

Effect of Aquatic Exercise on Foot Pressure Balance and Posture Stability in Elderly Women

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The purpose was investigate the foot pressure balance and body posture stability in elderly women. Sixteen elderly women participated in this study (mean age:72.63~79.38,46yrs, mean BMI: 25.03.83~27.99.78). They were divided into two groups (aqua exercise group, n=8, control group, n=8). Participants were tested before and after the study to measure foot pressure balance, body posture stability and advanced balance ability(limits of stability) were measured Biorescure(RM Ingenierie Co, France) which has % quarterly sector(RF, LF, RB, LB). Aqua exercise training program was performed for 50minutes per session, 3times per week for 12weeks. Data was analyzed with ANOVA for repeated measures, t-test using SPSS ver 19.0 program. Aquatic exercise considered a senior citizen fall prevention and improved quality of life.

KEY WORDS: aquatic exercise, elderly women, foot pressure balance, posture stability

INTRODUCTION: Nowadays in South Korea according to fast economy growth and medical development, senior citizens are growing rapidly Socially demands about a elderly reduction of health care cost and improvements quality life(Eun, Young, P., Jong Ha, L., 2005) . For Elderly, fast aging reducing physical strength and flexibility caused dynamic balance ability it become could be important factor of falling (Judge, J. o., Underwood, M., & Winsemius, D.,1993). For posture reliability and improving dynamic balance ability needs examine through efficiency aquatic exercise. (Sung Sun, K., Jae Moo, S., 2012).

METHODS: Sixteen elderly women subjects were participated in this study (n=16, mean age:72.63~79.38,46yrs, mean BMI: 25.03.83~27.99.78). They were divided into two groups (aqua exercise group, n=8, control group, n=8). Participants were tested before and after the study to measure foot pressure balance, body posture stability and advanced balance ability(limits of stability) were measured Biorescure(RM Ingenierie Co, France) which has % quarterly sector(RF, LF, RB, LB). Aqua exercise training program was performed for 50minutes per session, 3times per week for 12weeks. Data was analyzed with ANOVA for repeated measures, t-test using SPSS ver 19.0 program

Table 1
Characteristic of the subjects

| | Age(yrs) (M±SD) | Height(cm) (M±SD) | Weight(kg) (M±SD) | BMI(kg/m ²) (M±SD) |
|---------|--------------------|----------------------|----------------------|-----------------------------------|
| AG(n=8) | 72.63 (±2.00) | 153.63 (±6.72) | 59.35 (±9.05) | 25.03 (±2.83) |
| CG(n=8) | 79.38 (±3.46) | 153.24 (±4.80) | 65.44 (±7.91) | 27.99 (±2.78) |

AG : Aquatic Exercise Group, CG : Control Group

RESULTS:

