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## Effects of Qigong TRAINING on Body Composition, Fitness and Bone Mineral Density in the Elderly

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### Abstract

*This study investigated the effects on body composition, physical fitness, and bone mineral density (BMD) of 20 elderly women aged 60 or older residing in G city, K province who participated in the Dahn-taekwondo Qigong program for the elderly for 1 hour per day, 3 times a week for 3 months. This study examined the suitability of incorporating elderly Qigong program into the exercise prescription program for the elderly with decreased physical activity ability. The results showed that the Dahn-taekwondo Qigong program showed a significant decrease only in body fat percentage among the elderly women's body composition. For the fitness factor, all the fitness factors except cardiopulmonary endurance for the normal weight group and agility and dynamic equilibrium measures for the overweight group were significantly improved. Also, it showed a significant increase in the BMD of the normal weight group. Based on the observations mentioned above, participating in Qigong program for the elderly will be suitable as a health promotion program for the elderly by improving BMD and fitness factors even though the body composition does not change so much.*

**[Keywords]** *Body Composition, Physical Fitness, Qigong Training, Dahn-Taekwondo, Bone Mineral Density(BMD)*

### 1. Introduction

In 2000, with 7.2% elderly population whose age is 65 or older, South Korea entered the aging society. In 2018, with 14.46% of such population Korea became an aged society. Further Korea is anticipated to become a super-aged society by 2026 with 20.83% of elderly population. Colchero et al.(2016) reported that In the last two or three centuries, human life expectancy has increased by more than 40 to 50 years, Regular exercise is recommended as the most effective way to reduce the difference among delayed physiological aging, life expectancy and healthy life expectancy[1][2][3]. Physical inactivity is closely related to health risk factors[4] and health promotion of the elderly includes positive effects of reducing medical expenses[5]. Aging causes a reduction in body composition

and physical activity[6], and changes in body composition due to aging typically are decreased muscle mass and increased body fat[7][8]. Advantages of regular exercise is reported to include increased cardiopulmonary functions and muscle strengths[9][10][11][12] and decreased body fat and increased muscle mass as well as increased balance ability It has been reported that it helps to improve the balance ability with decreasing body fat and increasing muscle mass[13][14][15][16][17]. Meta-analysis related to the exercise effect of the elderly since 2011 shows the effect on the improvement of muscle strength[18][19][20] and effects on risk factors of cardiovascular disease[21] and emphasizes not only the importance of participating in exercise programs but also the necessity of tailored exercise programs.

Especially in old age, the importance of healthy body is absolute[22]. There are various exercises for improving the health of the elderly. However, among those exercises suitable for training, qigong is an exercise aiming for the improvement of general fitness of the body, maintenance of correct postures, restoration of flexibility, and strengthening abdominal and back muscles. Qigong refers to a method of training to human perfection by training and operating the qi. The basic elements of qigong are Joshin(調身: right posture and movement), Joshig(調息: right breathing) and Joshim(調心: right mind concentration) which usually are focused and used at the same time (2002). Yuasa Yasuo(1992) suggests that qigong training has the effects of analgesics, ability to kill cancer cells, and to decrease catecholamine[23]. Xing and Pi(1993) reported that qigong had psychological effects on exercise and perception and physiological functions such as heart rate, body temperature, sympathetic function and gastrointestinal function[24]. Already in China and Japan, medical practices combining traditional medicine and Western medicine are being implemented[23]. In relation to qigong, Kim Jong-hyun(2010) defines breathing as a process confirming that the breath itself is indeed the life itself as breathing continues in human body without a rest[25]. Also, Yoon Tae-gi(2012) said that through qigong the body itself can improve immune system by controlling the autonomic nervous system and prevent and heal diseases by balance and harmony[26].

