



## Feature Article

## Effects of a video guided T'ai Chi group intervention on center of balance and falls efficacy: A pilot study



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## ABSTRACT

This pilot study evaluated effects of a video-guided T'ai Chi group intervention on center of balance (COB) and falls efficacy, using a one arm, pre/post design. Thirty-two participants began the study, 17 completed pre- and post-testing and 15 were lost to follow-up. Outcomes were compared for the 17 participants who completed pre- and post-testing and subgroups based on session attendance. Irrespective of session attendance, participant COB scores improved. There was a significant negative correlation between number of sessions attended and pre and post scores on the fall efficacy (fear of falling) measure, indicating those with higher fear of falling were less likely to complete the study. Older participants were also less likely to continue participation. Findings indicate potential benefits of T'ai Chi in improving COB (a fall risk factor) among community-dwelling older adults. However, those with greater potential benefit (higher fear scores, older participants) were less likely to continue participation.

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## Background

Falls are a major public health problem for older adults. The Centers for Disease Control estimates that approximately 30–45% of community dwelling adults over the age of 65 fall each year.<sup>1</sup> Among older adults (65 or older) falls are the leading cause of traumatic death, non-fatal injury and hospital admission for traumatic injury.<sup>1,2</sup> In 2010, 2.3 million non-fatal fall-related injuries among older adults were treated in emergency departments and more than 662,000 of these patients were hospitalized. The direct cost of these injuries was estimated to be between 19.2 and 30.0 billion dollars per year; a substantial financial burden.<sup>1,2</sup>

Risk factors for falling in community dwelling older adults are multifactorial.<sup>1–3</sup> Most falls are related to environmental factors in combination with the inability to maintain balance or stability when attempting to navigate.<sup>1–5</sup> The inability to maintain stability is associated with age-related changes in sensory perception (vision and hearing) and the musculoskeletal (gait and balance

changes) and central nervous systems (CNS), (postural hypotension).<sup>1–5</sup> Deficits in vision and hearing may lead to a misinterpretation of the environment. Deconditioning related to musculoskeletal disorders or inactivity can play a role in postural instability.<sup>1–5</sup> In addition to age-related changes in the CNS (e.g., slower reaction time), postural hypotension is a common adverse effect of medications.<sup>1–5</sup>

Falls efficacy is defined as “perceived self-efficacy (confidence) at avoiding falls during essential, nonhazardous activities of daily living.”<sup>6,7</sup> Low fall efficacy, or fear of falling, is a problem reported by many older adults, regardless of having experienced a fall.<sup>6,7</sup> Fear of falling can be considered a proxy self-efficacy measure that correlates to fall events.<sup>8</sup> Fear of falling can impact an older adult's quality of life by increasing risk for decreased mobility, deconditioning, muscle atrophy and/or poor balance and gait along with self-imposed social isolation.<sup>6,7</sup> The resulting cycle of fear, self-imposed activity restriction and increased frailty may keep those who most need a fall prevention intervention from participating.<sup>6,7</sup>

A variety of strategies are recommended to reduce the incidence falls in older adults, including annual medication reviews and vision screens, along with making homes safer by removing hazards (loose rugs) and installing assistive devices such as grab bars and toilet lifts.<sup>1–6,9,10</sup> Exercise, performed on a regular basis,

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is increasingly recognized as an important means to reduce fall risk.<sup>1–6,9,10</sup> However, participation in routine exercise may be challenging for some older adults.

T'ai Chi, an ancient Chinese martial art, is thought to enhance awareness of body position, alignment and improve range of motion.<sup>4,11</sup> There are many forms of T'ai Chi, all grounded in the underlying principle of continuous slow movement of every part of the body.<sup>4,11</sup> The presumed benefit relates to improved perception of center of balance (COB), a complex process that is necessary to facilitate movement, maintain posture and recover equilibrium (i.e., postural stability), and is directly related to falls in older adults.<sup>3–6,9–12</sup>

A number of studies provide evidence that T'ai Chi can be an effective strategy to reduce fall risk among older adults.<sup>5,11,13–15</sup> When findings were examined in systematic reviews and meta-analyses, several conclusions emerged. Older adults who practice T'ai Chi can reduce their risk of falling<sup>5</sup> as well as their fear of falling.<sup>13</sup> In comparison to other interventions, T'ai Chi appears to be the most effective in reducing fear of falling in community dwelling older adults. However, not all individuals benefit equally; healthier older adults appear to gain more benefit from T'ai Chi than frail individuals.<sup>11</sup> Studies using a non-exercise control group report a significant decrease in fall rates and fear of falling and improved COB in those performing T'ai Chi.<sup>15</sup> However, studies that compared outcomes to various other types of exercise found no difference regarding balance measures. When studies examined in a meta-analysis were divided into subgroups based on differences in the frequency and dosage of T'ai Chi, there appeared to be differences in effectiveness. However, the authors of the meta-analysis (Logghe and associates, 2010) noted that it was difficult to summarize the T'ai Chi literature since studies vary in regard to delivery format, practice frequency, and outcomes measured. Therefore, the authors offered no recommendations regarding the most appropriate frequency or dosage.<sup>15</sup> Additionally; there is wide heterogeneity in sample size, participant age and demographic characteristics in the T'ai Chi literature. Despite these limitations, there is consistent evidence of benefit among older adults who practice a T'ai Chi exercise intervention.<sup>5,11,13–15</sup>

