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BIOMECHANICAL APPROACH TO TAI-CHI. RELAXATION AND STABILITY

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INTRODUCTION

Tai Chi is an ancient martial art based on stability and elasticity and it is usually suggested as physical activity for the wellbeing of elder people. The multiple aspects of the discipline can suggest its applicability to several forms of musculoskeletal or neurological diseases. In the last few years several studies were presented about the beneficial effect of Tai Chi. Nonetheless, the variability of teaching methods within this discipline creates difficulties in the univocal evaluation of the discipline and its effects [Lauche, 2013]. Different styles teach different sequences for a total of more than 100 different recognized "forms". Nonetheless, the study of the discipline reveals that all styles and forms aim to teach 8 basic movements, usually known as Ba Gua (Fig 1). All of them are based on the concept of relaxation in order to teach both stability and elasticity.

Figure 1: The 8 trigrams around the Dao represent the 8 fundamental movements of Tai Chi.

Accordingly, the present study aims to measure the effect of relaxation over the stability of the subjects.

METHODS

The statokinesigram of 10 subjects was acquired. Foot-ground contact forces were recorded by using a force plate (100Hz sampling). Subjects were asked to stand over the force-plate for at least one minute looking at a target painted on the wall approximately at the height of the eyes. Each subject was analysed three times to simulate different conditions: control, tense and relaxed conditions. Control-condition aimed to simulate standard daily situation. The subject was asked to stand over the force-plate without any additional information. Tense-condition was simulated asking the subject to continuously contract the body muscles with particular attention to the contraction of the gluteus and shoulders (rising of the shoulders). Additionally subjects were asked to keep thoracic breathing. After tense analysis subjects were guided through few exercises to relax neck, shoulders, hips and ankles. Relaxed-condition during the statokinesigram acquisition was then simulated, asking the subject to relax the whole body with particular attention to the gluteus, shoulders, and deep diaphragmatic breathe. Four different parameters were computed for each subject: mean distance, RMS distance, mean velocity and 95 % confidence circle area. Non-parametric Kruskal-Wallis test (significance 0.05) was applied to the analysis of each parameter. For significant results a Wilcoxon paired non-parametric test was used to compare results of different condition.

RESULTS AND DISCUSSIONS

The only parameter showing a difference of variance was the mean velocity ($p<0.001$).

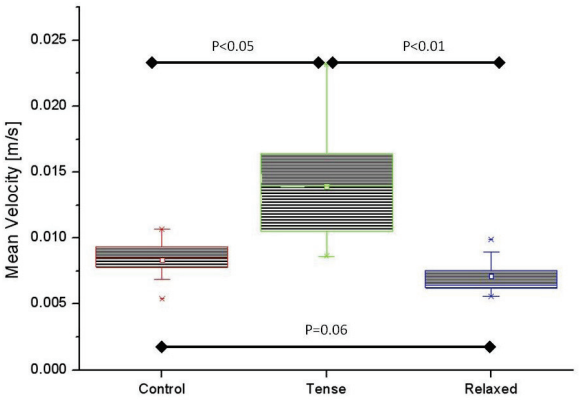

Figure 2: Box-plot of the mean velocity related to the three different conditions.

Velocity of both control and relaxed condition were found significantly smaller than the tense one, suggesting a reduced stability of the latter. This preliminary results show not statistically difference between control and relaxed condition. Nonetheless, it is important to notice how the extremely common task of standing can be influenced by the simulation of a tense stance. Moreover, standing is a posture that people is supposed to keep in a relaxed way, but the closely significant result of the test ($p = 0.06$) suggests that more data could reveal the contrary.

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