EMPTY AND FULL STEPS IN TAI CHI EXERCISE

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INTRODUCTION: Empty and full transition is one of the basic movements in Tai Chi exercise. This transition is the result of change of body mass position that lead to the change of force distribution between left and right feet. This change of reaction force on foot called transition. The stability and smoothness of transition is important to reflect the technique quality in 42-style Tai Chi competition. This study was to determine the difference of transition technique between professional and amateur groups.

METHODS: Fifty-five subjects were taken part in this project. The professional group included the top 15 World ranking male and female players in the 7th World Wushu Championship (12 male and 15 female, average age of 22.7 ± 4.7). The amateur group included male and female University students from China (15 male and 13 female, average age of 24.0 ± 5.3). Novel Pedar (Germany) insole measurement system was used to collect data and 50 Hz sampling rate was employed to collect the insole pressure data of the subjects. The subjects were requested to wear the insole pressure sensor to perform a 42-style Tai Chi exercise on floor covered with a carpet.
The insole pressure values of left and right feet were converted to reaction force on foot. Only the complete empty and full transition in 42-style Tai Chi exercise were selected. Foot reaction force per body weight versus time curve was plotted and a predicted curve based on third order polynomial equation $y=ax^3 + bx^2 + cx + d$ was also produced. The difference between the actual value and the predicted value by the third order polynomial equation indicated the smoothness of the transition technique. The smaller the deviation, the better the technique. The correlation coefficient of the actual curve with the predicted curve could show this relationship.

RESULTS AND DISCUSSION: There was no significant difference ($p > 0.05$) in transition technique between male and female Tai Chi players in professional or amateur group. There was a significant difference ($p < 0.05$) in transition technique between professional and amateur players in either male or female group. This implied that the transition technique of professional group was better than amateur group. The training period for professional group was much longer and had better knowledge on the basic meaning of Tai Chi than the amateur group. So, relatively smooth empty and full transition of professional group was found.

Table 1 Average Correlation Coefficient between Test Value and Predicted Value from 3rd Order Polynomial of Foot Reaction Force.

	Professional male		Professional female		Amateur male		Amateur female	
	Left	Right	Left	Right	Left	Right	Left	Right
Average	0.43	0.43	0.43	0.49	0.63	0.62	0.63	0.60
SD	0.12	0.10	0.08	0.08	0.12	0.09	0.11	0.09

Moreover, there was no significant difference ($p > 0.05$) in transition technique between left and right feet in professional or amateur group. The transition technique between left and right feet was very similar either in professional and amateur group.

CONCLUSION: Significant difference of transition technique between professional and amateur groups was found. This method could review the quality of transition in 42-style Tai Chi exercise.