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Original Article

Effects of Tai Chi on telomerase activity and gerotranscendence in middle aged and elderly adults in Chinese society

Gong-xiang Duan ^a, Ke Wang ^{b,*}, Yin-hua Su ^a, Shuang-yang Tang ^c,
Hong-li Jia ^a, Xue-mei Chen ^d, Hong-hui Xie ^d

^a School of Nursing, University of South China, Hengyang, Hunan Province, People's Republic of China

^b Hunan Cancer Hospital, Changsha, Hunan Province, People's Republic of China

^c Medical School, University of South China, Hengyang, Hunan Province, People's Republic of China

^d Community of Qingshan, Hengyang, Hunan Province, People's Republic of China

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ABSTRACT

Introduction: Telomeres are DNA protein structures at the end of chromosomes and are linked to the physical aging process. The improvement of quality of life is closely associated with aerobic exercise, and the dynamic effects of exercise on physiology and psychology are evident with aging. Tai Chi is popularly practiced in China. However, findings on the effects of Tai Chi on telomerase activity (TA) in peripheral blood mononuclear cells, and gerotranscendence (GT), as well as the association of TA and GT with Tai Chi, have been inconsistent.

Purpose: This study aims to assess TA in peripheral blood mononuclear cells, GT, and the associations between them. The associations among these variables are determined during six months of Tai Chi intervention among Chinese middle aged and elderly adults.

Methods: TA assessment was obtained by TE-ELISA (human telomerase–enzyme linked immunosorbent assay), and GT was measured at the baseline level after six months of Tai Chi intervention.

Results: TA increased significantly in the Tai Chi group from 23.75 ± 3.78 u/mmol (pre-intervention) to 26.31 ± 2.93 u/mmol (after 6 months) ($p < 0.05$). Compared with the TA in the control group, the TA in the intervention group was statistically significant after six months ($p < 0.05$). Compared with the GT in the control group, the GT in the intervention group improved significantly after six months ($p < 0.05$). TA and GT had a positive correlation ($r = 0.325$, $p < 0.01$).

Conclusion: Our data illustrated that Tai Chi had a protective effect on TA and might improve the GT in Chinese middle aged and elderly adults. The TA increased with the increasing GT in Chinese middle aged and elderly adults.

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* Corresponding author.

E-mail address: 920037840@qq.com (K. Wang).

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1. Introduction

Tai Chi is a mind–body exercise that involves a range of specific and gentle physical movements and incorporates the purposeful regulation of the body [1]. Tai Chi was originally developed in China on the basis of theoretical principles inherent to traditional Chinese medicine [2]. Tai Chi involves movements and thoughts by increasing awareness and releasing muscle holding patterns [3]. Many scientific studies have reported that mind–body practices, such as Tai Chi, have a beneficial effect on health [4,5]. The improvement of mental well-being and the immune system improves overall health [6]. Tai Chi has been shown to improve muscle strength, balance, and flexibility [7]; several chronic diseases, such as fibromyalgia [8], osteoarthritis [9], and Parkinson's disease [10], can be improved with Tai Chi training [11]. This intervention is safe and popular among people of different ages. Healthcare providers suggest that Tai Chi should be considered a complementary treatment.

Telomeres are DNA protein structures at the end of chromosomes that shorten with every cell division [12]. Telomeres play important roles in cellular aging and disease. Telomerase maintains the length of a telomere by adding DNA hexameric repeats, thereby promoting cell growth and longevity [13]. Therefore, telomerase is considered an important aging biomarker [13]. Telomerase also serves as an indicator of disease risk and is associated with psychological health [14]. In a study, psychological stress was linked to oxidative stress levels and telomerase activity (TA) levels [15]. In recent years, an increasing number of researchers have paid attention to the link between physical activities and TA. Some studies have illustrated that TA levels may be enhanced by a healthy lifestyle, e.g., a lifestyle involving physical exercise [16], intensive meditation training [17], yoga [18], and comprehensive lifestyle [19]. A research showed that after performing qigong exercise intervention, people in the intervention group with chronic fatigue exhibited higher TA levels than the control group [20]. Understanding the link between physical activities and peripheral blood mononuclear cell telomerase activities for middle aged and elderly adults is significant.

A report showed that the elderly will outnumber children by 2018, and the number of elderly who are over 65 years old is expected to nearly double from 506 million to 1.3 billion [21]. The elderly experiences a decline in physical/mental function, personal relationships, and personal wealth, thus causing depression, pessimism, and dissatisfaction, in addition to the stereotyping that they experience [22]. If the elderly have a negative attitude toward aging, then they encounter some troubles when they face their aging process. Gerotranscendence (GT) is considered the final stage in the natural aging process and is the stage wherein maturation and wisdom are achieved. GT is characterized by a shift from a material and self-centered perspective to a cosmic and transcendental perspective [23]; this perspective guides middle aged and elderly adults to face aging with a positive attitude.

Thus far, no study has evaluated the association of Tai Chi with TA and GT and the correlations between TA and GT.

Whether Tai Chi training has a positive effect on TA and GT in Chinese middle aged and elderly adults remains uncertain. This study aims to explore the association of Tai Chi with TA and GT and the correlations between TA and GT in Chinese middle aged and elderly adults from a community located in Hengyang, Hunan Province.

2. Methods

2.1. Subjects

In this study, men and women aged 55–65 years old were recruited from a community via word of mouth, flyers, and advertisements with the help of community leaders. We provided written informed consent for all subjects. The Institutional Review Board of the University of South China approved the protocol of this study. The following are the inclusion criteria for the participants: (1) 55–65 years of age; (2) able to communicate with others in Chinese; (3) cognitive function was measured using the Small Portable Mental Status Questionnaire (the total score of this questionnaire is 10, normal ≥ 8) [24]; (4) no regular exercises (3 times/week, at least 30 min/time); (5) no history of chronic disease, such as hypertension, diabetes, and cardiovascular diseases; (6) no medical history that could affect our laboratory result.

The screening questionnaires were answered by 256 middle aged and elderly adults in the community. A total of 156 subjects were included on the basis of the inclusion criteria. However, 31 of the 156 subjects were excluded because they were not interested in the intervention program or other causes. Among the remaining, 125 subjects, 23 subjects were further excluded because they disagreed with the collection of blood sample. Therefore, 102 subjects were initially included in our research, but 6 subjects dropped out before the start of our intervention program.

2.2. Study design

We used a randomized controlled design with repeated measures from October 2013 to April 2014. After the subjects completed the screening questionnaires, baseline measurements were obtained. After signing the written informed consent form, the subjects gave blood samples, and each of them acquired an order number. Thereafter, they were randomly allocated into the intervention group and the control group by using a random number table. The group allocation was concealed for laboratory technicians. The intervention program for the intervention group lasted six months, whereas the subjects in the control group kept their original lifestyle unchanged for six months. When the intervention program was finished, the subjects in the control group were encouraged to practice Tai Chi exercises. The TA was examined, and the GT was measured in middle aged and elderly adults. The outcomes of both groups were collected at baseline and after six months of intervention.

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