Tai Chi for Falls Prevention: A Student-led DNP Project

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Abstract

**Aim**: To reduce the fear of falling in an elderly population by teaching ‘Tai Chi for Falls Prevention’ classes twice a week for 12 weeks.

**Background & Significance**: Falls continue to be the leading cause of injury-related deaths of Arizonans who are 65 years or older - well above the national average. It is predicted that by 2030, national medical spending for this population will total over $31 billion, yearly. Tai Chi is revered for being a beneficial form of simple, low-impact exercise, which the CDC endorses for its falls risk reduction benefits.

**Methods**: The intervention consisted of 60-minute classes occurring twice a week for 12 weeks. Participants were English-speaking, between 65-85 years old, and able to ambulate independently. Appropriate pre-screening tools were used before applicants consented. Their Fear of Falling (FoF) was measured using a fall risk perception tool at the beginning, middle, and the end of the project. This ordinal data was analyzed with Friedman ANOVA using SPSS 25

**Outcomes/Results**: After enrolling five total participants, only three completed the project. This severely limited data analysis of their FoF, resulting in a statistical significance (p = 0.68), deeming the intervention ineffective - Despite observable downwards trending FoF scores.

**Conclusion**: The acceptance of the null hypothesis is attributed to the low enrollment and high attrition rate. Also, the only data measured was quantifiable, subjective data. Future projects could add objective data to reinforce the benefits of Tai Chi. This might reinforce the validity of Tai Chi as a practical recommendation due to its cost-effective simple interventional design and effectiveness for prevention of accidental falls. Increased focus on improved recruitment & retention strategies should be prioritized for similar projects in the future.

**Keywords**: accidental falls, falls, fall risk reduction, older adults, Tai Chi, balance, exercise,
Tai Chi for Falls Prevention: A Student-led DNP Project

Accidental falls in any age group can be devastating and have terrible consequences that can lead to outcomes with adverse long-term effects. Falls among the elderly who are 65 years of age and older can have detrimental effects physically and psychologically - both immediately and long-term. Falls are the number one cause of injury in older adults, with a third of this group of individuals falling every year, and half of them will have another fall sometime in the next year. One out of every two 80-year-olds fall every year (STEADI, 2015; Yoo, Kim, Yim, & Jeon, 2016; Gallant, Tartaglia, Hardman, & Burke, 2017; Office of Injury Prevention, 2017).

Problem Statement

A fall is classified as an accidental tumble downwards that is not caused by an external force or a neurological change. Falls have the potential to cause mortalities and create morbidities; morbidities that can steal away someone's independence and rob someone of their quality of life. Internationally, 28-35% of adults older than 65 years of age fall will fall each year (Yoo, Kim, Yim, & Jeon, 2016; Gallant, Tartaglia, Hardman, & Burke, 2017). Assessment and acknowledgment of other causes for falls should be mentioned. These include poor lighting which affects vision, slippery floors, lack of grab bars, etc. Environmental elements such as these contribute to roughly 41% of the risk factors that can instigate falls (Yoo, & et al., 2016). The likelihood of falls increases with age, but the frequency can vary by ethnicity and geographical location (STEADI, 2015). The National Guideline Clearinghouse adapted and released fall assessment and prevention recommendations for elderly adults (NICE, 2004). The recommendations were last updated in 2013, and cover cause and risk identification, multifactorial falls risk assessment, and multilevel interventions, and interpretation of current evidence regarding various interventional methods for preventing falls. Low-intensity exercises
and untargeted group exercises were not listed as a recommended intervention. Brisk walking, as it turns out, should no longer be recommended as a fall prevention measure, as it is not shown to reduce fall risk (NICE, 2013).

**Purpose & Rationale**

Falls among older adults continue to be a growing burden. The purpose of this proposed project is to highlight the importance of fall prevention in older adults who are 65 years and older while investigating implementing Tai Chi as a method of intervention to reduce the prevalence of falls in this population. In addition, there is a need for improved approaches for fall prevention and the applicability Tai Chi possess as an effective intervention for this at-risk population. The purpose of this paper is to discuss the background and significance of the problem; describe the search process; and the identification of ten research articles related to the addressing this problem.

**Background & Significance**

**Population: Older Adults and Falls.**

Accidental falls are linked as the number one most frequent cause of falls in the elderly, which can result in both short-term and long-term injuries which can result in decreased mobility afterward, pain – both chronic or acute, loss of independence, or even death. Gait and balance disorders are the second most frequent cause of falls (Landers, Oscar, Sasaoka, Vaughn, 2016). “Delays in recovery from a fall injury, plus post-fall anxiety, further heighten the risk of subsequent falls due to deconditioning, weakness and acquisition of abnormal gait,” (Plummer & Bradley, 2017, p. 239). Fear of falling has the potential to affect individuals who have and have not fallen, and as older adults get older, their fear of falling is likely to increase with age (Stojanovic, Kocic, Balov, Milenkovic, Savic, & Ivanovic, 2015).
Intervention: Tai Chi

Tai Chi (TC) originates from Chinese tradition over 400 years ago that has rapidly evolved beyond its original martial arts roots into a multiuse tool of diversity and utilization. It has become a popular form of exercise that is well-recognized worldwide and involves full mind-body movements that remain low-impact but high in potential benefits. The literature portrays the benefits having been shown to positively improve strength, aerobic aptitude, balance, quality of life, psychological well-being, and even affect physiological diseases (Lan, Chen, Lai, & Wong, 2013; Gallant, Tartaglia, Hardman, & Burke, 2017). It can be performed both individually, as well as in a social setting and there are different styles and forms to teach Tai Chi, but much of it incorporates the same vital principles with attention on breathing, slow, purposeful movements that include the entire body, and results that improve strength, balance, and flexibility (Wu, Macdonald, & Pescatello, 2016).

A community-based study used Tai Chi to modify fall-risk among older adults older than 65 years but could move about without any assistive walking devices in two senior centers where two individuals were trained from each county area to become a Tai Chi instructor leading each of the classes over 12 weeks. The classes took place two or three times a week with a 45-minute requirement of at-home practice per week as well. Upon completion of the study, participants, on average, showed improvement in their strength, balance, and mobility (Gallant, Tartaglia, Hardman, & Burke, 2017).

Incidence of Falls

In 2016, 42,808 Arizonans 65 years and older visited the emergency department due to falls that were unintentional, costing over $344.7 million. Of that number, 14,384 of them required inpatient hospitalization, and after averaging six days in the hospital, their totaled
chances were over $933.6 million. Falls continue to be the leading cause of injury-related deaths of Arizonans 65 or older, and in 2016, 974 deaths occurred as a result (Office of Injury Prevention, 2017). Every second, an older adult experiences an accidental fall somewhere in America. Every 20 minutes, one of them dies as a result of it. It is estimated that by 2030, medical expenses for these older adults at risk for falls will total over $31 billion each year (STEADI, 2015). The implementation of Tai Chi for falls prevention classes could reduce this high incidence of falls among the elderly who are at an increased risk, especially in Arizona, who vastly outpaces the nation’s mortality from accidental falls (Office of Injury Prevention, 2017).

**Internal Evidence**

The Arizona Falls Prevention Coalition (AFPC) expresses the desire of implementing more ‘Tai Chi for Falls Prevention’ programs throughout the state of Arizona – of which, currently there is a very limited number available to the elderly interest in Tai Chi for falls prevention. Initiating more instructor-led ‘Tai Chi for Falls Prevention’ classes throughout the community is a 2018 goal of theirs (Dunn, 2018). In 2013, a systematic review and meta-analysis of 124 randomized controlled trials were investigated after being gathered across several major research databases. The results found that regardless of the style, form, or duration, Tai Chi exercise training is shown to be an effectual technique in significantly reducing the occurrence of falls in older adults (Hu, Chung, Yu, Chen, Yu-Chi, Tsai, & Hu, 2016). A meta-analysis from 2017 acknowledges the reduction of risk of falls and fall-related injuries due to Tai Chi’s use short-term, but questions the validity and sustainability of the benefits long-term, however (Lomas-Vega, Obrero-Gaitán, Molina-Ortega, & Del-Pino-Casado, 2017); as did an evidence map reviewing 107 systematic reviews of the evidence regarding health outcomes from Tai Chi, but still indicates promising application (Solloway, Taylor, Shekelle, Miake-Lye, Beroes,
Adverse events mainly have included minor aches, soreness of the body, and stiffness (Wayne, Berkowitz, Litrownik, Buring, & Yeh, 2014).

Current literature strongly suggests the clear benefits and higher outcomes of Tai Chi compared to other more standardized and common fall prevention measures and combined exercise prescriptions which might include brisk walking, physical therapy, and physical exercises that focused on lower limbs Stevens & Burns, 2015; Yildirim, Ofluoglu, Aydogan, & Akyuz, 2016; Bubela, Sacharko, Chan, & Brady, 2017). Despite the Center for Disease Control & Prevention’s endorsement of Tai Chi and its multiple health benefits, awareness of Tai Chi’s benefit for falls prevention in the elderly is still not commonly known among healthcare and the community. This stated problem has led to the clinically relevant PICOT question, “In older adults, how does Tai Chi compared to no tai chi affect fear of falling-over time?”

