

Effects of Mawangdui Daoyin Exercise on Aging Hormone in Elderly Women

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Abstract: Objective: To explore the effect of Mawangdui Daoyin exercise on aging-related hormones in elderly women. **Methods:** Twenty healthy women aged 60-70 years old who voluntarily participated in Mawangdui Daoyin exercise were recruited as experimental subjects, and they were divided into exercise group (n=10) and control group (n=10). Three aging-related hormones, growth hormone (GH), dehydroepiandrosterone sulfate (DHEA-s) and estrogen (Estrogen), were measured before exercise, 6 weeks and 12 weeks after Mawangdui Daoyin surgery. **Results:** 1) The change of growth hormone, compared with before exercise, showed significant difference after 6 weeks of exercise; compared with 6 weeks of exercise, there was no significant difference after 12 weeks of exercise; 2) The change of DHEA-s, with Compared with before exercise, there is a significant difference after 6 weeks of exercise; compared with after 6 weeks of exercise, there is a significant difference after 12 weeks of exercise; 3) Compared with before exercise, there is no significant difference in Estrogens after exercise for 6 weeks Differences; significant difference after 12 weeks of exercise compared to 6 weeks of exercise. **Conclusion:** 12-week Mawangdui Daoyin exercise can positively affect aging-related hormones such as growth hormone (GH), dehydroepiandrosterone sulfate (DHEA-s) and estrogen (Estrogen) in elderly women.

1. Introduction

The main data of China's seventh national census shows that by the end of 2020, our country's total population was 1,411.78 million, and the population aged 60 and above was 264.02 million, accounting for 18.7%. Our country has entered an ageing society (Aged Society) (China) Bureau of Statistics of the People's Republic of China, 2021). According to the latest forecast data released by the Ministry of Civil Affairs, by the end of the "14th Five-Year Plan" period, my country will enter a "moderately aging" society, and the number of elderly people aged 60 and above will reach 300 million. One person was over 60 and entered the "Post-aged Society". The sharp increase of the elderly population requires the whole society to pay attention to the physical and mental health of the elderly; aging leads to a decrease in the ability of cells to synthesize protein and a decline in immune function. Decreased secretion of related hormones[1].

Prior studies have shown that growth hormone (GH), dehydroepiandrosterone sulfate (DHEA-s) and estrogen (Estrogen) are the three main hormones associated with aging, and growth hormone (GH) is produced by the growth hormone in the pituitary gland. A peptide hormone synthesized, stored and

secreted by cells, it has the effect of stimulating cell growth and proliferation, promoting protein synthesis, and affecting fat oxidation and mineral metabolism. Growth hormone changes with exercise, increasing the secretion, thereby reducing the utilization of glucose, increasing the flow of lipids in the blood, and having a positive effect on fat oxidation and maintaining body composition, but with the aging of the human body, its function declines, and the secretion also decreases accordingly (Rudman, 2005). DHEA is a steroid hormone, mainly secreted by the adrenal glands. Clinically, DHEA has been shown to have anti-aging and anti-cancer effects. The reduction of DHEA-s is associated with increased dissimilation in the body, decreased immunity, increased body fat, decreased muscle strength, and insulin susceptibility[2]. The decrease was highly positively correlated (Katz & Morales, 1998), the secretion of DHEA in women decreased by 14.4% per year after the age of 20, decreased to less than 50% of the 20-year-old at the age of 60, and decreased to less than 20% at the age of 70. Estrogen is one of the most important hormones secreted by the human body, and there are as many as 300 estrogen receptors in different tissues. Estrogen affects a wide range of tissues and organs in the body, from the brain to the liver and bones, the uterus, urinary system, breasts, skin and blood vessels all require estrogen to maintain a normal physiological state. For women, at menopause, with the sharp decrease in the amount of estrogen, it will lead to facial flushing, decreased physiological function of the genitals, urinary incontinence, loss of libido, osteoporosis, and the risk of various chronic diseases. Increase; as we all know, the inherent root cause of various diseases in old age is the decrease in the secretion of aging-related hormones. Scientific physical exercise can regulate the secretion of hormones and delay the aging of the human body.

