

THE EFFECT OF KOREAN FOLK DANCE EXERCISE TO THE KINEMATIC PARAMETERS FOR DOWN STAIRCASE WALKING OF ELDERLY PEOPLE

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KEYWORDS: elderly, stair walking, descending, folk dance, lower extremity, kinematics

INTRODUCTION: According to the Statistics department of Korea in 1991, population aged over 65 years in 1970 was 991,000 people (3.1% of whole population) and it has increased to 3,370,000 people (10.7% of whole population) in 2000. By 2010 Korea will become a full-scale aged society with an estimated population of about 7.53 million, 13.7% of those being the elderly. This phenomenon was occurred primarily due to the fertility reduction by the family planning project which was held since 1962 and extension of average life expectancy. Compared to the foreign countries which manage the aging population over long periods of time, the growth of the elderly population in Korea was faster than any other country in the world. Thus, the preparation for this is very urgent matter. Aging changes their movements and activities of people. Physical and functional degradation due to the aging process affect muscle atrophy, muscle loss, and loss of muscle function (Schlicht, Camaione & Owen, 2001). Muscle weakness affects the balance keeping which is an important factor to cause a falling. Falling is the most common injury of elderly people and even a light fall seriously hurts the elderly and can often lead to death (Leibson, Toteson, Gabriel, Ransom & Melton, 2002). Elderly's falling occurred more often to elderly women than men and 60% of this accident happens during daily activities. Startzell et al. (2000) also indicated that stair descending falls occurred three times more often than for stair ascending. Walking downstairs is not only an essential motion but also is the most fearful action for elderly's daily life process. However, most previous research on the characteristics of stair walking were targeted to normal young people. Thus, in this study, Korean folk dance program as part of rhythmic movement exercise was applied to the elderly women for increasing dynamic balance, stability and range of motion, and the determined effect of it will be analyzed selected kinematic parameters.

METHOD: Twenty elderly women (70 ± 1.3 yrs, 154.9 ± 9.2 cm, 63 ± 14 Kg) were recruited as the participants. Kinematic data were collected by seven real-time infrared cameras (125Hz, Vicon, England) while subjects walked stair descent as a pre-test. Thirty seven reflective markers were attached to the body for 3D-analysis and COM and joint angles of lower extremity at each event were calculated. The Korean folk dance exercise program was practiced by the elderly for 12 weeks. All participants performed this dance exercise for 50 minutes a day, three times a week. Same experiment on stair descent walking was performed as post-test. A stride of gait was divided into five events such as E1: initial contact of 1st foot, E2: mid-stance at maximal vertical GRF, E3: toe-off, E4: mid-swing with maximal knee angle and E5: initial contact of 2nd foot. For comparison of kinematics at each event, a paired t-test was performed to observe if significant differences existed between pre and post test ($p < 0.05$).

RESULTS: The COM of anterior-posterior (A/P) direction shows significant differences between pre-and post tests at E4 and 5 (table 1). Knee angles also show significant differences between the tests for flexion/extension at E1, and for internal/external rotation at E2, E3, and E5 (table 2).

Table 1. COM (unit:m)

		E 1	E 2	E 3	E 4	E 5
M/L	Pre	0.20(0.07)	0.20(0.04)	0.20(0.06)	0.19(0.05)	0.20(0.04)
	Post	0.20(0.04)	0.21(0.04)	0.20(0.01)	0.20(0.04)	0.19(0.05)
	<i>t</i>	0.130	0.406	0.102	0.602	0.819
A/P	Pre	1.56(0.07)	1.49(0.06)	0.99(0.09)	0.71(0.09)	0.40(0.22)
	Post	1.52(0.07)	1.40(0.08)	1.00(0.11)	0.82(0.09)	0.66(0.13)
	<i>t</i>	0.906	1.661	0.138	3.154*	3.646*
Ver	Pre	1.24(0.05)	1.20(0.05)	1.04(0.05)	0.98(0.09)	0.89(0.05)
	Post	1.24(0.07)	1.20(0.09)	1.06(0.10)	1.00(0.07)	0.93(0.11)
	<i>t</i>	0.194	0.050	0.249	1.357	1.247

Note. * significant difference at $p < 0.05$

Table 2. Knee Angle (unit:degree)

		E 1	E 2	E 3	E 4	E 5
M/L	Pre	2.37(10.46)	14.84(5.34)	41.48(34.34)	48.15(28.60)	8.39(5.07)
	Post	13.21(8.60)	19.59(11.51)	56.10(31.30)	65.72(27.39)	27.42(33.56)
	<i>t</i>	5.360*	1.192	0.728	1.202	1.573
A/P	Pre	-0.62(6.71)	0.08(10.72)	-4.20(25.61)	5.29(33.38)	0.86(7.35)
	Post	-3.82(16.82)	1.22(12.51)	5.88(25.80)	1.83(30.37)	-6.70(23.45)
	<i>t</i>	0.775	0.342	1.745	0.523	1.223
Ver	Pre	-4.25(8.62)	-11.98(14.75)	-5.34(8.92)	-12.62(16.71)	-12.39(8.67)
	Post	-2.39(4.94)	1.78(5.10)	13.28(11.72)	9.44(17.57)	-4.76(5.17)
	<i>t</i>	0.393	2.921*	2.813*	1.731	2.427*

Note. * significant difference at $p < 0.05$, M/L: flexion/extension, A/P: varus/valgus, Ver: internal/external rotation

DISCUSSION: Cesari (2005) mentioned that old adults at descent stairs preferred lower staircase height due to the less flexibility of lower extremity compared to the young adults. In this study, after the 12 week exercise treatment, elderly subjects showed significant increase of COM in the anterior direction during swing phase. During the stride, kinematic data also indicated that knee is more flexed and rotates internally after the treatment. These results reflected that the exercise treatment may affect to increase ROM of knee joint and improve the gait pattern of stair descent.

CONCLUSION: This study proved that Korean folk dance can be a tool of training elderly people for improving dynamic balance and mobile abilities. It is expected to be able to contribute to the welfare of the elderly in an aging society by utilizing this program and also to develop fall-related injury prevention program.

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Acknowledgement

This work was supported by the Korea Research Foundation Grant funded by the Korean Government (KRF-2007-313-G00031)