



Original Article

## Effects of silver gymnastic exercises on aging-related hormones in elderly women living alone

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**Abstract.** [Purpose] The purpose of this study was to investigate the effect of silver gymnastic exercises on aging-related hormones in elderly women living alone. [Subjects and Methods] The study group consisted of 20 elderly women living alone who performed the silver gymnastic exercises for 12 weeks. Blood samples were obtained for measurement of aging-related hormones (human growth hormone [HGH] and estrogen). [Results] HGH and estrogen levels increased significantly after the exercise program as compared to before the program. [Conclusion] The silver gymnastic exercises helped to induce positive changes in aging-related hormone levels in elderly women living alone. These positive effects on aging-related hormones might help to slow down aging in elderly women living alone.

**Key words:** Silver gymnastic exercises, Aging-related hormone, Elderly women living alone

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### INTRODUCTION

More elderly people live alone today than in previous times. The rise in the numbers of elderly individuals living alone is due to increases in average life expectancies, with subsequent increases in the percentage of elderly people in the population. However, it is also the result of changes in family structures and lifestyles, with more nuclear families and one-parent families today, as well as increased divorce rates. Furthermore, there are changes in trends in familial support, with many elderly members of families no longer looked after by their children. These trends are expected to continue in the future<sup>1, 2)</sup>.

Although elderly people generally experience aging-related health problems, these difficulties are more severe for elderly individuals living alone. Previous research showed that elderly people who lived alone had lower levels of health and self-competence as compared to elderly individuals who did not live alone and that health-related issues were preconditions for other problems<sup>2)</sup>. These problems include psychological conflict, sadness, and a sense of isolation due to an absence of relationships with family members, as well as the loss of friends<sup>3)</sup>.

Previous research demonstrated that exercise improved the gait of elderly individuals and prevented falls by enhancing their overall body balance ability. It also had positive effects on the muscular functions of elderly individuals, providing pain relief in cases of musculoskeletal system problems. Furthermore, studies showed that exercise had positive effects on the cardiovascular system, thereby helping to prevent circulatory system diseases, in addition to improving insulin sensitivity by enhancing saccharometabolism<sup>4-6)</sup>. There have been no studies of the effects of exercise on aging-related hormones on elderly individuals, although such studies, especially among elderly people living alone, are important. The purpose of this study was to investigate the effects of silver gymnastic exercises on aging-related hormones in elderly women living alone.

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## SUBJECTS AND METHODS

The study population consisted of 20 elderly women living alone who were registered in the elderly persons living alone comprehensive support center in D city of South Korea and were in receipt of elderly person care services. The average age, height, body weight, and body fat percentage of the study participants were  $75.9 \pm 6.3$  years,  $152.9 \pm 5.53$  cm,  $59.1 \pm 7.8$  kg, and  $33.3 \pm 6.3\%$ , respectively. The silver gymnastic exercise program was implemented three times per week for 12 weeks based on the elderly persons exercise program recommendation<sup>7)</sup>, and each exercise session lasted 60 min. In the silver gymnastic exercises, the target heart rate was 40–60% of heart rate reserve (HRR), and 21 movements were performed. These were as follows: morning stretching, water force massage, knee pulling, body lifting, neck stretching, shoulder turning, flank stretching, trunk twisting, upper body bending in a sitting position, upper body bending to stretch the leg, inhaling the energy of the sun, bending the waist to 90°, pup stretching, balancing on a foot, erecting the trunk, cat stretching, ankle stretching, ballet stretching, half-moon stretching, whole body twisting, and tree posture. To measure aging-related hormone (human growth hormone [HGH] estrogen) levels, blood was collected from the forearm vein of each participant before and after the silver gymnastic exercise. To compare changes before and after the exercise program, paired t-tests were conducted. All the data were analyzed using the SPSS 21.0 Windows program. The significance level  $\alpha$  was set to 0.05. This study has been prepared in accordance with the Namseoul University research ethics standards, and the subjects were safely protected throughout every stage of the experiment. All of the subjects understood the purpose of this study and provided written informed consent prior to their participation in accordance with the ethical standards of the Declaration of Helsinki.

## RESULTS

The levels of HGH increased from  $0.85 \pm 0.63$  (ng/ml) before the exercise program to  $1.47 \pm 1.13$  (ng/ml) after the exercise program, and the difference was statistically significant (t-value=  $-2.575$ ,  $p=0.019$ ). The levels of estrogen also changed, increasing from  $156.94 \pm 71.48$  (pg/ml) before the exercise program to  $229.32 \pm 85.74$  (pg/ml) after the program, and the difference was statistically significant (t-value=  $-2.856$ ,  $p=0.011$ ).