Mawangdui "Daoyin" is based on the schema in the "Daoyin Map" unearthed in the Han Tomb in Mawangdui, Changsha, Hunan in 1973. Falling, rotating, flexing, stretching, and pulling tendons and bones are designed for action design. It is a set of beautiful and simple exercises with both internal and external cultivation. It is simple and easy to learn, safe and reliable, and moderate in strength. It is suitable for different groups of people to practice. efficacy [3]. Therefore, in this study, Mawangdui Daoyin was used as an exercise intervention method, and elderly women were taken as the research objects. Through 12 weeks of Mawangdui Daoyin exercise, GH, DHEA-s, Estrogen and other aging hormones, to explore the effect of Mawangdui Daoyin exercise on aging-related hormones in elderly women.

2. Objects and Methods

2.1 Research objects

Sample size was calculated using 3.1.9.7 for Windows (GPower © from University of Dusseldorf, Germany). The study adopts an experimental design of 2 (groups) * 3 (time points). Through the previous experiments, the effect size was set to 0.35, the power (1-βerr prob) was determined to be 0.8, and the αerr prob was 0.05; the statistical analysis method used Two-way ANOVA with repeated measure, the sample size was determined by GPower by 20 participants, 10 in each group[4].

Twenty elderly women aged 60-70 in the community of Z city were selected. Inclusion criteria: Have not participated in a regular exercise program for the past six months or more, have no serious illness or long-term medication, voluntarily participate in this experiment, signed the research informed consent form and the research participation consent form before the experiment, and the physical characteristics of the research subjects are as follows(Table 1):

Table 1: Characteristics of the subjects a

	control	exercise	P ^b
Age (years)	63.57±0.98	64.14±1.07	.230
Hight (cm)	164.79±4.02	164.54±9.46	.940
Weight (kg)	62.53±2.94	63.3±8.06	.780
SBP(mmHg)	119.67±13.96	121.36±12.58	.779
DBP(mmHg)	69.43±0.94	70.06±0.84	.131

a Mean±SD

b Independent t-test, compared with control group

2.2 Mawangdui Daoyin intervention plan

This research employs professional teachers of Mawangdui Daoyin from the School of Physical Education of XX University in Z City to teach[5]. The exercises, practice requirements and teaching guidance of Mawangdui Daoyin are subject to the version created by the Health Qigong Management Center of the General Administration of Sports of the People's Republic of China. , 4 times a week, 60 minutes each time for 12 weeks. The exercises include 10 minutes of preparation and 10 minutes of relaxation, and 40 minutes of Mawangdui Daoyin exercises, for a total of 60 minutes. The exercise intensity was controlled to be moderate. By using the HUAWEI B6-42D bracelet, the subjects' heart rate was basically controlled at 60% to 80%[6].

2.3 Blood Analysis

In this study, three biochemical indicators, GH, DHEA-s, and Estrogen, were selected to measure, and blood collection was commissioned by the Department of Hematology of Z Central Hospital for analysis. A total of 3 blood draws were performed before the experiment, after 6 weeks, and after 12 weeks, and all measurements were performed at 09:00 am[7].

Blood is collected as follows:

Blood storage method: Add the extracted blood to the serum separation tube containing anticoagulant, mix 5~6 times, and centrifuge at 3000rpm for 20min. Before centrifugation, it can be stored at room temperature for 2h.

Analysis method: 3~4ml of blood is collected, and after serum separation, a sterile disposable pipette is used, and each is loaded into the 2ml cryovial provided in advance for the detection of antibodies, and each time is not less than 0.3ml. Divide it into no more than 3/4 of the total volume of vial and store vertically in a frozen state below -18 °C.

2.4 Statistical methods

Two-way ANOVA with repeated measure was performed using SPSS26.0 software; in the case of interaction effects ($P<0.05$), one-way ANOVA was performed within the group, and the application Multiple comparison test was performed by LSD method, and independent samples T test was

performed between groups at the same time point[8]. The significance level (α) for this study was set at 0.05.