The fundamental cause of the incongruity of elderly people is that the energy(氣運) of the elderly does not flow properly. A healthy state with good energy flow in body is when the head is cold and the belly is warm which is known as Rising Water and Falling Fire(水昇火降) state. Our society which has become an aging society in the 21st century, the feminization of the elderly population is intensifying, health problems and old age adjustment problems unique to women and different from elderly men are approaching. The researcher of the study has developed Dahn-taekwondo 'Qigong Program For the Elderly' and applied to elderly women as a way to find the health of the elderly generations from the

standpoint of a person who is trained and teaching Taekwondo. Especially, Dahn-taekwondo 'Qigong Program for the Elderly' is a bare hand, whole body exercise using arms, legs and the whole body.

As it trains according to the flow of meridians, it not only facilitates the circulation of the blood, but also corrects the structure of the muscle skeletal system and makes the body healthier. Previous studies related to Taekwondo training so far have mainly focused on improving physical fitness and psychological stability in younger generations. Thus, this study seeks to find the effects of Dahn-taekwondo 'Qigong Program for the Elderly' which incorporates breathing and Doin exercise on body composition and BMI of elderly women.

## 2. Methods

### 2.1. Subject of study

The subject of this study is 20 elderly women aged 60 and above who live in G city in K province and were voluntarily participated in this study after sufficient information about the test purpose and details are provided to them. Their physical characteristics are as shown in <Table 1>.

**Table 1.** The physical characteristics of the subject.

| Group         | Age(yrs)   | Height(cm)  | Weight(kg)  | BMI(kg/m <sup>2</sup> ) | N  |
|---------------|------------|-------------|-------------|-------------------------|----|
| Normal weight | 67.80±0.95 | 156.34±5.63 | 46.76±7.97  | 21.18±1.66              | 12 |
| Over weight   | 69.68±0.79 | 155.99±6.04 | 61.13±10.23 | 25.96±2.16              | 8  |

Note: Value are mean±SD.

### 2.2. Experimental design

The subjects were trained of Dahn-taekwondo Qigong Program for the Elderly which modernized Korea Sundo for 36 times(1 hour per day, 3 times a week, 3 months per week) in Y senior citizen community center. Training details are as shown in <Table 2>. In addition, before and after the application of the program, subjects were measured for height, weight, body mass index, and bone mineral density. Also, they

went through Senior Fitness Test: SFT means standing up after sitting on a chair for 30 s, lifting a dumbbell, 2-minute step test, stretching arms and back sitting on a chair, turning arms back and let middle fingers reach each other and sitting on a chair after walking 8 feet.

**Table 2.** Dahn-taekwondo Qigong program for the elderly.

| Time (min) | Description   | Effect                        | Stage       |
|------------|---|-------------------------------|-------------|
| 15         | Hitting danjeon, intestine exercise, hitting water wall, turning infinitely, tapping the whole body | Rising water and falling fire | Initial     |
| 30         | Doin exercise such as relieving tension in the 8 joints and stretching the whole body               | 12meridian communication      | Development |
| 15         | Wagongyundan, relaxation  | Stabilization and relaxation  | End         |

### 2.3. Processing the data

Statistical analysis was performed using the SPSS 21.0 program. The mean and standard deviation of each measurement variable were calculated. The paired t-test was used to compare the mean values of the normal weight and task groups before and after participation. Analysis of Covariate (ANCOVA) was used to compare the average value between the two groups after the study. The significance level was set at  $p < .05$ .

## 3. Results

### 3.1. Changes in body composition before and after qigong for the elderly.

Changes in body composition before and after qigong for the elderly is as shown in <Table 3>. Before and after participation in the qigong for the elderly program, the normal weight group showed between  $46.76 \pm 7.97$ (kg) to  $47.43 \pm 6.43$ (kg) and overweight group showed from  $61.13 \pm 10.23$ (kg) to  $60.68 \pm 10.42$ (kg) and no statistical significance was identified. There was statistically