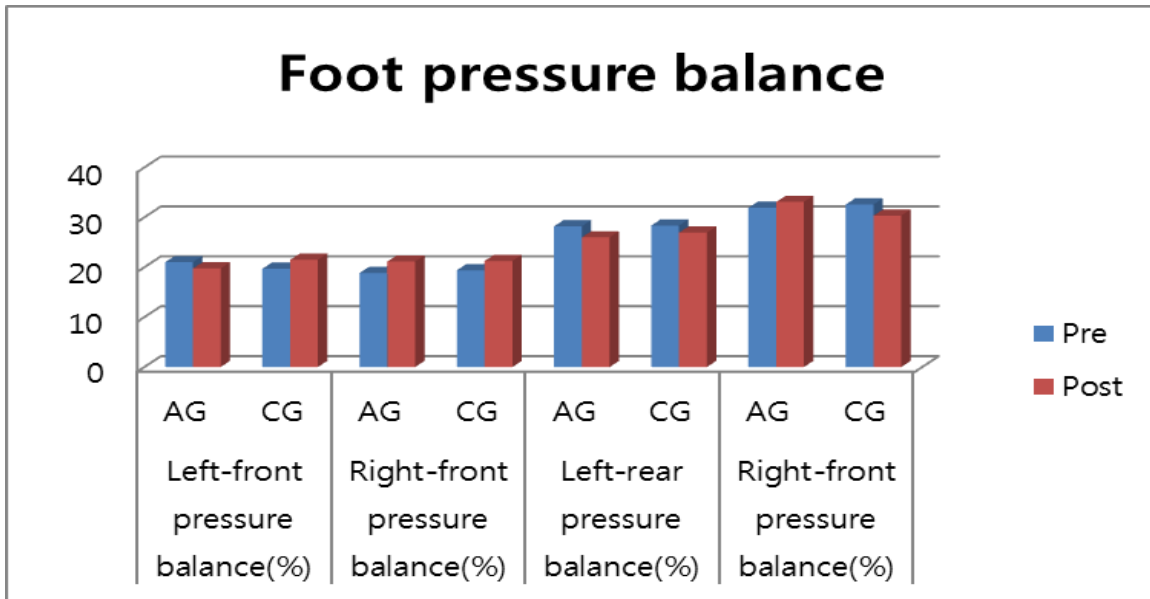


Figure 1. Change of foot pressure balance

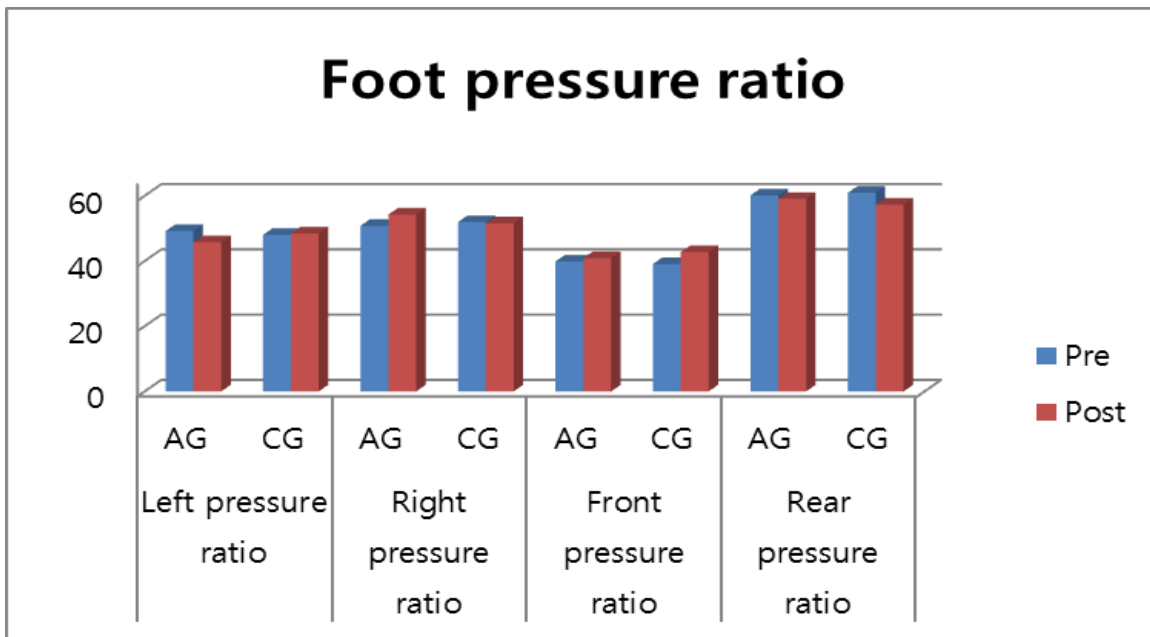


Figure 2. Change of foot pressure ratio

**Table 2
Change of postural stability balance**

| Items | Group | Time | | Effect | P | |
|--|---|------|-------------|-------------|-----|-------|
| | | Pre | Post | | | |
| Standing position (Free 30s) (EO/EC) | Eyes open surface area ellipse(mm ²) | AG | 26.13±21.83 | 41.38±36.16 | T | .212 |
| | | CG | 51.88±33.82 | 68.75±46.24 | G | .044* |
| | | | | | TxG | .949 |
| | Eyes open | AG | 7.66±1.84 | 6.64±1.91 | T | .586 |

| | | | | | | |
|--------------------|---|----|--------------------------|---------------|------|-------|
| | length(cm) | | | G | .586 | |
| | | CG | 7.55±0.68 | 7.96±1.54 | T×G | .207 |
| | Eyes open average speed(cm/s) | AG | 0.25±0.05 | 0.21±0.06 | T | .402 |
| | | CG | 0.25±0.05 | 0.25±0.08 | G | .402 |
| | Eyes closed surface area ellipse(mm ²) | AG | 90.1±45.6 | 53.8±40.4+ | T×G | .402 |
| | | CG | 81.5±38.3 | 127.4±64.4 | T | .783 |
| | Eyes closed length(cm) | AG | 14.56±7.31 ^{##} | 9.88±5.60 | G | .067 |
| | | CG | 11.24±2.67 | 14.03±3.79 | T×G | .023* |
| | Eyes closed average speed(cm/s) | AG | 0.50±0.24 ^{##} | 0.33±0.18 | T | .606 |
| | | CG | 0.38±0.12 | 0.46±0.13 | G | .823 |
| | Left area(mm ²) | AG | 968.1±1057.8 | 1176.1±968.2 | T×G | .050 |
| | | CG | 638.6±436.0 | 633.1±671.8 | T | .483 |
| | Right area(mm ²) | AG | 1058.1±849.5 | 852.0±592.3 | G | .920 |
| | | CG | 1025.1±528.9 | 799.6±480.0 | T×G | .042* |
| Limit of stability | Forward area(mm ²) | AG | 1294.0±1161.5 | 1290.4±1037.5 | T | .730 |
| | | CG | 1103.9±723.6 | 918.9±619.3 | G | .144 |
| | Backward area(mm ²) | AG | 732.0±726.3 | 738.9±494.5 | T×G | .716 |
| | | CG | 559.8±321.4 | 491.6±486.5 | T | .340 |
| | Total area(mm ²) | AG | 2026.3±1810.3 | 2029.0±1509.6 | G | .849 |
| | | CG | 1663.9±923.1 | 1432.8±1027.5 | T×G | .966 |

Values were expressed by means(standard deviation); Significant difference to GROUP(+p<.05); Significant difference to TIME(##p<.01); Significant difference to GROUP×TIME(*p<.05). AG: Aqua exercise group, CG: Control group

DISCUSSION: There was no statistically significant difference in foot pressure ratio through aquatic exercise in elderly women but was statistically similar with the ratio of general women. Also the limit of stability and trajectory beyond BOS improved. It is considered to be a result of balance training to apply COG and BOG under water together, and to adapt to drag force and turbulence.

CONCLUSION: This study examining effects of foot pressure balance and body posture stability through 12 weeks Aquatic exercise for elderly women. Results statistically similar, but after Aquatic exercise, static stability and dynamic stability ability was improved that effects elderly woman's posture stability. Aquatic exercise considered a senior citizen fall prevention and improved quality of life. Also proposed study of foot pressure balance may effects body posture stability

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