**Search Strategy**

To order to effectively address this question, a comprehensive and thorough screening of the literature was implemented through the following online databases: Cumulative Index of Nursing and Allied Health Literature (CINAHL), PubMed, and The Cochrane Library, OCLC Worldcat, PubMed, Science Direct, Springer Link, Cochrane Library, and ProQuest Medline, as well as being independently, handpicked by this author.

The population was searched for using the following search terms: *elderly, older adult, 65+ years, geriatric*. The outcome was searched for using: *fall* or falls and *accidental fall*. The intervention of Tai Chi, tai ji, Tai Ji Quan, Tai Chi Chuan was searched. The intervention’s focus was used to further narrow the results using these key terms: *fear of falling, fear of falls*, and *falls prevention*. All searches were restricted using the following modifiers and limiters when
available: within five years “2013-2018,” limited to “Humans,” and “English” language only, and narrowed by subject age of “65+ years”.

Initially, while using the modifiers listed above, searching with the only “fall OR fall prevention OR falls prevention AND tai chi” yielded 2,933 search results in CINAHL (Appendix A), 452 results with Online Computer Library Center (OCLC) WorldCat (Appendix B), 216 with PubMed (Appendix C), 290 results using ScienceDirect (Appendix D), 588 results from Springer Link (Appendix E), 1,706 records in Cochrane Library (Appendix F), 464 with SAGE journals (Appendix G), and 11,261 results with ProQuest Medline (Appendix H).

Final search results, revising and combining search terms resulting with refinement of the search to, “‘Tai Chi’ OR ‘Tai Ji’ OR ‘Tai Ji Quan’ OR ‘Tai Chi Chuan’ AND ‘fall’ OR falls AND ‘prevention’ AND ‘fear of falling’ OR ‘fear of falls’,” resulted in four applicable search results in CINAHL (Appendix A), 60 results with OCLC WorldCat (Appendix B), 50 with PubMed (Appendix C), 1,740 review & research articles with ScienceDirect (Appendix D), 11 results from Springer Link (Appendix E), 43 results in Cochrane Library (Appendix F), 24 with SAGE journals (Appendix G), and 939 results with ProQuest Medline (Appendix H). When unable to select population or age filters or limiters, “elderly OR ‘older adult’ OR ‘65+ years’ OR ‘geriatric’ OR ‘Aged 65+’ OR ‘65 years’,” was added to the keywords being searched. Seventy studies were selected after the searching and screening took place, found from both the database containing the search elements above and hand selected from related sources. 10 final studies were selected for evaluation and synthesis (Appendix I).

The criteria for exclusion included studies published before 2013, published in a non-English language, or unfinished studies, or reports studying a population younger than 65 years old. Reports that studied the effects of Tai Chi without mention of fall reduction or prevention
were further eliminated. Studies investigating the benefits of Tai Chi in patients with chronic diseases such as a deteriorating neurologic condition or diabetes were excluded. This resulted in ten final studies that were chosen for critical appraisal.

**Critical Appraisal & Evidence Synthesis**

The ten final studies were quantitative and evaluated with a rapid critical appraisal tool and are displayed in a table below (*Appendix I*). The strength of the studies is high, overall: five systemic reviews (SR), two SR with meta-analysis (MA), two Quasi-Experimental, and one randomized-control trial (RCT). Most of the studies did not report a theoretical framework and most studies and reviews of RCTs took place in community-based settings. The studies evaluating Tai Chi’s effectiveness for falls prevention featured samples composed of populations of older adults without chronic illnesses. A handful of studies report bias within sampling without much diversity in the characteristics of their members. Some of the systemic reviews did not mention the sample group characteristics of the studies included in their review. (*Appendix J*).

Bubella et al. reported a moderate increase to perceived balance confidence using the self-reported balance confidence activity-specific balance confidence (ABC) scale, between pre and post scores using the activity-specific balance confidence, “\((p = .022)\) and moderate effect size and observed power \((\eta_p^2 = 0.217; \text{observed power} = 0.656)\)” (2017, p. 5). Gallant, Tartaglia, Hardman, & Burke determined that even a novice instructor for a 12 week tai chi program could have a beneficial impact, as significant pre-post improvements were reported among functional mobility and balance (Timed Up and Go \((p < .001)\) and Functional Reach \((p < .01)\), as well as perceived balance (ABC scores \((p < .01)\), (2017). Hu et al. reported tai chi as having significantly reduced fall risk \((OR = 0.70; \text{95\% confidence interval}, 0.59 \text{ to } 0.84)\) during
its meta-analysis of ten different trials with 2850 individuals participating. They used the Physiotherapy Evidence Database (PEDro) scale to measure and determine the quality of the randomized controlled trials. Their subgroup analysis also found no evidence of differential effects from training duration or Tai Chi style used (2016). Lomas-Vega & et al. performed a meta-analysis on ten studies and reported Tai Chi as having “high-quality evidence of a medium protective effect for fall incidence over the short term ($IRR = 0.57; 95\% CI = 0.46, 0.70$) and a small protective effect over the long term ($IRR = 0.87; 95\% CI = 0.77, 0.98$)” (2017, p. 2037).

Yıldırım, Ofluoglu, Aydogan, & Akyuz compared changes to standing balance, ambulatory balance, fear of falling and mood between two groups - one following ‘combined exercise prescription’ and the other ‘tai chi’. Afterward, differences to pre-post evaluations between the two groups were compared after 12 weeks. Using the Survey of Activities and Fear of Falling in the Elderly (SAFFE) tool, it was determined that there was a greater and much more significant reduction to fear of falling in the group practicing tai chi ($p = 0.002$) (2016).

Most of the studies were led by an instructor certified in Tai Chi training, and a couple of others were led by non-professionals who were volunteers or just moderately trained beforehand. On average, Tai Chi classes took place for about an hour, once or twice a week, ranging 12-16 weeks, with pre- and post- tests and evaluations. Fear of Falling changes was commonly analyzed via the SPSS program. Timed up and go and activity-specific balance scales were commonly for assessment for Tai Chi’s effects upon participant balance (Bubella & et al., 2017; Yildirim, Ofluoglu, Aydogan, & Akyuz, 2016). Attrition rates were generally low for the studies and SRs, when divulged. Strength, mobility, fall incidence, balance, and fear of falling or confidence were mainly tested for and reported.
Tai Chi is well-regarded as being generally very safe, due to its simple, low impact, continuous, sequential movements that doubles as a form of exercise and meditation. Concerning its safety, adverse events (AE) reported during studies using Tai Chi are rare uncommon but do include falls and fall-related injuries. Commonly reported complaints from participants of Tai Chi includes fatigue, muscle soreness, or muscle stiffness (Wayne et al., 2014).

**Evidence-Based Practice Model and Conceptual/Theoretical Model**

**Plan-Do-Study-Act Model**

The Plan-Do-Study-Act (PDSA) model (PDSA, 2018) was chosen to guide project development, it is a simple (Appendix K) model and is commonly used as a performance improvement project because it measures a change after it has been implemented and is designed to be made adjustments to be made after, allowing for the process to repeat again. This method guides the process with four steps: Plan, Do, Study, Act. First, a plan must be drawn up with clear indications for what is to be done, the outcomes desired, and the steps for execution. Next, the test is carried out or executed – during this phase, the observations are recorded. After this step, the results are studied and whether or not the goal was achieved is evaluated. The final stage is the conclusion of what was learned from the conclusion of the effects, including what worked, what did not, and what could be done differently for next time? (PDSA Worksheet, 2018).

The plan would involve using Tai Chi as a method for fall prevention with reducing the incidence of falls, preventing falls, and increasing the confidence of individuals who are afraid of falls. The project could be student-led and would follow much of the same structure, direction, and goals of that in the studies below. The frequency of classes per week, length of each class, and the same age of participants would be replicated. The project would take place in the
community, in an area that does not already have Tai Chi classes for fall prevention already in place. After the project has completed, the data will be collected and studied. Then, during the act phase, conclusions will be made so that adjustments can be made. This model easily allows for repeating of the project with adjustments made afterward.