significant difference between the two groups. There was statistically significant difference between the two groups before the program. There was no significant difference in the covariance analysis on the body weight between the two groups after participation in the program. Body fat percentage decreased from  $30.58 \pm 4.74$ (%) to  $29.57 \pm 3.73$ (%) in normal weight group but there was no statistically significant difference. For the overweight group it was significantly ( $p < .05$ ) reduced from  $32.31 \pm 5.26$ (%) to  $30.24 \pm 6.26$ (%). There was no significant difference in the covariance analysis on the fat body fat percent between the two groups after participation in the program. Before and after participating in the Qigong program for the elderly, The body mass index was from  $21.18 \pm 1.66$ ( $\text{kg}/\text{m}^2$ ) to  $21.43 \pm 1.60$ ( $\text{kg}/\text{m}^2$ ) for the normal weight group and  $25.78 \pm 2.06$ ( $\text{kg}/\text{m}^2$ ) to  $25.96 \pm 2.16$  for the overweight group and there was no statistically significant difference

**Table 3.** Changes in body composition before and after Qigong program for the elderly.

|               | Weight (kg)       |                   | Body Fat (%)     |                    | BMI ( $\text{kg}/\text{m}^2$ ) |                  |
|---------------|-------------------|-------------------|------------------|--------------------|--------------------------------|------------------|
|               | Pre               | Post              | Pre              | Post               | Pre                            | Post             |
| Normal weight | $46.76 \pm 7.97$  | $47.43 \pm 6.43$  | $30.58 \pm 4.74$ | $29.57 \pm 3.73$   | $21.18 \pm 1.66$               | $21.43 \pm 1.60$ |
| Overweight    | $61.13 \pm 10.23$ | $60.68 \pm 10.42$ | $32.31 \pm 5.26$ | $30.24 \pm 6.26^*$ | $25.96 \pm 2.16$               | $25.78 \pm 2.06$ |

Note: Value are mean  $\pm$  SD, \*, Significantly different from pre ( $p < .05$ ).

### 3.2. Changes in physical fitness before and after qigong for the elderly

1) Changes in muscle strength and endurance and cardiopulmonary endurance before and after qigong for the elderly

**Table 4.** Changes in muscle strength and endurance and cardiopulmonary endurance before and after qigong for the elderly.

|               | Chair stand test |                    | Arm curl test    |                       | 2-Minute step     |                   |
|---------------|------------------|--------------------|------------------|-----------------------|-------------------|-------------------|
|               | Pre              | Post               | Pre              | Post                  | Pre               | Post              |
| Normal weight | $13.00 \pm 2.56$ | $14.63 \pm 2.88^*$ | $15.38 \pm 2.32$ | $17.13 \pm 2.10^{**}$ | $143.0 \pm 27.76$ | $145.8 \pm 22.56$ |

|             |                |                      |                |                     |                      |                        |
|-------------|----------------|----------------------|----------------|---------------------|----------------------|------------------------|
| Over weight | 12.91<br>±3.14 | 14.58<br>±2.57<br>** | 15.58<br>±4.30 | 17.21<br>±4.76<br>* | 125.5<br>8±36.<br>27 | 141.9<br>2±31.<br>67** |
|-------------|----------------|----------------------|----------------|---------------------|----------------------|------------------------|

Note: Value are mean±SD, \*: Significantly different from pre(p<.05), \*\*: Significantly different from pre(p<.01)

Changes in muscle strength and endurance and cardiopulmonary endurance before and after qigong for the elderly are as shown in table 4. Lower leg strength and muscle endurance(Chair stand test) was 13.00±2.56(each) to 14.63±2.88(each) for the normal weight group and 12.91±3.14(each) to 14.58±2.57(each) for the overweight group. Two groups both are significantly(p<.05, p<.01) increased. There was statistically significant difference between the two groups before. There was no significant difference in the covariance analysis between the two groups after the program, having the before lower leg strength values as the covariate variable. Arm strength and muscle endurance(Arm curl test) was 15.38±2.32(each) to 17.13±2.10(each)for the normal group and 15.58±4.30(each) to 17.21±4.76(each) for the overweight group. Two groups both are significantly(p<.05, p<.01) increased. There was statistically significant difference between the two groups' arm strength and muscle endurance before. There was no significant difference in the covariance analysis between the two groups after the program, having the before program arm strength values as the covariate variable. For cardiopulmonary endurance(2-Minute step), there was a statistically significant difference between the normal weight group and the overweight group. Changes in cardiopulmonary endurance before and after participating the program was 143.00±27.76(each) for the normal group and 145.88±22.56(each) for the overweight group but there was no statistically significant difference. However, for the overweight group, there was a significant (p<.01) increase from 125.58±36.27(each) to 141.92±31.67(each). There was no significant difference in the covariance analysis between the two groups after the program, having the before average value as a covariate variable.