3. Results

3.1 Changes in growth hormone (GH)

Changes of growth hormone in different groups and time points, the exercise group was 1.146 ng/mL before exercise, 1.512 ng/mL after 6 weeks of exercise, 1.895 ng/mL after 12 weeks of exercise, 1.356 ng/mL before exercise in the control group, and 1.452 ng/mL after 6 weeks of exercise, 1.865 ng/mL after 12 weeks of exercise.

3.2 Changes in dehydroepiandrosterone sulfate (DHEA-s)

Changes of DHEA-s in different groups and time points, the exercise group was 62.175 ug/dL before exercise, 70.64 ug/dL after 6 weeks of exercise, 76.12 ug/dL after 12 weeks of exercise, 66.90 ug/dL before exercise in the control group, and 66.90 ug/dL after exercise 69.21 ug/dL after a week, 63.30 ug/dL after 12 weeks of exercise[9].

3.3 Changes in estrogen (Estrogen)

Changes of Estrogens in different groups and time points, the exercise group was 78.29 pg/mL before exercise, 84.96 pg/mL after 6 weeks of exercise, 89.35 pg/mL after 12 weeks of exercise, 76.52 pg/mL before exercise in the control group, and 74.53 pg/mL after 6 weeks of exercise pg/mL 72.32 pg/mL after 12 weeks of exercise (Table 2).

Table 2: Results of two-way ANOVA with repeated measure for GH, DHEA-s & Estrogen

index	group	Pre	Post-6	Post-12	F-value		
					G	T	G×T
GH	experience group	1.146±465	1.512±779	1.895±1.11	0.389	3.277*	5.522*
	control group	1.356±413	1.452±590	1.865±334			
DHEA-s	experience group	62.18±33.8	70.64±37.0	76.12±40.8	3.065	5.171*	11.284*
	control group	66.90±20.0	69.21±14.8	63.30±19.4			
Estrogen	experience group	78.29±11.53	84.96±13.98	89.35±17.59	2.516	0.779	4.06*
	control group	76.52±14.96	74.53±20.35	72.32±23.45			

Note: * indicates between groups (G), test time point (T) and interaction effect (G×T), $p < 0.05$.

4. Discussion

4.1 The effect of Mawangdui Daoyin exercise on growth hormone (GH) in elderly women

Growth hormone is a hormone secreted by the anterior pituitary gland, which has the effect of promoting growth and development and maintaining the normal function of internal organs. Its

secretion decreases with age, and decreases by 14% every year after the age of 20 to 30. At the age of 60, the secretion is only half of the youth; at the age of 80, it is only 1/10 of the youth. The decrease in the secretion of growth hormone leads to the gradual weakening of the physiological functions of tissues and organs, and the gradual aging of the human body[10]. Therefore, supplementation of growth hormone is an important aspect of anti-aging (Meng Lining, 2018).

In addition, regular exercise or physical activity can promote the secretion of growth hormone. Regular exercise can promote the secretion of growth hormone, promote the development of the circulatory system and muscle system, and play an important role in preventing the disease of modern civilization (Synder et al., 1999). Throughout the previous studies on the changes of exercise and aging hormones in the elderly at home and abroad, female elderly people have significantly increased the secretion of growth hormone in the blood through long-term low- and high-intensity physical exercise (Han Kyu Han, 2016). The study of Beomjin Yoo (2019) showed that the concentration of growth hormone in the blood increased after long-term compound exercise in female elderly, and the change of the concentration with time was significantly different. In addition, research by Roennicb & Togo (2017) showed that more anti-aging hormones are secreted during high-intensity exercise compared to low-intensity exercise. The study of Kyungho Lee (2010) showed that the secretion of growth hormone in the blood increased significantly in middle-aged and elderly men over the age of 50 after 24 weeks of aerobic and resistance combined exercise. Ye-Ju Hong (2015) found in a 12-week dance participation study on functional fitness, blood lipids, and aging-related hormones in elderly women that the growth hormone in the blood of the elderly in the dance + melatonin group The most significant increase. In addition, a study by Seung-beom Lee (2016) found that the concentration of growth hormone significantly increased in female elderly after physical dance exercise, and a study by Soyoung Park (2013) found that elderly women exercised through aerobics for 12 weeks. concentration increased significantly[11].

