EFFECTS OF SHORT-TERM WALKING EXERCISE IN ELDERLY

Sukhoon Yoon, Jeff Casebolt, Sunghoon Shin, Jaewoong Kim, and Young-Hoo Kwon
Biomechanics Laboratory, Texas Woman's University, Denton, TX 76205-5647
email: g_2yoon@mail.twu.edu, web: http://www.twu.edu/biom

INTRODUCTION

Falls among the elderly are quickly becoming an enormous concern for the United States in the 65-plus age group population. Tripping is one of the main causes for concern and is usually attributed to decreased lower extremity strength, stability, and range of motion. Minimizing the potential for tripping when maneuvering around or over an obstacle requires body control and working within a safe distance of the obstacle in question. Furthermore, if an obstacle is of a different height, then additional strength and coordination are needed from the lower extremity to perform the appropriate action.

The purpose of this study was to determine the effectiveness of: 1) a three month regular walking program, and 2) three different walking groups to improve an elderly individual's ability to interact with a series of obstacles in a safe and effective manner.

METHODS

Subjects were medically screened and cleared by a doctor to participate in the study. Thirty-three subjects volunteered and met all the criteria for participation (mean age: 73.2 ± 5.5 yrs). Thirteen males and twenty females were randomly assigned to one of three walking groups: 1) walking without equipment (C), 2) walking with ski-poles (T1), and 3) walking with equipment where the poles attached to a vest and were allowed to swing freely by the participants side (T2). The walking program lasted for twelve weeks and included three sessions per week at forty-five minutes per session.

Each participant was asked to perform three distinct tasks at a self selected pace using both their Preferred (P) and Non-Preferred (N) leg: 1) Step-Over (SO), 2) Step-Up (SU), and 3) Step-Down (SD). The SO consisted of an obstacle placed in the path of the participant at a height of 30% of leg length. During SU and SD the subjects were asked to step on to or down from a platform at a self-selected pace. The height of the platform was set at 30% of leg length.

Participants' motions were recorded in both right and left sagittal planes at 60-Hz video cameras (Panasonic AG450) and digitized with Kwon3D motion analysis software (Visol, Inc., Seoul, Korea). Ground reaction forces were collected using two force plate (AMTI OR6-5). The 3 x 2 (groups x periods) factorial ANOVAs were performed to see significance in dependent variables ($\alpha < .05$).

RESULTS AND DISCUSSION

During SO, Maximum Vertical Heel Clearance (MVHC) was calculated as the vertical distance between top of the obstacle and heel of the lead leg at the instant of the leg crossing the obstacle. Toe Clearance (TC) was defined as the horizontal distance between the toe of the lead leg and the obstacle prior to crossing the obstacle. Heel Clearance (HC) is the horizontal distance between the heel and the obstacle at post crossing obstacle. The significant crossing clearance differences in step over among groups were shown (Table 1). SU elicited different GRF loading times among groups ($p < 0.05$). Longer propulsive force loading time were demonstrated in T2 versus T1 in both SU_N and SU_P, while T2 showed longer pulling force loading time compare with T1 in SU_P.

Pulling force loading time may indicate the index of confidence for falling. If an elderly walker has confidence to step up onto an obstacle in a safe manner, the trail foot will remain in contact with ground until leading foot is fully secure on the top of the platform.

While we expected a training effect, none was noted. This is probably due to the relatively short training period (12 weeks) coupled with the relatively low intensity training (walking). One possible reason for lack of significant data may be the duration of the training period. O' Neill et al. reported positive resistance training effects within 3 months [1], but the current study may have been hindered due to the low-intensity activity of walking given the time frame [2].

CONCLUSIONS

The current study revealed obstacle clearance and loading time differences among groups. At the present time, we cannot attribute these differences to the relatively short training period and low-intensity activity. A longer training period seems warranted, and further studies with longer training periods are in progress.

REFERENCES

1. O'Neill DET, et al.. *Journal of Aging and Physical Activity* **8**, 312-324, 2000.
2. Hamdorf, PA, et al.. *Archives of physical medicine and rehabilitation* **73**, 603-608, 1992.

Table 1: Summary of obstacle clearance parameters among groups in period (Mean ± SD).

	Pre-Test									Post-Test								
	C			T1			T2			C			T1			T2		
	MVHC	HC	TC	MVHC	HC	TC	MVHC	HC	TC	MVHC	HC	TC	MVHC	HC	TC	MVHC	HC	TC
SOR_P	8.1±4.7	16.6±6.3	65.0±11.6	7.4±5.7	18.0±3.5	75.4±13.7[2]	5.5±2.9	16.6±6.9	60.6±11.7	15.6±7.0	17.1±5.6	58.5±12	14.2±6.1	19.9±8.1	66.9±11.3[2]	12.3±5.1	18.0±6.7	67.8±7.9
SOR_N	11.8±6.5[1]	17.2±5.0	57.9±15.4	11.8±9.1	16.9±4.5[3]	70.8±14.4	8.1±4.1	14.4±5.2	57.5±10.5	15.7±7.8[1]	18.1±4.3	65.6±12.2	13.6±7.9	19.5±8.0[3]	65.5±8.4	8.1±4.3	14.1±5.6	67.9±9.1

[1]- significantly different from T2; [2]- significantly different from C; [3] significantly different from T2 ; All measurement in cm