**Self-Efficacy Theory**

The entirety of the project is built upon Bandura’s Self-Efficacy Theory which is a sub-theory of his Social-Cognitive theory. The Self-Efficacy theory lends itself to what the structure of the Tai Chi for Falls Prevention classes is structured to achieve. This theory presents the notion that the observation of value or efficacy is determined by four main aspects: mastery experience, vicarious experience, verbal persuasion, and somatic or state of emotion. The mastery experience builds upon the perceptions from previous successes that have been accomplished in the past but are similar to the newer behaviors being attempted. With the step-by-step program being followed by the participants, they are more open to each of the newer, more complicated steps because of their mastery of the earlier, similar steps prior. The vicarious experience is based upon the individual’s ability to learn by watching others be successful at completing the same actions being attempted by the individual. Being surrounded in a supportive environment that a group class setting provides creates an atmosphere that is encouraging and motivating to the participants of the tai chi classes. With verbal persuasion, reinforcement from others and instructors is both crucial and effective, which is supplied both from the fellow participants and the instructor in this project. Lastly, the somatic and emotional states of each individual must be considered constantly because their physical and emotional statuses are instigated by their perception regarding the undertaking of new behaviors (Brown, Malouff, & Schutte, 2013). By measuring the participant’s fear of falling perceptions, the instructor of the
Tai Chi for Falls Prevention classes can adjust the teaching stylings to better meet the needs of the participants.

**Project Methods**

After becoming a certified Tai Chi for Falls Prevention instructor through the Tai Chi for Health Institute, I designed my intervention to consist of: 60-minute classes that were held twice a week over 12 weeks in a classroom setting at a not-for-profit hospital’s medical office building in an urban Phoenix area. Participants who were considered for recruitment had to be between the ages of 65-85 years of age, English-speaking and able to ambulate without the use of assistive devices. Relevant pre-screening was utilized with reliable tools that whose validity was supported, with permission to use granted beforehand. Before interested applicants were allowed to provide consent, individuals were screened for any pre-existing mental or cognitive impairments using the Montreal Cognitive Assessment-Basic (MoCA-B) tool (Appendix L). Their physical activity readiness was determined using the 2018 Physical Activity Readiness Questionnaire (PAR-Q+) (Appendix M). The data collected was their falls risk perception, measured using the ‘Falls Efficacy Scale-International (English)’ (FES-I) (Appendix N) at the beginning, middle, and the end of the project. This ordinal data was analyzed using SPSS 25, in which Friedman ANOVA was used for data analysis. All participant-related information and data was safely stored on an encrypted, external flash drive that was only via secure methods only. After completion of the project, the information and any identifying information was properly deleted, removed, and destroyed.

Total expense, excluding commute-related expenses for this project, would have been about $308 to cover the certification course and related learning materials and supplemental supplies for teaching the Tai Chi classes. No cost for classes space as they were provided via the
connections of the Arizona Falls Prevention Coalition. It should be mentioned that Tai Chi can occur in any public space that is flat and open, such as at a park, library, or home, therefore, additional costs for practice space should not be included in a proposed budget.

Outcomes

The project started on 11/27/18, after minor project delays due to poor public response to recruitment strategies utilized. There was a total enrollment of five participants, each providing their consent after passing the pre-screenings beforehand for a total inclusion into the project of five participants ($n = 5$). After an anticipated attrition rate of two, this project completed without any adverse events 12 weeks later on 2/14/19 with three participants. Because of this low completion rate, data analysis of their FoF was severely limited. After analyzing the three participant’s data collected from the three different intervals using Friedman ANOVA analysis, the resulting p-value indicated that the intervention’s effects were not significant ($p = .68$). Thus, proving the null hypothesis correct.

Discussion

Though, participant enrollment might have been impeded by non-ideal recruitment strategies in the beginning, the impact was of Tai Chi’s benefits was clear and apparent to the participants who completed the project after 12 weeks as indicated by the positive verbal praise that was shared at the project’s end. Poor recruitment strategies are considered to be the primary cause of low participant interest/enrollment. The attrition rate, like most long-term projects and studies, was not unexpected as this project’s requirements were demanding in its length of time and frequency of classes. As mentioned above, low enrollment that was negatively affected by the project’s attrition rate is most likely the cause for the data lacking statistical significance ($p > .05$), but there was an unmistakable downwards trend observed for fear of falling total scores.
among all completing participants (Appendix O), which indicates this intervention as having clinical significance. After completing the project, the participants were encouraged to seek Tai Chi instructor certifications of their own so that additional Tai Chi for falls prevention classes can be implemented in their own communities. Nine weeks into the project, one of the participants stated as testimonial believing in the effects of the project,

“Over the weekend, I tripped over my dog while trying to settle him when someone was in the yard. I felt myself falling as I instantly regretted everything I did leading up to that point. Miraculously, I maneuvered my feet in a way to recover and catch myself. I didn’t fall, and I know for certain that it is due to these Tai Chi classes.”

Interested participants, upon completing the project were advised to continue taking Tai Chi classes within and were encouraged to seek instructor certification for the continued development and expansion of available Tai Chi classes throughout their communities for sustainability.

**Conclusion**

The project’s implications and benefits for falls prevention is not without merit due to its apparent clinical benefits which should not be overshadowed by the data’s lack of statistical significance. To the participants who completed the project to its entirety, there was personal benefit that was stated by all. The Tai Chi was discussed as being both beneficial, easy to perform, and fun. These subjective critiques are worth mention in reviewing the benefits to both the site at which the project took place and the organization this student partnered with. Increased focus for recruitment strategies should be better prioritized by the organization and the project site to more aptly prevent lower enrollment of participants in the future. Also, it is worth highlighting that the only data measured was quantifiable, subjective data. Despite this project’s
lack of interventional validation, current literary evidence does extensively support the health benefits of Tai Chi (Lan, Chen, Lai, & Wong, 2013). Future projects could add objective data to reinforce the benefits of Tai Chi, such as: ‘Sit to Stand’ timing, Balance, Leg-Strength, & Speed of ambulation (Bubella & et al., 2017; Yildirim, Ofluoglu, Aydogan, & Akyuz, 2016). Doing so might reinforce the validity of Tai Chi as a practical recommendation due to its cost-effective, simple interventional design and effectiveness for prevention of accidental falls. Depending on who is asked, this project could still be considered a great success in its potential benefits and should be regarded as a worthwhile first step in a process advocating for more practical falls prevention options for the public.
References


Appendix A

Figure A

*CINAHL Database – Search Results Screenshot:

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Appendix B

Figure B1

*Online Computer Library Center WorldCat – Initial Search Results Screenshot:*

- Search results for "fall OR fall prevention OR falls prevention AND tai chi" > '2013..2018' > 'English' > 'Non-Juvenile'

- 1. *Non-pharmacological management of osteoporosis : exercise, nutrition, fall and fracture prevention* by Mohseneed Sinaei; Micheal Pfeifer;
  - eBook: Document: View all formats and languages
  - Language: English
  - Publisher: Cham, Switzerland : Springer, [2017]

- 2. *Evidence map of Tai Chi* by Susanne Hangel; Paul G Shinkieta, Stephanie L Taylor; Michelle R Solloway; Quality Enhancement Research Initiatives Department of Veterans Affairs, Health Services Research and Development Service, West Los Angeles VA Medical Synthesis Program Center,
  - eBook: Document: National government publication
  - Language: English
  - Publisher: Washington, DC : Department of Veterans Affairs, Health Services Research & Development Service, [2014]

- 3. *The Gale encyclopedia of nursing and allied health* by Jacqueline L Longo;
  - eBook: Document: View all formats and languages
  - Language: English
  - Publisher: Farmington Hills, Michigan : Gale, [2018] 00218

- 4. *Adult development and aging* by John C Cavanaugh; Freda Blanchard-Fields
  - Print book: Document: View all formats and languages
  - Language: English
  - Publisher: Stamford, CT : Cengage Learning, [2015] 00205

Figure B2

*Online Computer Library Center WorldCat – Final Search Results Screenshot:*

- Search results for "elderly" OR "older adult" OR "65+ years" OR "geriatric" OR "Aged 65" AND "tai chi" OR "tai ji" OR "Tai Ji Cuan" OR "Tai Chi Chuan" AND "fall prevention" OR "fall intervention" OR "fall" OR "fear of falling" OR "fear of falls" OR "Falls prevention" > '2013..2018'
Appendix C

Figure C

*PubMed.gov* - Search Results screenshot:

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<td>Search (((fall) OR falls) AND prevention): AND tai chi Filters: published in the last 5 years</td>
<td>78</td>
</tr>
<tr>
<td>#1</td>
<td>Add</td>
<td>Search (((fall) OR falls) AND prevention): AND tai chi</td>
<td>216</td>
</tr>
</tbody>
</table>
Appendix D

Figure D1

*ScienceDirect - Initial Search Results Screenshot:*

Find articles with these words
“fall OR fall prevention OR falls prevention AND tai chi”
Year: 2013-2018
Advanced search

290 results

Figure D2

*ScienceDirect - Final Search Results Screenshot:*

Find articles with these words
'Tai Chi' OR 'tai ji' OR 'tai ji quan' OR 'Tai Chi Chuan' AND 'fall' OR
Year: 2013-2018
Advanced search

1,740 results

Refine by:
Years
- 2018 (214)
- 2017 (369)
- 2016 (337)
- 2015 (307)
- 2014 (247)
- 2013 (266)

Show less

Article type
- Review articles (519)
- Research articles (1,221)

