

## 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 Biorescore(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).

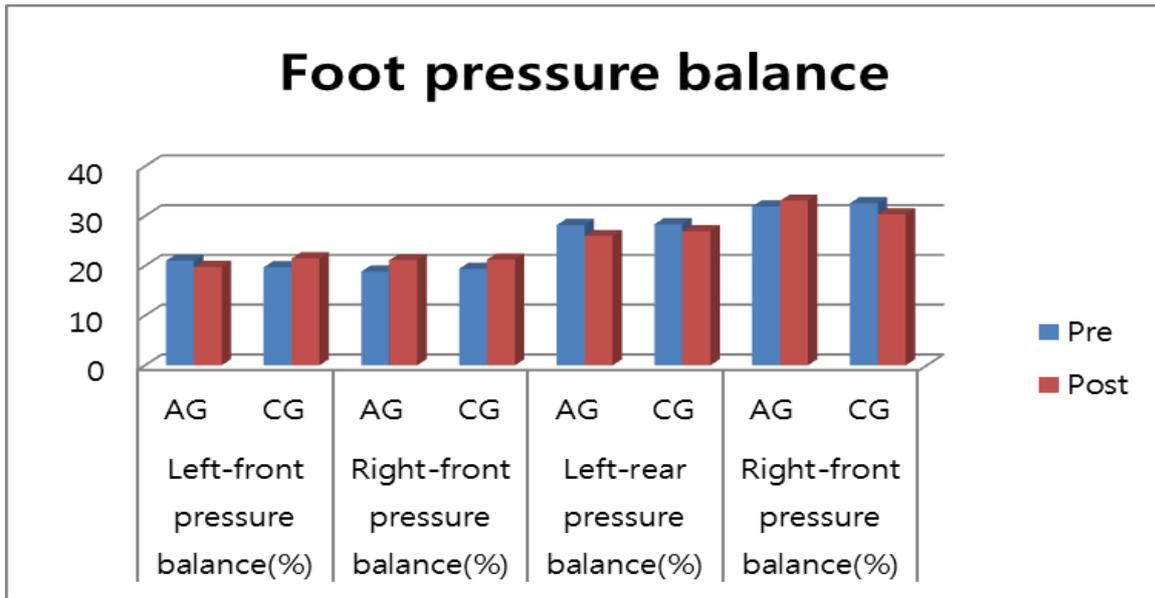
**METHODS:** Sixteen elderly women subjects were participated in this study (n=16, mean age:72.63~79.38,46yrs, mean BMI: 25.03.83~27.99.78). They were divided into two groups (aqua exercise group, n=8, control group, n=8). Participants were tested before and after the study to measure foot pressure balance, body posture stability and advanced balance ability(limits of stability) were measured Biorescore(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**

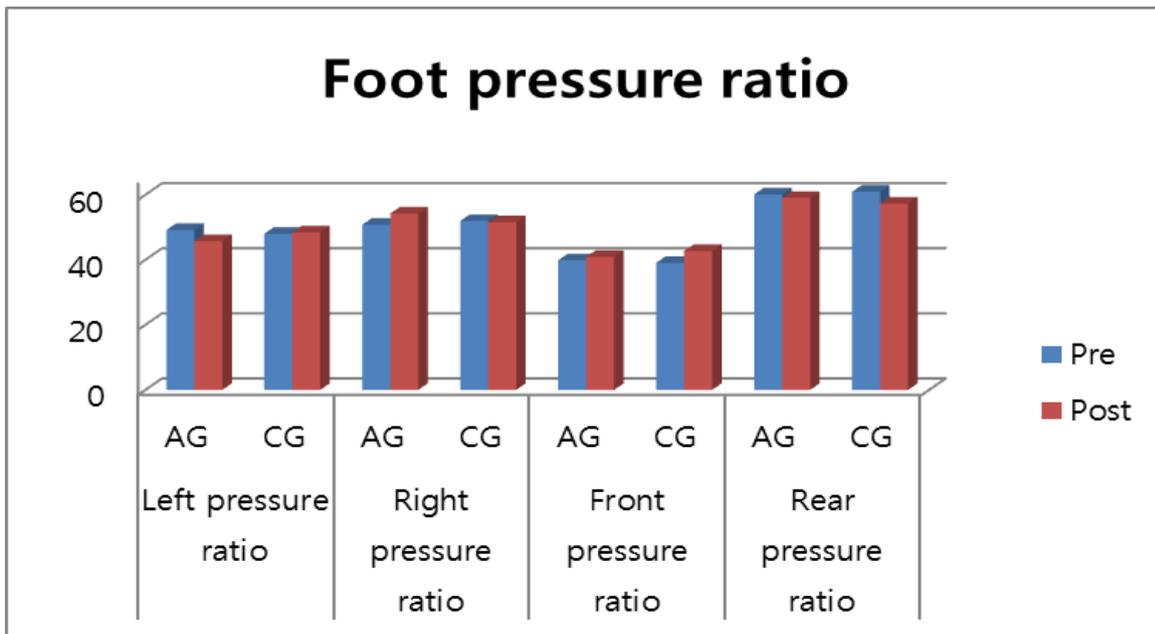
	Age(yrs) (M±SD)	Height(cm) (M±SD)	Weight(kg) (M±SD)	BMI(kg/m <sup>2</sup> ) (M±SD)
AG(n=8)	72.63 (±2.00)	153.63 (±6.72)	59.35 (±9.05)	25.03 (±2.83)
CG(n=8)	79.38 (±3.46)	153.24 (±4.80)	65.44 (±7.91)	27.99 (±2.78)

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 <sup>2</sup> )	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	TxG	.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 <sup>2</sup> )			T	.783	
		AG	90.1±45.6	53.8±40.4+	G	.067
		CG	81.5±38.3	127.4±64.4	TxG	.023*
		AG	14.56±7.31 <sup>##</sup>	9.88±5.60	T	.606
Eyes closed	length(cm)			G	.823	
		CG	11.24±2.67	14.03±3.79	TxG	.050
Eyes closed	average speed(cm/s)	AG	0.50±0.24 <sup>##</sup>	0.33±0.18	T	.483
		CG	0.38±0.12	0.46±0.13	G	.920
				TxG	.042*	
		AG	968.1±1057.8	1176.1±968.2	T	.730
Left area(mm <sup>2</sup> )				G	.144	
		CG	638.6±436.0	633.1±671.8	TxG	.716
Right area(mm <sup>2</sup> )		AG	1058.1±849.5	852.0±592.3	T	.340
		CG	1025.1±528.9	799.6±480.0	G	.849
				TxG	.966	
		AG	1294.0±1161.5	1290.4±1037.5	T	.772
Limit of stability	Forward area(mm <sup>2</sup> )			G	.392	
		CG	1103.9±723.6	918.9±619.3	TxG	.781
Backward area(mm <sup>2</sup> )		AG	732.0±726.3	738.9±494.5	T	.871
		CG	559.8±321.4	491.6±486.5	G	.270
				TxG	.842	
		AG	2026.3±1810.3	2029.0±1509.6	T	.815
Total area(mm <sup>2</sup> )				G	.329	
		CG	1663.9±923.1	1432.8±1027.5	TxG	.810

Values were expressed by means(standard deviation); Significant difference to GROUP(+p<.05); Significant difference to TIME(<sup>##</sup>p<.01); Significant difference to GROUPxTIME(\*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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