In this study, Mawangdui Daoyin exercise did not show significant differences in the changes of growth hormone between groups ($P>0.05$), but there were significant changes in time points and interaction effects ($P<0.05$). The test results showed that there was a significant difference in the Mawangdui exercise group[12]. The growth hormone concentration in the group increased significantly after 6 weeks of exercise compared with before exercise. Although there was no statistically significant difference between before and after exercise for 12 weeks, it maintained a certain increase. value of . At the same time, there was no difference in the changes of growth hormone between groups, indicating that the decrease of growth hormone secretion with human aging is a general rule[13].

The results of this study showed that through 12 weeks of Mawangdui Daoyin exercise, a good effect of qi regulation and physical exercise was achieved, which directly stimulated the growth of bone tissue, thereby stimulating the secretion of growth hormone, as Ye-Ju Hong (2019), 12 weeks of regular aerobic exercise stimulated the bones of older women properly, promoted the circulation of metabolism in the body, and maintained the concentration of growth hormone. Therefore, Mawangdui Daoyin exercise can be used as an effective exercise method for regulating growth hormone and anti-aging[14].

4.2 The effect of Mawangdui Daoyin exercise on DHEA in female elderly

Dehydroepiandrosterone (DHEA) and its sulfide (Dehydroepiandrosterone sulfate ester, DHEA-S) are the most abundant steroid hormones in human blood circulation. The vast majority of DHEA in the body exists in the form of sulfide (Hunt, 2000). Peak levels of DHEA and DHEA-S were observed around age 20, and subsequently declined with age, eventually returning to prepubertal concentrations. Plasma DHEA levels are 10 to 25 nM in adult men, 5 to 30 nM in premenopausal women, and 2 to 20

nM in postmenopausal women. Decreased DHEA-s have been reported to be highly correlated with increased anabolic effects, decreased immunity, increased body fat mass, decreased muscle strength, decreased insulin sensitivity, and amenorrhea-related osteoporosis (Katz & Morales, 2018) ; With the increase of age, the adrenal function begins to functionally decline, the content of DHEA in the body will become less and less, and the level of its downstream metabolic hormones (T, AE, E2, etc.) will also decrease, which is the cause of endocrine disorders in the human body. , Disharmonious secretion of estrogen and androgen, decreased sexual performance, and even the root cause of aging[14]. Decreases in DHEA are also associated with decreased bone mass, decreased muscle mass, increased fat mass, and Alzheimer's disease (Horii, et al., 2016).

Previous studies have shown that regular physical activity is related to DHEA-s, and that the increase of HDL-C in the blood and the improvement of blood lipids caused by the breakdown of lipids in tissues are positively related to the concentration of HDEA-s (Chanhee Kim, Jungwon Lee & Sangin Han, 2013). Recent animal experiments reported that higher blood DHEA-s concentration can reduce visceral fat mass and increase the gene expression of adiponectin in adipocytes[15]. DHEA-s concentration is highly correlated with the metabolic regulation of adipocytes. correlation (Hori, Sato, Mesaki & Iemitsu, 2016). Han(2006) in a study of aging-related hormone and brain function changes in elderly women with different types of training, 12 weeks of resistance exercise, aerobic exercise and compound exercise, the concentration of DHEA-s increased sequentially, Anker(1997) performed treadmill exercise on menopausal women, and the results showed that the exercise group had significantly higher DHEA-s concentrations than the non-exercise group[16].

In this study, Mawangdui Daoyin exercise showed no significant difference between groups in the change of DHEA-s ($P>0.05$), but there was a significant change in time point and interaction effect ($P<0.05$) post hoc The test results showed that there was a significant difference in the Mawangdui exercise group. The growth hormone concentration in the group increased significantly after 6 weeks of exercise compared with before exercise, and the increase was greater after 12 weeks of exercise than after 6 weeks of exercise ($P<0.05$)[17]. The reason is that Mawangdui's "Daoyin" and the traditional Chinese medicine health care value of dance are closely related in origin and function, and the two have similar effects in theory and practice (Zhu Yi, 2017). When Wangdui is exercising, he can stimulate and promote the circulation of qi, blood and body fluid in the twelve normal meridians through qi-conducting, pulling-in and hitting acupoints, so as to harmonize qi and blood, and make the meridians unobstructed. Promotes changes in inner circulation harmony. Therefore, the Mawangdui Daoyin exercise in this study contributes to the positive effect of DHEA-s concentration, and at the same time shows that the effect of continuous exercise on DHEA-s is more obvious[18].