- Preventing falls with *Tai Ji Quan*: A public health perspective
  - Open access, Review article
  - Journal of Sport and Health Science, Volume 3, Issue 1, March 2014, Pages 21-26
  - Judy A. Stevens, Alexander Voukletatos, Heidi Ehrenreich

- The effect of Chinese martial arts *Tai Chi Chuan* on *prevention* of osteoporosis: A systematic review
  - Open access, Review article
  - Journal of Orthopaedic Translation, Volume 12, January 2018, Pages 74-84
  - Tao Ho Chow, Bo Yue Lee, Adrian Bing Fung Ang, Veronica Yi Ki Cheung, ... Saori Takemura

- *Tai Ji Quan*, the brain, and cognition in older adults
  - Open access, Review article
  - Journal of Sport and Health Science, Volume 3, Issue 1, March 2014, Pages 36-42
  - [Download PDF (242 KB)](#)
Appendix E

Figure E1

*Springer Link* - Initial Search Results Screenshot:

![Initial Search Results Screenshot](image)

Figure E2

*Springer Link* – Final Search Results Screenshot:

![Final Search Results Screenshot](image)
Appendix F

Figure F1

_Cochrane Library – Initial Search Results Screenshot:_

Figure F2

_Cochrane Library – Final Search Results Screenshot:_
Appendix G

Figure G1

*SAGE journals – Initial Search Results Screenshot:*

![Initial Search Results Screenshot](image)

Figure G2

*SAGE journals – Final Search Results Screenshot:*

![Final Search Results Screenshot](image)
Appendix H

Figure H

ProQuest: Medline – Search Results Activity Screenshot:
### Appendix I

**Table 1**

*Quantitative Evaluation Table:*

| Citation: Bubela, D., Sacharko, L., Chan, J., & Brady, M. (2017). Balance and functional outcomes for older community-dwelling adults who practice tai chi and those who do not. | Design: A quasi-experimental comparative pre-and post-test design | Sample: Subjects had to be community dwelling and English-speaking, 55 years or older, who ambulated independently w/ or w/o an | Major Variables & Definitions: IG: Tai Chi (n=16) | Measurement/Instrumentation: Pre- & post-test measures of: | Data Analysis (stats used): SPSS15 with an α level of .05 | Findings/Results: Age: (SD) age of persons participating in the Tai Chi group was 80.4 (6.8) years, (P = .00), (SD) = 71.2 (6.1) years. | Decision for practice: S: LOE: I • TC significantly increasing force production & improves functional lower extremity strength in older adults • The results of this study support the CDC’s endorsement of Tai Chi as a means of fall prevention in older community-dwelling adults. |
|---|---|---|---|---|---|---|---|---|
| **Design:** Inferred: social cognitive therapy | **Sample:** IG: Tai Chi = 16 CG: no TC = group of 14 adults, (SD) age = 71.2 (6.1) years | **Pre- & post-test measures of:** DV1: • handheld dynamometry (HHD) • knee extension strength | **Data Analysis:** Cohen’s d values were calculated to determine the effect sizes of changes Comparison of the 2 groups over the training period through mixed ANOVA 2×2 mixed analysis of variance | **Sample:** IG: Tai Chi Training Group AR: 100% CG: no TC AR: 93% | **Findings/Results:** | **Decision for practice:** | **Key:** α – alpha; ABC / ASBS – Activity-specific balance confidence; AE - adverse events; CBS - community-based setting; CEP – Combined Exercise Prescription; CCT - clinically controlled trial; CG - control group; DI - duration of intervention; DV - dependent variable; EC - exclusion criteria; ES – effect size; IG - intervention group; IC - inclusion criteria; IV - independent variable; FoF - Fear of Falling; LOE – Level of Evidence; LT – Longterm; mo - month(s); MTA - meta analysis; N - number of studies; n - number of participants; PC - population characteristics; RCT - randomized control trial; S - strengths; SD – standard deviation SR - systematic review; ST – Shortterm; TC Tai Chi; TCMBB -Tai Chi: Moving for Better Balance; TUG – Timed Up & Go test; W - weaknesses |
| **IG:** Tai Chi | **Sample:** Subjects had to be community dwelling and English-speaking, 55 years or older, who ambulated independently w/ or w/o an | **DV1:** Age | **DV2:** Mobility | **DV3:** Balance | **DV4:** Fear of Falling | **DV4:** Fear of Falling | **Decision for practice:** | **Key:** α – alpha; ABC / ASBS – Activity-specific balance confidence; AE - adverse events; CBS - community-based setting; CEP – Combined Exercise Prescription; CCT - clinically controlled trial; CG - control group; DI - duration of intervention; DV - dependent variable; EC - exclusion criteria; ES – effect size; IG - intervention group; IC - inclusion criteria; IV - independent variable; FoF - Fear of Falling; LOE – Level of Evidence; LT – Longterm; mo - month(s); MTA - meta analysis; N - number of studies; n - number of participants; PC - population characteristics; RCT - randomized control trial; S - strengths; SD – standard deviation SR - systematic review; ST – Shortterm; TC Tai Chi; TCMBB -Tai Chi: Moving for Better Balance; TUG – Timed Up & Go test; W - weaknesses |
### Citation:

### Inferred: descriptiv e theory

### Design: A quasi-experimental comparative pre- and post- test design

**Purpose:**
To examine the effectiveness of the shorter 12-week TCMBB program when taught by trained community members, instead of experienced instructors.

**Setting:**
Local senior citizen center

**Sample/Setting:**
N= 131 individuals
n= 126 completed
Evaluated pre & post: 97
AR= 92.3%
Sample: community dwelling adults aged 65 and above, who could walk with ease with or without IV1: age
IV2: sex
IV3: race/ethnicity
IV4: Ed.
IV5: Income
IV6: Chronic Conditions

**DV1:**
- self-reported fall history
- FoF
- Monthly Falls
- Recent falls (w/i 6 mo’s)

**DV2:**
- Functional mobility & Balance
- TUG
- Functional reach
- Activities-specific balance scale scores

**DV3:**
- IV1-5: self-report
- IV6: Health background

**Measurement/Instrumentation:**
- • ABC
- • IV1-5: self-report
- • IV6: Health background
- SPSS: 23
- Chi-square and two-tailed t-tests
- Cronbach’s alpha: .04
- Wilcoxon signed rank test

**Data Analysis (Stats used):**
- 0.183; observed power = 0.543.
- Conf: IG vs CG (P = .022) & modes and observed power (η p ² = 0.217; observed power = 0.656).

**Findings/Results:**
- • Timed Up and Go (p < .001)
- • Functional Reach (p < .1)
- • ABC scores (p < .01)

**Decision for practice:**
- lack of randomization and use of convenience sampling led to the creation of groups with characteristics

Key: a – alpha; ABC – Activity-specific balance confidence; AE - adverse events; BC – balance confidence; CBS - community-based setting; CEP – Combined Exercise Prescription; CCT - clinically controlled trial; CG - control group; DI - duration of intervention; DV - dependent variable; EC - exclusion criteria; ES – effect size; IG - intervention group; IC - inclusion criteria; IV - independent variable; FoF - Fear of Falling; LOE – Level of Evidence; LT – Long-term ; mo - month(s); MTA - meta analysis; N - number of studies; n - number of participants; PC - population characteristics; RCT - randomized control trial; S - strengths; SD – standard deviation SR - systematic review; ST – Short-term; TC Tai Chi; TCMBB -Tai Chi: Moving for Better Balance; TUG – Timed Up & Go test; Tx – treatment; W - weaknesses
<table>
<thead>
<tr>
<th>Citation: Implementation.</th>
<th>Theory/Conceptual Framework</th>
<th>Design/Method</th>
<th>Sample/Setting</th>
<th>Major Variables &amp; Definitions</th>
<th>Measurement/Instrumentation</th>
<th>Data Analysis (stats used)</th>
<th>Findings/Results</th>
<th>Decision for practice</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>assistsive devices.</td>
<td>DV3: Confidence</td>
<td>DV3: ABC scale</td>
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</tbody>
</table>

Of the total group of 131 participants, 126 (96%) participated in the evaluation procedures, and complete pre–post data were obtained from 97 (77%) of these participants.