Self-efficacy theory proposes that individuals have the ability to change behavior and recognize the link between personal health practices and choices that influence health.<sup>16–18</sup> Self-efficacy theory is an effective guide to change behavior in older adults, especially relating to exercise behavior. According to Bandura, there are four major sources of self-efficacy: mastery experiences (performing a task successfully), social modeling (witnessing others successfully completing a task), social persuasion (verbal encouragement from others) and psychological responses (moods, physical reactions, stress level).<sup>16–18</sup> Applying this theory, one can expect that those individuals with higher self-efficacy, and a greater belief in a positive outcome, will be more likely to attempt a behavior.<sup>16–18</sup> We therefore reasoned that T'ai Chi exercises, offered in a group format might promote feelings of mastery in regard to exercise participation. This type of group program could also provide social modeling and social persuasion in the form of modeling and verbal encouragement from other participants. These sources of self-efficacy may increase intervention participation and thereby improve COB and reduce fall risk.

The primary goal of this pilot study was to evaluate the effect of a 12-week video guided T'ai Chi exercise program on COB and falls efficacy in healthy older adults in a community-based Senior Center. It was hypothesized that the video guided T'ai Chi exercise classes would improve COB and decrease fear of falling. An additional aim was to explore participant characteristics associated with positive benefit.

## Methods

### Design

We used a pretest-posttest, 1-arm (no control group) study design. After obtaining approval from the two Senior Centers used for data collection and the University Institutional Review Board, flyers were posted and study availability announced to older adults attending the centers. The flyers instructed interested individuals to call a number or provide information to the Senior Center Director for research team contact. Dates were also provided when a research team member would be available at the Senior Centers to provide study information. A research team member contacted all individuals who expressed interest, explained the study, and obtained verbal permission to perform eligibility screening. Recruitment and eligibility screening occurred over a four week period. All participants provided signed informed consent. They were encouraged to attend all sessions.

### Sample and setting

Participants included a convenient (voluntary) sample of 32 adults who attended day programming at a two Senior Centers in rural Pennsylvania. Senior Centers were chosen as the setting for the intervention because they attract a population of community dwelling adults over the age of 60 who gather for nutritious low cost meals, games, socialization and various exercise classes. This setting offered a convenient site for the intervention and access to free or low cost equipment necessary for participation (e.g., television, Wii™ Game console). Participant inclusion criteria were: 1) age >60 years (to avoid excluding Senior Center members); 2) ability to complete the "Get up and go test"<sup>19</sup> which evaluated the participant's ability to get out of a chair independently (to evaluate mobility) and 3) not at high risk for falls based on selected items in the Hendrich II Fall Risk Model (HIIFRM).<sup>19</sup> Potential participants were excluded if they acknowledged experiencing dizziness or vertigo, were taking benzodiazepines or antiepileptic medications, or could not rise from a chair unassisted.

### Intervention

The T'ai Chi program used in this study was Yang Style 5-Form; delivered via a video that was developed and evaluated in a National Institutes of Health funded study designed to determine the effects of T'ai Chi on balance confidence, balance performance, strength, and mobility in females at risk for developing osteoporosis.<sup>20</sup> Permission was obtained to use the video for this project. Three exercise sessions, each 45 min in length, were scheduled 3 times a week for 12 weeks (36 total sessions). Exercise sessions took place in the common meeting area or an activity room at the Senior Center. Each participant was given a calendar with a schedule of the exercise sessions. Dates and times of the exercise sessions were also published in the Center's monthly activity calendar.

After baseline and demographic data were obtained, participants were instructed in use of the Tai Chi video and, if desired, given a copy of the video for home use. During the first 2 weeks, participants learned and practiced the T'ai Chi forms using video section II, "Instruction in Yang Style 5-Form." This section of the video slowly and repeatedly reviewed each of the motions required in the 5-forms. For the next 10 weeks, participants followed the video section III, "Performance in standing." This section of the video included a warm up (20 min) followed by Yang Style 5-form

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