4.3 The effect of Mawangdui Daoyin exercise on Estrogen in female elderly

For women, the aging process is closely related to the changes in the endocrine system, especially the decrease in the secretion of estrogen in the ovary (Hyun-woong Moon, 2013). If estrogen secretion is reduced, bone density will decrease, increasing the risk of fracture (Yoo-Jeong Jeon & Ja-Young Kim, 2004). Decreased physiological capabilities such as the endocrine system. A study by Cerella (2010) pointed out that the decline of physical fitness and physical function caused by aging can be slowed down by regular aerobic exercise, even for elderly women with low fitness levels, short-term exercise can Increases secretion of Estrogens. In the previous research on aging-related estrogen changes, Beomjin Yoo (2019) took elderly women as the research objects, and conducted a comparative analysis of blood lipids, growth hormone, and estrogen in the experimental group and the control group through compound exercise. Compared with the control group, the estrogen concentration of the older women in the experimental group was significantly increased[19]. Joo-Young Park (2010), in a study on the effects of dance exercise programs on aging-related hormones

in older women, suggested that estrogen concentrations in the exercise group increased significantly after exercise compared to before exercise[20].

In this study, Mawangdui exercise showed no significant difference between the groups in the changes of estrogen in aging-related hormones, but there was a significant difference in the interaction effect[21]. Post-hoc test showed that the exercise group did not increase after 6 weeks of exercise. But there was a significant increase after 12 weeks of exercise. Kyung-Rye Kim (2005) took 65-92-year-old women as the research object, through 12 weeks, 60-70 minutes of resistance exercise, compound exercise and aerobic exercise 3 times a week, the results showed the estrogen level of the three groups Compared to before exercise were significantly increased. Soonhyang Jang (2005) studied the effects of Korean traditional dance on aging hormones in menopausal women aged 55-60 years[22]. The results showed that after 16 weeks of Korean traditional dance, the estrogen concentration of the experimental subjects increased significantly[23]. Youngpyo Kim, Hankyun Kim, & Seokhoon Kim (2017) found that estrogen in older women after 12 weeks of yoga exercise was significantly different at time points, as well as in the interaction effects of different groups and measurement time points, consistent with the results of this study. Hankyun Kim's (2017) study found that yoga can promote the secretion of estrogen, prevent osteoporosis and dementia, and improve immune function, thereby preventing health problems in older women. Likewise, the results of this study showed that long-term and regular Mawangdui Daoyin exercise had a positive effect on estrogen secretion in elderly women[24].

5. Conclusion

In order to understand the effect of Mawangdui Daoyin exercise on aging hormones in elderly women, this study conducted a 12-week Mawangdui Daoyin exercise to analyze the intervention effect of aging hormones in elderly women. Statistical analysis was carried out on the experiments, and the following conclusions were drawn:

1) Before and after the Mawangdui Daoyin exercise, there was a significant difference in growth hormone after 6 weeks of exercise compared with before exercise, and there was no significant difference after 12 weeks of exercise.

2) Before and after the Mawangdui Daoyin exercise, there was a significant difference in DHEA-s after 6 weeks of exercise compared with before exercise, and there was also a significant difference after 12 weeks of exercise.

3) Before and after the Mawangdui Daoyin exercise, there was no significant difference in Estrogen after 6 weeks of exercise compared with before exercise, but there was a significant difference after 12 weeks of exercise.

The above findings suggest that 12 weeks of Mawangdui Daoyin exercise had a positive effect on aging hormones in elderly women. Long-term and regular Mawangdui Daoyin exercise will increase the secretion of GH, DHEA-s, and Estrogen in elderly women, and have a positive anti-aging effect. In addition, Mawangdui Daoyin exercises can not only improve the quality of life and physical health of elderly women, but also become an effective solution for preventing falls.

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