Setting:
nine programs were held in two senior centers, two community/recreation centers, and

Key: α – alpha; ABC – Activity-specific balance confidence; AE - adverse events; BC – balance confidence; CBS - community-based setting; CEP – Combined Exercise Prescription; CCT - clinically controlled trial; CG - control group; D1 - duration of intervention; DV - dependent variable; EC - exclusion criteria; ES – effect size; IG - intervention group; IC - inclusion criteria; IV - independent variable; FoF - Fear of Falling; LOE – Level of Evidence; LT – Long-term; mo - month(s); MTA - meta analysis; N - number of studies; n - number of participants; PC - population characteristics; RCT - randomized control trial; S - strengths; SD – standard deviation; SR - systematic review; ST – Short-term; TC Tai Chi; TCMBB - Tai Chi: Moving for Better Balance; TUG – Timed Up & Go test; Tx – treatment; W - weaknesses
| Citation: Hu, Y.N., Chung, Y.J., Yu, H.K., Chen, Y.C., Tsai, C.T., & Hu, G.C. (2016). Effect of tai chi exercise on fall prevention in older adults: Systematic review and meta-analysis of randomized controlled trials | Theory/Conceptual Framework | Inferred: predictive theory | Design: SR and MTA | Purpose: To synthesize the latest trial reports with the older data, we have performed this systematic review and meta-analysis of all randomized controlled trials of the effectiveness of Tai Chi on the risk of falls among older adults. | Sample/Setting: two assisted living/senior housing facilities in three counties across New York state. | Major Variables & Definitions: N= 10 studies n= 2850 total participants IGs= 1540 CGs= 1310 *sample sizes ranging from 59 to 684 participants. * mean age of all participants: 68-84 years. IC: (1) the type of trial was a randomized | Measurement/Instrumentation: IV1: DI <6mo IV2: DI >6mo IV3: TC style: Sun IV4: TC style: Yang DV1: effect of Tai Chi exercise on the risk of falls in older adults DV2: risk of falls (portrayed by odds ratio) | Data Analysis (stats used): • PEDro Scale: • Physio-therapy Evidence Database scale. | Findings/Results: Forest Plots Random effects meta-analysis • In the two subgroups, the effect of Tai Chi exercise on prevention of fall risks were 0.80 (95% CI, 0.66 to 0.96; <6 months) and 0.52 (95% CI, 0.38 to 0.71; 6 months). Then, the trials were grouped according to the Tai Chi style used. The effect of S: LOE: I • TC has a significant protective effect on fall risk among older adults. | Decision for practice: S: LOE: I • TC has a significant protective effect on fall risk among older adults. • W: potential incompleteness of the evidence reviewed. • data for outcome measures were self-reported [subj. to bias] • lack of training variables as a subgroup |

Key: α – alpha; ABC – Activity-specific balance confidence; AE - adverse events; BC – balance confidence; CBS - community-based setting; CEP – Combined Exercise Prescription; CCT - clinically controlled trial; CG - control group; DI - duration of intervention; DV - dependent variable; EC - exclusion criteria; ES – effect size; IG - intervention group; IC - inclusion criteria; IV - independent variable; FoF - Fear of Falling; LOE – Level of Evidence; LT – Long-term; mo - month(s); MTA - meta analysis; N - number of studies; n - number of participants; PC - population characteristics; RCT - randomized control trial; S - strengths; SD – standard deviation SR - systematic review; ST – Short-term; TC Tai Chi; TCMBB -Tai Chi: Moving for Better Balance; TUG – Timed Up & Go test; Tx – treatment; W - weaknesses
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<th>Decision for practice</th>
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<tbody>
<tr>
<td>Controlled trial</td>
<td></td>
<td>(2) participants were older adults (age (\geq 65) yrs); (3) one of the interventions was a form of Tai Chi exercise training (4) the outcomes included falls</td>
<td>EC: &lt;6 on PEDro score was cutoff for high-quality studies</td>
<td>Tai Chi exercise on the prevention of fall risks was measured as 0.57 (95% CI, 0.33 to 0.99) for the Yang style, 0.79 (95% CI, 0.62 to 0.99) for the Sun style, and 0.68 (95% CI, 0.50 to 0.93) for the modified or unspecified style TC showed a significant reduced risk of falls (odds ratio (\frac{1}{1.40}); 95% confidence interval, 0.59 to 0.84).</td>
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</table>

### Key:
- \(\alpha\) – alpha
- ABC – Activity-specific balance confidence
- AE - adverse events
- BC – balance confidence
- CBS - community-based setting
- CEP – Combined Exercise Prescription
- CCT - clinically controlled trial
- CG - control group
- DI - duration of intervention
- DV - dependent variable
- EC - exclusion criteria
- ES - effect size
- IG - intervention group
- IC - inclusion criteria
- IV - independent variable
- FoF - Fear of Falling
- LOE – Level of Evidence
- LT – Long-term
- mo - month(s)
- MTA - meta analysis
- N - number of studies
- n - number of participants
- PC - population characteristics
- RCT - randomized control trial
- S - strengths
- SD - standard deviation
- SR - systematic review
- ST – Short-term
- TC – Tai Chi
- TCMBB -Tai Chi: Moving for Better Balance
- TUG – Timed Up & Go test
- Tx – treatment
- W - weaknesses
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</thead>
<tbody>
<tr>
<td><strong>Inferred:</strong> predictive theory</td>
<td><strong>Design:</strong> SR and MTA</td>
<td><strong>Sample/Setting:</strong> N= 10 RCTs</td>
<td><strong>Major Variables &amp; Definitions:</strong> IV: time points</td>
<td><strong>Measurement/Instrumentation:</strong> • GRADE – measured quality of evid.</td>
<td><strong>Data Analysis (stats used):</strong> random-effects model for estimating pooled effects</td>
<td><strong>Findings/Results:</strong> • fall incidence ST: (IRR = 0.57; 95% CI = 0.46, 0.70) • Small protective effect over the long term (IRR = 0.87; 95% CI = 0.77, 0.98)</td>
<td></td>
</tr>
<tr>
<td><strong>Purpose:</strong> To analyze the effectiveness of tai chi for falls prevention</td>
<td><strong>PC:</strong> Older adult population and at-risk adults. The age of participants ranged from 56 to 98 years old.</td>
<td><strong>IV1:</strong> incidence of falls, short term (&lt;12mo)</td>
<td><strong>DV:</strong> • incidence rate ratio (IRR) for falls incidence</td>
<td><strong>Publication bias was assessed using a funnel plot</strong></td>
<td><strong>Decision for practice:</strong> S: LOE: I • In at-risk adults and older adults, tai chi practice may reduce the rate of falls and injury-related falls over the short term (&lt;12 months) by approximately 43% and 50%</td>
<td></td>
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</tr>
<tr>
<td><strong>IC:</strong> (1) randomized controlled trials (RCTs) (2) analyzing the effect of tai chi (not combined with other intervention) (3) on incidence of falls, incidence of injurious</td>
<td><strong>DV2:</strong> incidence of falls, long-term (&gt;12mo)</td>
<td><strong>DV3:</strong> incidence of injurious falls, short-term</td>
<td><strong>DV4:</strong> incidence of injurious falls, long-term</td>
<td><strong>The Q test was used for heterogeneity analysis and was completed by calculating the degree of inconsistency (I²)</strong></td>
<td><strong>W:</strong> Tai chi practice may not influence time to first fall in these populations. • Low quality evidence used • The most relevant shortcoming in this evaluation was a high risk of attrition bias in two studies and in the long-term follow-up of one study.</td>
<td></td>
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<tr>
<td><strong>DV5:</strong> Time to first fall</td>
<td><strong>DV:</strong> • hazard ratio (HR) for time to first fall</td>
<td><strong>Publication bias was assessed using a funnel plot</strong></td>
<td><strong>Comprehensive Meta-analysis Software 3.3.070</strong></td>
<td><strong>S:</strong> LOE: I</td>
<td><strong>W:</strong> Tai chi practice may not influence time to first fall in these populations. • Low quality evidence used • The most relevant shortcoming in this evaluation was a high risk of attrition bias in two studies and in the long-term follow-up of one study.</td>
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<th>Findings/Results</th>
<th>Decision for practice</th>
</tr>
</thead>
</table>
| “The PICOS framework (Population, Intervention, Comparison, Outcome and Study) was used” | Design: SR and MTA | N= 4 RCTs included in MTA | IV1: Population type IV2: duration IV3: intensity | IV5: The methodologic quality of the four papers included in this review was assessed using the CASP tool for RCTs. | pooled effect was estimated using the trim and fill method | Only ¼ of the studies produced sig effects in favor of Tai Chi for fall prevention. | S: LOE: I  
• There is some evidence for positive effects in pre-frail individuals; however, more research is needed to confirm this  
W: although Tai Chi is effective for reducing falls in the population aged 65 and over, the body of evidence does not conclude this effect to be significant. |
| Plummer, M., Bradley, C. (2017). Tai chi as a falls prevention strategy in older adults compared to conventiona physiotherapy exercise: A review | Purpose: 1. To clarify for which population Tai Chi is most effective  
2. To identify the optimal type, duration and intensity of Tai Chi for falls prevention  
3. To confirm whether Tai | N= 4 RCTs included in MTA | IC: ■ Published between 2005 and 2015 ■ Published worldwide but written in the English language ■ Randomised controlled trials (RCTs) | • DV1: falls incidence • DV2: mobility • DV3: balance • DV4: functional status/disability | DV5: The methodologic quality of the four papers included in this review was assessed using the CASP tool for RCTs. | Only ¼ of the studies produced sig effects in favor of Tai Chi for fall prevention. | S: LOE: I  
• There is some evidence for positive effects in pre-frail individuals; however, more research is needed to confirm this  
W: although Tai Chi is effective for reducing falls in the population aged 65 and over, the body of evidence does not conclude this effect to be significant. |

Key: α – alpha; ABC – Activity-specific balance confidence; AE - adverse events; BC – balance confidence; CBS - community-based setting; CEP – Combined Exercise Prescription; CCT - clinically controlled trial; CG - control group; DI - duration of intervention; DV - dependent variable; EC - exclusion criteria; ES – effect size; IG - intervention group; IC - inclusion criteria; IV - independent variable; FoF - Fear of Falling; LOE – Level of Evidence; LT – Long-term; mo - month(s); MTA - meta analysis; N - number of studies; n - number of participants; PC - population characteristics; RCT - randomized control trial; S - strengths; SD – standard deviation SR - systematic review; ST – Short-term; TC Tai Chi; TCMBB -Tai Chi: Moving for Better Balance; TUG – Timed Up & Go test; Tx – treatment; W - weaknesses

**Purpose:** In order to provide a broad overview of the research evidence that has been published to date, we conducted a systematic review of systematic reviews. N= 107 SRs N=5 SRs focused on BC/FOF. IC: * Systematic reviews of the effects of Tai Chi for any clinical condition.