2) Changes in flexibility, agility and dynamic equilibrium before and after qigong for the elderly

Changes in flexibility(Chair sit-and-reach)agility and dynamic equilibrium(8-Foot up-and-go) before and after qigong for the elderly are as shown in <Table 5>.

**Table 5.** Changes in flexibility agility and dynamic equilibrium before and after qigong for the elderly

|               | Chair sit-and-reach |                         | Back stretch   |                      | 8-Feet up-and-go |                    |
|---------------|---------------------|-------------------------|----------------|----------------------|------------------|--------------------|
|               | Pre                 | Post                    | Pre            | Post                 | Pre              | Post               |
| Normal weight | -8.13<br>±11.2<br>6 | -5.56<br>±10.4<br>2 *** | -4.61<br>±6.86 | -0.56<br>±5.73<br>** | 7.07<br>±1.00    | 6.72<br>±1.00<br>* |
| Over weight   | 3.42±<br>5.55       | 5.67±<br>4.89*<br>*     | -8.90<br>±6.02 | -5.11<br>±6.61<br>*  | 7.36<br>±1.13    | 6.95<br>±.78       |

Note: Value are mean±SD, \*: Significantly different from pre(p<.05), \*\*: Significantly different from pre(p<.01), \*\*\*: Significantly different from pre(p<.001)

There was a statistically significant difference between the waist flexibility values of the two groups before the program. Changes in the waist flexibility was -8.13±11.26(cm) to -5.56±10.42(cm) for the normal weight group and 3.42±5.55(cm) to 5.67±4.89(cm) for the overweight group. Both groups are significantly(p<.001, p<.01) increased. There was a significant difference in the covariance analysis between the two groups' waist flexibility after the program, having the before average value as the covariate variable. Upper body flexibility was 4.61±6.86(cm) to -0.56±5.73(cm) for the normal weight group and -8.90±6.02(cm)to -5.11±6.61(cm) for the overweight group. Both groups were significantly (p<.01, p<.05)) increased. There was a statistically significant difference between the upper body flexibility values of the two groups before the program. There was no significant difference in the covariance analysis between the two groups' upper body flexibility after the program, having the before average value as the covariate variable.

Changes in agility and dynamic equilibrium(8-Foot up-and-go) were 7.07±1.00(second) to 6.72±1.00(second) for the normal weight group and reduced significantly (p<.05). However, for the overweight group it was reduced form 7.36±1.13(second) to 6.95±0.78(second) but there was no statistically significant difference.

### 3.3. Changes in BMD before and after qigong for the elderly

Changes in BMD before and after qigong for the elderly are as shown in <Table 6>. The BMD of normal weight group significantly ( $p < .05$ ) increased from  $31.29 \pm 2.87$  (g/cm<sup>2</sup>) to  $33.40 \pm 3.41$  (g/cm<sup>2</sup>) but overweight group's BMD changed from  $35.52 \pm 7.25$  (g/cm<sup>2</sup>) to  $35.57 \pm 7.17$  (g/cm<sup>2</sup>) so no statistically significant difference was observed. There also was no difference observed in the two groups's BMD from covariance analysis

**Table 6.** Changes in BMD(g/cm<sup>2</sup>).

| Group         | Pre            | Post           | t-value | p-value |
|---------------|----------------|----------------|---------|---------|
| Normal weight | 31.29<br>±2.87 | 33.40<br>±3.41 | 2.67    | .03*    |
| Over weight   | 35.52<br>±7.25 | 35.57<br>±7.17 | .37     | .72     |

Note: Value are mean±SD, \*: Significantly different from pre( $p < .05$ ).