## DISCUSSION

Changes in the endocrine system, including aging-related declines in HGH and estrogen, can lead to the collapse of the metabolic regulatory function, thereby accelerating aging and causing various diseases<sup>8)</sup>. HGH is a potential mediator of aging-related muscle atrophy and an important indicator of the functional capacity and activity of elderly individuals. The secretion of estrogen rapidly decreases after menopause, with resulting effects on physiological systems<sup>9)</sup>. Decreased secretion of estrogen also results in an increased risk of heart diseases and osteoporosis<sup>9)</sup>. In the present study, the level of HGH was significantly higher after the exercise program as compared to before the program. This result is consistent with the findings of a previous study, which indicated that aerobic exercises and resistance exercise had positive effects on HGH<sup>10, 11)</sup>. We attribute the positive effects of the 12-week silver gymnastic exercise program in the present study to physical stimulation of the musculoskeletal system promoting the metabolism of the study participants. Increases in HGH levels can be expected to help the movements of amino acids between cells and cells' re-synthesis of amino acids, leading to the production and recovery of organs, including the heart and skin, thereby helping to suppress aging in elderly people and improve their health. It is expected to benefit the health of elderly people by making and restoring the body's muscles, heart, and skin.

In this study, estrogen levels were also significantly higher after the silver gymnastic exercise program as compared to before the program. A previous study reported that long-term aerobic exercise increased the levels of estrogen, a sex hormone<sup>12)</sup>. Another study reported that an exercise program of short duration (i.e., 12 weeks) increased the estrogen levels of elderly people with very low fitness levels and that it had positive effects<sup>13)</sup>, consistent with the results of the present study. Based on the findings of the present study and those in the literature, it appears that silver gymnastic exercises, in addition to preventing osteoporosis caused by a shortage of estrogen and dementia, which afflicts many elderly people living alone, can have other long-term health-related benefits due to the promotion of the synthesis of neurotransmitters and improvements in immune functions. These include the prevention of heart diseases and arteriosclerosis among elderly women living alone.

In conclusion, silver gymnastic exercises induced positive changes in aging-related hormones in elderly women living alone. The results of this study may be useful in helping to combat adverse health effects associated with aging among elderly women living alone.

Generally speaking, the characteristics of the aging-related hormones is not different in the elderly who live alone compared to elderly individuals who do not. However, it is also well known that elderly individuals living alone have more negative health elements including the low levels of overall health and self-competence and disconnection with their family compared to their counterparts. It is necessary to look for an exercise program as the health promotion of the elderly living alone. In addition, it is difficult to conclude that the silver gymnastics exercises sustain the positive change of the aging-related hormone in elderly individuals with the finding of the present study that the exercises induced positive aging-related hormonal changes in the female elderly individuals living alone. Therefore, the validity of the long-term effect should be verified.

## REFERENCES

- 1) Kim YS: The study of the impact of the family type on the health promoting behavior and physical and mental health of elderly people. *Health Soc Welf Rev*, 2014, 34: 400–429. [[CrossRef](#)]
- 2) Lee DY, Park JD: A study on the factors for the elderly living alone at home to determine their participation in a health promotion activity program: with the application of Anderson Model. *Soc Welf Policy*, 2011, 38: 1–23. [[CrossRef](#)]
- 3) Fowler SB: Health promotion in chronically ill older adults. *J Neurosci Nurs*, 1997, 29: 39–43. [[Medline](#)] [[CrossRef](#)]
- 4) Frankel JE, Bean JF, Frontera WR: Exercise in the elderly: research and clinical practice. *Clin Geriatr Med*, 2006, 22: 239–256, vii. [[Medline](#)] [[CrossRef](#)]
- 5) Fatouros IG, Taxildaris K, Tokmakidis SP, et al.: The effects of strength training, cardiovascular training and their combination on flexibility of inactive older adults. *Int J Sports Med*, 2002, 23: 112–119. [[Medline](#)] [[CrossRef](#)]
- 6) Morey MC, Pieper CF, Crowley GM, et al.: Exercise adherence and 10-year mortality in chronically ill older adults. *J Am Geriatr Soc*, 2002, 50: 1929–1933. [[Medline](#)] [[CrossRef](#)]
- 7) American College of Sports Medicine: ACSM's guidelines for exercise and prescription, 6th ed. Philadelphia: Lea & Febiger, 2002.
- 8) Powers DC, Morley JE, Coe RM: Aging immunity and infection. New York: Spring Publishing Company, 1994.
- 9) Consitt LA, Copeland JL, Tremblay MS: Endogenous anabolic hormone responses to endurance versus resistance exercise and training in women. *Sports Med*, 2002, 32: 1–22. [[Medline](#)] [[CrossRef](#)]
- 10) Kraemer RR, Kilgore JL, Kraemer GR, et al.: Growth hormone, IGF-I, and testosterone responses to resistive exercise. *Med Sci Sports Exerc*, 1992, 24: 1346–1352. [[Medline](#)] [[CrossRef](#)]
- 11) Snyder F: Toward an evolutionary theory of dreaming. *Am J Psychiatry*, 1966, 123: 121–142. [[Medline](#)] [[CrossRef](#)]
- 12) Bonen A, Burke EJ, Brush C: Physiological and anthropometric assessment of successful teenage female instance runners. *Res Q*, 1992, 50: 2, 180–187.
- 13) Cerella J: Aging and information-processing rate. EDS, *Handbook of the psychology if aging*. 1990, pp 201–221.