**DV1:** patient health outcomes: duration and

**DV2:** measures a reduction in falls as an outcome.

**Measurement/Instrumentation:** • Evidence Map • Bubbleplot • PRISM checklist • Meta-Analysis

**Data Analysis Results:** • 15/107 SRs were regarding Fall prevention • 27/107 SRs were regarding balance • 42% reported on the presence or absence of adverse events

**Conclusion:** Although a worldwide search was conducted, only articles written in English language were included in the search criteria, limiting the body of evidence to be appraised. A search of unpublished research was not conducted, which again may limit the validity of this review.

**Findings/Results:**

**LOE: I?**

**W:** 42% reported on the presence or absence of adverse events

**S:** Firm conclusions cannot be drawn due to

---

Key: α – alpha; ABC – Activity-specific balance confidence; AE - adverse events; BC – balance confidence; CBS - community-based setting; CEP – Combined Exercise Prescription; CCT - clinically controlled trial; CG - control group; DI - duration of intervention; DV - dependent variable; EC - exclusion criteria; ES – effect size; IG - intervention group; IC - inclusion criteria; IV - independent variable; FoF - Fear of Falling; LOE – Level of Evidence; LT – Long-term; mo - month(s); MTA - meta analysis; N - number of studies; n - number of participants; PC - population characteristics; RCT - randomized control trial; S - strengths; SD – standard deviation; SR - systematic review; ST – Short-term; TC Tai Chi; TCMBB - Tai Chi: Moving for Better Balance; TUG – Timed Up & Go test; Tx – treatment; W - weaknesses
<table>
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<tr>
<th>Citation: evidence map of the effect of Tai Chi on health outcomes</th>
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<th>Data Analysis (stats used)</th>
<th>Findings/Results</th>
<th>Decision for practice</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>reviews of the effects of Tai Chi on health outcomes</td>
<td>indication were eligible for inclusion.</td>
<td>follow-up point <strong>DV3:</strong></td>
<td></td>
<td></td>
<td>absence of adverse events</td>
<td>• “Five systematic reviews focused on balance confidence/fear of falling and the largest included six RCTs. One reported a positive effect for Tai Chi compared to usual care, exercise, or education (SMD 0.47; 95% CI 0.30, 0.63; 4 RCTs)”</td>
<td>methodological limitations in the original studies and/or an insufficient number of existing research studies.</td>
</tr>
<tr>
<td></td>
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<td></td>
<td></td>
<td>• evidence maps cannot provide definitive answers about the effectiveness of an intervention.</td>
<td></td>
</tr>
</tbody>
</table>

Key: \( \alpha \) – alpha; \( \text{ABC} \) – Activity-specific balance confidence; \( \text{AE} \) - adverse events; \( \text{BC} \) – balance confidence; \( \text{CBS} \) - community-based setting; \( \text{CEP} \) – Combined Exercise Prescription; \( \text{CCT} \) - clinically controlled trial; \( \text{CG} \) - control group; \( \text{DI} \) - duration of intervention; \( \text{DV} \) - dependent variable; \( \text{EC} \) - exclusion criteria; \( \text{ES} \) – effect size; \( \text{IG} \) - intervention group; \( \text{IC} \) - inclusion criteria; \( \text{IV} \) - independent variable; \( \text{FoF} \) - Fear of Falling; \( \text{LOE} \) – Level of Evidence; \( \text{LT} \) – Long-term; \( \text{mo} \) - month(s); \( \text{MTA} \) - meta analysis; \( \text{N} \) - number of studies; \( \text{n} \) - number of participants; \( \text{PC} \) - population characteristics; \( \text{RCT} \) - randomized control trial; \( \text{S} \) - strengths; \( \text{SD} \) – standard deviation; \( \text{SR} \) - systematic review; \( \text{ST} \) – Short-term; \( \text{TC} \) Tai Chi; \( \text{TCMBB} \) - Tai Chi: Moving for Better Balance; \( \text{TUG} \) – Timed Up & Go test; \( \text{Tx} \) – treatment; \( \text{W} \) - weaknesses
### Inferred: Prescriptive theory

**Design:** SR

**Purpose:**
Evaluate the frequency and type of AE occurrences in randomized controlled trials (RCTs) of TC for all populations.

A secondary aim is to evaluate the consistency and quality of AE monitoring protocols used in the included trials.

**N:** 50 RCTs

**IC:** RCTs that were published in English and used TC as an intervention.

**IV:**
- **IV1:** Study Focus
  - PC: avg. age of study participants was 65 years old (median 69 y; range, 11-102 y)
  - IC: RCTs that were published in English and used TC as an intervention.

- **IV2:** Intervention type

- **DV1:** AEs reported

- **DV2:** AEs not reported

- **DV3:** AE monitoring protocol

**AE reporting protocol:** CONSORT Extension checklist of 10 rec’s when reporting harms in RCTs

**Systematic searching by the 2 authors**

**Descriptive stat’s**

**Findings/Results**

**Summary:**
- 18/50 reported detailed synthesis of safety
- 0/50 reported serious AEs
- 15/50 minor aches/pains of lower ext’s
- 6/50 reported back/spine pain, of which one was severe
- 100 (65%) included no mention of either AE

**Key:**
- α – alpha; ABC – Activity-specific balance confidence; AE - adverse events; BC – balance confidence; CBS - community-based setting; CEP – Combined Exercise Prescription; CCT - clinically controlled trial; CG - control group; DI - duration of intervention; DV - dependent variable; EC - exclusion criteria; ES – effect size; IG - intervention group; IC - inclusion criteria; IV - independent variable; FoF - Fear of Falling; LOE – Level of Evidence; LT – Long-term ; mo - month(s); MTA - meta analysis; N - number of studies; n - number of participants; PC - population characteristics; RCT - randomized control trial; S - strengths; SD – standard deviation SR - systematic review; ST – Short-term; TC Tai Chi; TCMBB -Tai Chi: Moving for Better Balance; TUG – Timed Up & Go test; Tx – treatment; W - weaknesses
<table>
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<th>Decision for practice</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Inferred:</strong> Predictive Theory</td>
<td><strong>SR</strong></td>
<td><strong>N= 26 RCTs</strong></td>
<td><strong>n= 3247 participants</strong></td>
<td><strong>IV1: Ex Rx Methods</strong></td>
<td><strong>IV1: Ex Rx Methods</strong></td>
<td>monitoring protocols or AE reports, additional 3 studies only mentioned an AE protocol but no AE report. Of the 50 eligible studies that included an explicit AE report only 18 trials included an explicit monitoring protocol, which provides a more reliable framework for interpreting the validity of AE reports.</td>
<td>• only included trials published in the English language. study only used descriptive statistics and narrative summaries of AE reports d/t the small number of studies and the heterogeneity of both interventions &amp; controls</td>
<td></td>
</tr>
</tbody>
</table>