## 5. Discussion

For the body composition change before and after participating in Dahn-taekwondo Qigong program for the elderly for 3 months, only body fat percent reduction of the overweight group was statistically significant. Comparing the treated exercise type with various study results[26][27][28][29] on similar exercises such as Danjeon breathing, oriental and gunshin Qigong exercises, The general tendency was found to be consistent, but there was a partial difference in statistical significance. In general, regular aerobic exercise has been reported to have a positive effect on body composition However, it seems that the effect of exercise program on body composition varies depending on the characteristics of the exercise programs, the demographic characteristics of the participants, and the individual characteristics of the participants. In this study, 20 elderly women aged 60~80 years were administered three times a week for 60 minutes of Qigong program for the elderly for three months. In the previous study, the exercise duration(9~18 weeks), frequency(2~4 times a week), type(Kukhak qigong, Dahn-taekwondo, walking etc.), and participants type(adult male,

adult female, elderly women, elderly women with high blood pressure and etc.) are so different from this Dahn-taekwondo Qigong program for the elder and cannot be used to explain the result and direct relationship). However, based on the results from this study, it can be assured that the Dahn-taekwondo Qigong program for the elderly has positive effects on elderly women's body composition. Especially, the fact that the overweight group significantly reduced body fat percent means that this exercise program is effective in controlling and preventing obesity in elderly women. Changes in physical fitness and BMD before and after participating Dahn-taekwondo Qigong program for the elderly indicated improvement in all aspects of physical fitness except the cardiopulmonary endurance for the normal weight group and agility and dynamic balance measures of overweight group. This results are consistent with previous studies[26][27][30][31][32]. Kwon Kiwook(2000) reported that all health-related fitness factors improved positively after elderly women's qigong training and Jung Yun-soo(2006) reported that muscular strength did not increase significantly, but muscle endurance, flexibility, and balance were increased[27][30]. Jun Young-sun(2004), also reported that the Taegeuk health Qigong exercise program positively affected the flexibility of the waist and arm[32]. Huh Il-woong, Kim Eun-jung, Kim Ji-sung(2008) concluded that Gunshin qigong helps the muscular strength, flexibility, muscular endurance, and equilibrium of the elderly[29]. As shown in the previous studies and the results of this study, regular exercise program is very effective for the prevention of fall, maintenance and improvement of health convenience of daily life of the elderly and means that it should be recommended to the elderly. In addition, the BMD of the normal weight group was significantly increased after the participation of the program. It is because although Qigong program for the did not result in positive change in the elderly women's body condition but it indirectly brought effects of increased muscle. It seems that hitting danjeon and intestine exercise performed during Dahn-taekwondo Qigong program for the el-

derly positively affected the body to normalize body weight and body mass index which are related to body composition, reduce body fat percentage and increase more than other aerobic exercise programs. Cold intestine can hinder Rising Water and Falling Fire effect circulating body energy. Especially hitting danjeon and intestine exercise are training methods to relax the cold and hardened intestine to make warm and comfortable intestine and for the body's harmonious blood circulation. By boosting Rising Water and Falling Fire effect, they are considered to provide various effects for the health promotion of the elderly.

## 5. Conclusion

Study investigated the effects on body composition and physical fitness(BMD) of 20 elderly women aged 60 or older residing in G city, K province who participated in the Dahn-taekwondo Qigong program for the elderly for 1 hour per day, 3 times a week for 3 months and obtained results as follow. Dahn-taekwondo Qigong program for the elderly only body fat percent reduction of the overweight group was statistically significant. Taekwondo Qigong program for the elderly indicated improvement in all aspects of physical fitness except the cardiopulmonary endurance for the normal weigh group and agility and dynamic balance measures of overweight group. Also, the BMD of the normal weight group significantly reduced. Based on the results above, it can be concluded that Dahn-taekwondo Qigong exercise is a program needs to be recommended to the elderly.

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