($\bar{x}$± s).

Influence of aerobic exercise on cardiovascular and pulmonary function of theelderly males with different aging degree

The systolic blood pressure, diastolic blood pressure, resting heart rate and vital capacity of the pro-senescence group before taking exercise in the early aging group were(145.6±13.95)mmHg, (86.79±1.98) mmHg, (76.02±5.97) times/min, (2.98±0.81z)L, respectively. After the aerobicexercises, each of their blood pressure, diastolic blood pressure, resting heart rate and vital capacity was (120.66±15.78) mmHg,(80.62±5.23) mmHg, (79.88±14.92) times/min, (3.06±0.56)L. The results showed that both groups showed the improvement in term ofcardiovascular function,lower systolic blood pressure and diastolic blood pressure and lung capacity after the aerobic exerciseespecially for the delaying senescence group with $P < 0.05$.

Discussion

The biological age wascalculated on the basis of the biological or anatomical developmental status. Biological age is to show the process of aging with biological ability or vitality and other aspects, and it is also an important index for the evaluation of the aging degree[10]. Since the elderly maleslive under different social life environment, and have different living habits and living conditions, there are inconsistent biological order and time order among the elderly males.In addition,the process and degree of aging of the internal organs vary from person to person[11-15]. Regular exercise can significantly improve the physical and mental state of the elderly, and enhance their life from the physiological and the mental aspect, and hence ultimately delaying their process of aging[16-18].

In order to explore whether fitness exercise exerts differentinfluences on the biological age, physical shape and physiological function of the elderly males with different aging degree, this study followed the basis of biological age, and the 100 elderly males was divided into the pro-senescence group and the delaying senescence group to performaerobic exercise for 12 weeks. The changes of the biological age, body shape, circulation, breathing and other physiological functions of the candidiates before and after aerobic exercise were observed and analyzed in this study.

The results show that aerobic exercise has a positive impact on the biological age of the elderly males with different aging degree, and achieved the goal of delaying aging. It has more obvious influence on the biological age of the elderly who have advanced aging.

It has been a common consensus that fitness exercise is conducive to the health of the elderly.With the depthof relatedresearch, the public hasrealized that fitness exercise couldpromote the rehabilitation of elderly diseases, and fitness exercise has already been well applied in the treatment of the patients with high blood lipids, hypertension, obesity, emphysema and atherosclerosis[19]. The results of this study show that aerobic exercise exhibitsa positive influence on the physical shape and the physiological functions of the elderly males with differentaging degree.

Conclusions

In summary, for the elderly males with differentaging degrees, aerobic exercise demonstratedpositiveeffect ontheir biological age, physiological function and body shape, and thus,realizing aging delaying.

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