**Key:** α – alpha; ABC – Activity-specific balance confidence; AE - adverse events; BC – balance confidence; CBS - community-based setting; CEP – Combined Exercise Prescription; CCT - clinically controlled trial; CG - control group; DI - duration of intervention; DV - dependent variable; EC - exclusion criteria; ES – effect size; IG - intervention group; IC - inclusion criteria; IV - independent variable; FoF - Fear of Falling; LOE – Level of Evidence; LT – Long-term ; mo - month(s); MTA - meta analysis; N - number of studies; n - number of participants; PC - population characteristics; RCT - randomized control trial; S - strengths; SD – standard deviation SR - systematic review; ST – Short-term; TC Tai Chi; TCMBB -Tai Chi: Moving for Better Balance; TUG – Timed Up & Go test; Tx – treatment; W - weaknesses
<table>
<thead>
<tr>
<th>Citation: Pescatello, L. (2016). Evaluating Exercise Prescription and Instructional Methods Used in Tai Chi Studies Aimed at Improving Balance in Older Adults: A Systematic Review</th>
<th>Theory/Conceptual Framework</th>
<th>Design/Methodology</th>
<th>Sample/Setting</th>
<th>Major Variables &amp; Definitions</th>
<th>Measurement/Instrumentation</th>
<th>Data Analysis (stats used)</th>
<th>Findings/Results</th>
<th>Decision for practice</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Purpose:</strong> To develop an evaluation instrument to determine to what extent Tai Chi interventions aimed at improving the balance of older adults disclosed their exercise prescription (Ex Rx) and instructional methods and met best-practice exercise recommendations for balance improvement.</td>
<td>(mostly women)</td>
<td>27 interventions identified/reeived</td>
<td>IV1 Defined: Integration of the components of freq., intensity, time, type, volume, &amp; progression principle for TC practice</td>
<td>1. Freq. of Tai chi practice (sessions/week)</td>
<td>(augmented version): used for methodologic al study quality assessment</td>
<td>marginally correlated w/ balance imp’s s/p TC (r=0.35, P=.08)</td>
<td>• Balance was significantly improved in 19/27 interventions</td>
<td>• Balance was significantly improved. In 19/27 interventions</td>
</tr>
<tr>
<td></td>
<td>CG: 1613</td>
<td>IG: 1634</td>
<td>PC: participants aged 60 and older w/o debilitating disease</td>
<td>2. Time or duration of each TC session</td>
<td></td>
<td>• The mean reporting rate for the IV1 was (92.6+/-.19.2%)</td>
<td>W: • Intervention features specific to IV2 were poorly reported and weren’t customized for the purpose of balance improv.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>EC: • not RCTs (n=23)</td>
<td>• Participant s had severe debilitating disease (n=8)</td>
<td>3. Length of TC intervention (weeks)</td>
<td></td>
<td></td>
<td>• Mean reporting rate for IV2 (41.1+/-.18%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Article was not published</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>P&lt;.001</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Key: α – alpha; ABC – Activity-specific balance confidence; AE - adverse events; BC – balance confidence; CBS - community-based setting; CEP – Combined Exercise Prescription; CCT - clinically controlled trial; CG - control group; DI - duration of intervention; DV - dependent variable; EC - exclusion criteria; ES – effect size; IG - intervention group; IC - inclusion criteria; IV - independent variable; FoF - Fear of Falling; LOE – Level of Evidence; LT – Long-term; mo - month(s); MTA - meta analysis; N - number of studies; n - number of participants; PC - population characteristics; RCT - randomized control trial; S - strengths; SD – standard deviation SR - systematic review; ST – Short-term; TC Tai Chi; TCMBB -Tai Chi: Moving for Better Balance; TUG – Timed Up & Go test; Tx – treatment; W - weaknesses
<table>
<thead>
<tr>
<th>Citation: Yang, G., Wang, L., Ren, J., Zhang, Y., Li, M., &amp; Zhu, Y., Luo, J.,</th>
<th>Inferred:</th>
<th>Design: SR</th>
<th>N=507 n=464</th>
<th>IV1: TC IV2: Chronic Disease(s)</th>
<th>Data Extraction: • 2 authors (GYY &amp; JPL) designed a structured data extraction form: • SPSS 17.0</th>
<th>• (94.1%) reported positive effects of TC • 5.1% studies reported weaknesses</th>
<th>20/460 studies had no drop outs or withdrawals</th>
</tr>
</thead>
</table>

Key: α – alpha; ABC – Activity-specific balance confidence; AE - adverse events; BC – balance confidence; CBS - community-based setting; CEP – Combined Exercise Prescription; CCT - clinically controlled trial; CG - control group; DI - duration of intervention; DV - dependent variable; EC - exclusion criteria; ES – effect size; IG - intervention group; IC - inclusion criteria; IV - independent variable; FoF - Fear of Falling; LOE – Level of Evidence; LT – Long-term; mo - month(s); MTA - meta analysis; N - number of studies; n - number of participants; PC - population characteristics; RCT - randomized control trial; S - strengths; SD – standard deviation; SR - systematic review; ST – Short-term; TC Tai Chi; TCMBB -Tai Chi: Moving for Better Balance; TUG – Timed Up & Go test; Tx – treatment; W - weaknesses
| Citation: Cheng, Y., Li, W., Wayne, P., & Liu, J. (2015). Evidence base of clinical studies on tai chi: A bibliometric analysis. | Design/Method: evidence on Tai Chi... to provide current state of evidence in support of the application of Tai Chi for healthcare, and to identify limitations and priorities for further clinical research.” | Sample/Setting: Many practiced 2-3 1 hr sessions/week for 12 weeks | Major Variables & Definitions: DV1: Psychologic al Outcomes DV2: Satisfaction DV3: compliance DV4: safety DV5 physical performance | Measurement/Instrumentation: • (1) Pub. info., including: - Pub. yr, - study design, - language, - country, - funding • Dis./cond.: - Studies about disease prevention, health pro. or preservation were specially recorded. • Tai Chi intervention: -Styles -method of learning & practicing -qual’s of Tai Chi instructors. • If Tai Chi was applied in | Data Analysis (stats used): uncertain effects • 0.8% studies reported negative effects. • No serious adverse events related to TC were reported. | Findings/Results: W: • 46 studies (46/507, 9.1%) reported incidence of health-related events (i.e. falls, fracture, angina & others) • Some bias in testing the effects of TC on sampling that is primarily healthy | Decision for practice: |
| Citation: Yildirim, P., Ofluoglu, D., Aydogan, | **Inferred:** prescriptive theory | **Design:** RCT= single-blind Purpose: | n=60 PC: Sixty older Turkish adults aged | **IV1:** Group 1 | **Data Analysis (stats used):** SPSS 15.0 | **Findings/Results:** A total of 48 participants completed the study | **Decision for practice:** S: LOE: II It can be concluded that Tai Chi may be a more combination with other therapies, • Outcomes & overall conclusions: -All outcomes were extracted directly, then classified into different categories. If quality of life was reported, the measurement was also extracted if available. -overall authors’ conclusions (positive, negative or unclear). | **Major Variables & Definitions:** • all participants were evaluated using general systemic | **Measurement/Instrumentation:** • Chi-square test: analyze differences | **Sample/Setting:** IV1: Group 1 | **Theory/Conceptual Framework:** | **Measurements/Instrumentation:** | **Design/Method:** | **Sample/Setting:** | **Data Analysis (stats used):** | **Findings/Results:** | **Decision for practice:** |

Key: $\alpha$ – alpha; ABC – Activity-specific balance confidence; AE - adverse events; BC – balance confidence; CBS - community-based setting; CEP – Combined Exercise Prescription; CCT - clinically controlled trial; CG - control group; DI - duration of intervention; DV - dependent variable; EC - exclusion criteria; ES – effect size; IG - intervention group; IC - inclusion criteria; IV - independent variable; FoF - Fear of Falling; LOE – Level of Evidence; LT – Long-term; mo - month(s); MTA - meta analysis; N - number of studies; n - number of participants; PC - population characteristics; RCT - randomized control trial; S - strengths; SD – standard deviation SR - systematic review; ST – Short-term; TC Tai Chi; TCMBB -Tai Chi: Moving for Better Balance; TUG – Timed Up & Go test; Tx – treatment; W - weaknesses
To compare the effect of Tai Chi and combined exercise prescription that consists of three main components of an exercise prescription on static balance, dynamic balance, fear of falling and mood.

**Setting:**
- Style: Yang-Style TC
- IC: cognitively intact, older than 55 y/o, and had never been in any exercise

**Measurement/Instrumentation**
- examination of the cardiovascular, neurological, and musculoskeletal system. Body weight and height were also measured for each subject
- Pre- & post- test questionnaire
- Single Leg-Stance-Eyes Open (SLS-EO)
- Single Leg-Stance Eyes Closed (SLS-EC)
- computerized balance assessment/measurements (CBA)
- Timed Up and Go (TUG) test

**Data Analysis (stats used)**
- Between the two groups for demographic data.
  - Kolmogorov-Smirnov: normality of continuous variables.
  - Wilcoxon test: intragroup comparisons
  - Mann-Whitney U test: comparison of data obtained

**Findings/Results**
- 27 in Group 1
- 21 in Group 2
- SLS-EO (p < 0.05), SLS-EC (p < 0.05), BBS (p < 0.05), & TUG (p < 0.05).
- statistically significant improvements in the SAFFE, BDS, & GDS scores between the before & after in Group 1 (all p < 0.05).
- In Group 2, only significant differences in BBS & TUG scores between successful exercise intervention for factors-related to falls in older people

**Decision for practice**
- a short intervention follow-up period and the lack of a third control group not assigned to an exercise program

