EFFECTS OF TAI-CHI CHUAN ON THE CONTROL OF BODY'S CENTRE OF MASS MOTION DRUING OBSTACLE-CROSSING IN THE ELDERLY

Tsung-Jung Ho[1], Sheng-Chang Chen[2], Chu-Fen Chang[2] and Tung-Wu Lu[2]

[1]College of Chinese Medicine, China Medical University, Taiwan
[2]Institute of Biomedical Engineering, National Taiwan University, Taiwan

KEY WORDS: gait analysis, inclination angle, centre of pressure

INTRODUCTION: Tripping over obstacles is a common problem among the elderly, which often leads to physical injuries. Previous studies have shown the positive effects of Tai Chi Chuan (TCC) exercises on muscle power, flexibility, endurance, dexterity, physical fitness, and balance (Wolf et al., 1996; Li et al., 2004). These effects are beneficial for the control of the body stability and prevention of falls. The aim of this study was to investigate the effects of Tai-Chi Chun and obstacle heights on the inclination angles of the center of mass (COM) relative to the center of foot pressure (COP) during obstacle-crossing.

METHODS: Ten TCC practitioners (age: 71±5.3 years, height: 163±6.7 cm, mass: 58.7±6.5 kg, TCC experience: 25±9.9 years) and fifteen healthy controls (age: 72±6 years, height: 160 ±5.7 cm, mass: 58±10.4 kg) crossed obstacles of heights of 10%, 20% and 30% of their leg lengths while the COM and COP position data were measured using a 3D motion analysis system and forceplates, respectively. COM-COP inclination angles at the instances when the swing toe was above the obstacle for both leading and trailing limb (T1 and T2) were extracted and statistically analyzed using a mixed analysis of variance with one between-subject factor (subject group) and one within-subject factor (obstacle height).

RESULTS and DISCUSSION: On the anterioposterior (A/P) COM-COP inclination angles, significant group effects were found at T1 ($p<0.001$) and T2 ($p<0.001$). Greater anterior COM-COP inclination angles in the control group indicated that they needed more effort to maintain A/P stability. Significant height effects were found at T1 ($p<0.001$) and T2 ($p<0.001$) and A/P COM-COP inclination angles were decreased with increasing obstacle height, except for the TCC group at T1. These results suggest that the non-TCC older people tended to keep their COM close to COP to increase the body's stability when the obstacle height increased. However, there were no effects on the mediolateral (M/L) COM-COP inclination angles at T1 and T2.

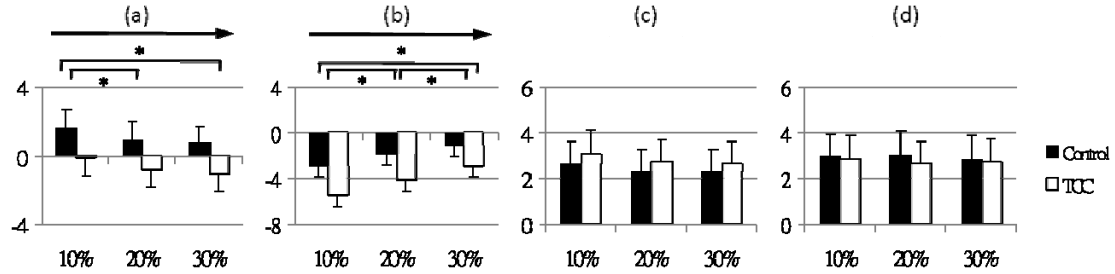

Figure 1 means and standard deviations of the A(+)/P(-) COM-COP inclination angles at T1 (a) and T2 (b), and these of the M(+)/L(-) angles at T1 (c) and T2 (d). (an arrow: a decreasing trend with increasing obstacle height; an asterisk: a significant difference between groups.)

CONCLUSION: The differences of the control strategies adopted during crossing between the TCC and control groups in the sagittal plane may be related to the strengthening effects of one leg standing commonly practiced in the TCC. The findings will be helpful for future studies on kinematics and control strategies adopted during obstacle-crossing.

REFERENCES:

Wolf et al. (1996).. *J Am Geriatr Soc.* 44, 489-97.

Li et al. (2004). *Med Sci Sports Exerc*. 36, 2046-52