Key: $\alpha$ – alpha; ABC – Activity-specific balance confidence; AE - adverse events; BC – balance confidence; CBS - community-based setting; CEP – Combined Exercise Prescription; CCT - clinically controlled trial; CG - control group; DI - duration of intervention; DV - dependent variable; EC - exclusion criteria; ES – effect size; IG - intervention group; IC - inclusion criteria; IV - independent variable; FoF - Fear of Falling; LOE – Level of Evidence; LT – Long-term ; mo - month(s); MTA - meta analysis; N - number of studies; n - number of participants; PC - population characteristics; RCT - randomized control trial; S - strengths; SD – standard deviation SR - systematic review; ST – Short-term; TC Tai Chi; TCMBB -Tai Chi: Moving for Better Balance; TUG – Timed Up & Go test; Tx – treatment; W - weaknesses
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<th>Sample/Setting</th>
<th>Major Variables &amp; Definitions</th>
<th>Measurement/Instrumentation</th>
<th>Data Analysis (stats used)</th>
<th>Findings/Results</th>
<th>Decision for practice</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>program including Tai Chi in the six months prior to the intervention</td>
<td>DV6: BDS measurements • Berg Balance Scale (BBS) • Survey of Activities and Fear of Falling in the elderly (SAFFE) • Geriatric Depression Scale (GDS) • Beck Depression Scale (BDS)</td>
<td>before &amp; after the training evaluation (p &lt; 0.05). scores in all other clinical balance, fear of falling, &amp; mood scales did not improve compared to the baseline in Group 2 (all p &lt; 0.05). No sig. difference between the 2 groups at the beginning of the study for the assessment values for both eyes-opened &amp; closed (p &gt; 0.05). After training, only</td>
<td></td>
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</tr>
</tbody>
</table>

Key: α – alpha; ABC – Activity-specific balance confidence; AE - adverse events; BC – balance confidence; CBS - community-based setting; CEP – Combined Exercise Prescription; CCT - clinically controlled trial; CG - control group; DI - duration of intervention; DV - dependent variable; EC - exclusion criteria; ES – effect size; IG - intervention group; IC - inclusion criteria; IV - independent variable; FoF - Fear of Falling; LOE – Level of Evidence; LT – Long-term ; mo - month(s); MTA - meta analysis; N - number of studies; n - number of participants; PC - population characteristics; RCT - randomized control trial; S - strengths; SD – standard deviation SR - systematic review; ST – Short-term; TC Tai Chi; TCMBB -Tai Chi: Moving for Better Balance; TUG – Timed Up & Go test; Tx – treatment; W - weaknesses
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<tr>
<th>Citation: Theory/ Conceptual Framework</th>
<th>Design/Method</th>
<th>Sample/ Setting</th>
<th>Major Variables &amp; Definitions</th>
<th>Measurement/ Instrumentation</th>
<th>Data Analysis (stats used)</th>
<th>Findings/ Results</th>
<th>Decision for practice</th>
</tr>
</thead>
</table>

- mild improv’s in Group 1 – but not statistically significant (p > 0.05).
- Group Comparison of balance control, fear of falling, & mood parameters: a sig. difference observed in Group 1 for SLS-EO (p < 0.05) & SAFFE scores (p < 0.05)
- There were no serious adverse events reported

Key: $\alpha$ – alpha; ABC – Activity-specific balance confidence; AE - adverse events; BC – balance confidence; CBS - community-based setting; CEP – Combined Exercise Prescription; CCT - clinically controlled trial; CG - control group; DI - duration of intervention; DV - dependent variable; EC - exclusion criteria; ES – effect size; IG - intervention group; IC - inclusion criteria; IV - independent variable; FoF - Fear of Falling; LOE – Level of Evidence; LT – Long-term ; mo - month(s); MTA - meta analysis; N - number of studies; n - number of participants; PC - population characteristics; RCT - randomized control trial; S - strengths; SD – standard deviation SR - systematic review; ST – Short-term; TC Tai Chi; TCMBB -Tai Chi: Moving for Better Balance; TUG – Timed Up & Go test; Tx – treatment; W - weaknesses
Appendix J

Table 2

*Synthesis Table:*

<table>
<thead>
<tr>
<th>Studies</th>
<th>Year</th>
<th>LOE</th>
<th>Design</th>
<th>Studies Reviewed</th>
<th>Length (weeks)</th>
<th>Length of Class (hrs)</th>
<th>Freq/week</th>
<th>Community-based</th>
<th>Measured AEs</th>
<th>Bias</th>
<th>Sample Size</th>
<th>Mean Age (years)</th>
<th>Neg. Events</th>
<th>ASBCS</th>
<th>BBS</th>
<th>BDS</th>
<th>Fall Incidence</th>
<th>Fear of Falling</th>
<th>FFWT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Battea, D., et al.</td>
<td>2017</td>
<td>IV</td>
<td>Quasi-XP</td>
<td>n/a</td>
<td>16</td>
<td>n/a</td>
<td>n/a</td>
<td>x</td>
<td></td>
<td>X</td>
<td>16/14</td>
<td>80.4/71.2</td>
<td>0</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>Gallant, M., et al.</td>
<td>2017</td>
<td>IV</td>
<td>quasi-XP</td>
<td>10</td>
<td>12</td>
<td>n/a</td>
<td>n/a</td>
<td>x</td>
<td></td>
<td></td>
<td>131</td>
<td>68-84</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
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<tr>
<td>Hu, Y. N., et al.</td>
<td>2016</td>
<td>1</td>
<td>SR &amp; MTA</td>
<td>10</td>
<td>12-26</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
<td></td>
<td></td>
<td>2850</td>
<td>56 to 98</td>
<td>n/a</td>
<td>n/a</td>
<td></td>
<td></td>
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<tr>
<td>Lomas-Vega, R., et al.</td>
<td>2017</td>
<td>I</td>
<td>SR &amp; MTA</td>
<td>4 rcts</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
<td></td>
<td></td>
<td>1432</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
<td></td>
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<tr>
<td>Plummer, M., et al.</td>
<td>2017</td>
<td>I</td>
<td>SR</td>
<td>107 SRs</td>
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<td>n/a</td>
<td>n/a</td>
<td></td>
<td></td>
<td>1383</td>
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<td>n/a</td>
<td>n/a</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Solloway, M., et al.</td>
<td>2016</td>
<td>I?</td>
<td>Eviden ce Map of SRs</td>
<td>153 RCTs</td>
<td>6-52</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
<td></td>
<td></td>
<td>26 RCTs</td>
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<td>n/a</td>
<td>n/a</td>
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<td></td>
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<tr>
<td>Wayne, P., et al.</td>
<td>2014</td>
<td>I</td>
<td>SR</td>
<td>26 RCTs</td>
<td>n/a</td>
<td>x</td>
<td>x</td>
<td>n/a</td>
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<td></td>
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<tr>
<td>Wu, Y., et al.</td>
<td>2016</td>
<td>I</td>
<td>SR?</td>
<td>507</td>
<td>n/a</td>
<td>x</td>
<td>x</td>
<td>n/a</td>
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<td>n/a</td>
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<tr>
<td>Yang, G., et al.</td>
<td>2015</td>
<td>I</td>
<td>RCT</td>
<td>n/a</td>
<td>19.7</td>
<td>x</td>
<td>x</td>
<td>n/a</td>
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<td></td>
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<td>n/a</td>
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<td></td>
<td></td>
<td></td>
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<tr>
<td>Yildirim, P., et al.</td>
<td>2016</td>
<td>II</td>
<td>RCT</td>
<td>n/a</td>
<td>~12</td>
<td>x</td>
<td>x</td>
<td>n/a</td>
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<td>n/a</td>
<td>n/a</td>
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</tbody>
</table>

Key: 0 – No change; **ASBCS** – Activity-Specific Balance Confidence Scale; **BBS** – Balance Berg Scale; **BDS** – Beck Depression Scale; **FFWT** – Fifty-Foot Walk Test; **GARS** - Groningen Activity Restriction Scale; **GDS** - Geriatric Depression Scale; **LOE** - Level of evidence; **PPS** - Physical Performance Scores; “/” - indicates that study did not mention; **SLS-EC** – Single leg stance eyes closed; **SLS-EO** – Single Leg-Stance-Eyes Open; **POMA** - Performance Orientated Mobility Assessment Scores; **SAFFE** - Survey of Activities and Fear of Falling in the elderly; **TC** – Tai Chi; **TCMBB** - TC Moving for Better Balance **TUG** – Timed up & go; **X** - Indicates yes;
<table>
<thead>
<tr>
<th>Five-time Sit to Stand</th>
<th>x</th>
</tr>
</thead>
<tbody>
<tr>
<td>Functional Reach</td>
<td>X x</td>
</tr>
<tr>
<td>GARS</td>
<td>X</td>
</tr>
<tr>
<td>GDS</td>
<td>x</td>
</tr>
<tr>
<td>Knee Extension Strength</td>
<td>x</td>
</tr>
<tr>
<td>PPS</td>
<td>X</td>
</tr>
<tr>
<td>SAFFE</td>
<td>x</td>
</tr>
<tr>
<td>SLS-EC</td>
<td>x</td>
</tr>
<tr>
<td>SLS-EO</td>
<td>x</td>
</tr>
<tr>
<td>Time to first fall</td>
<td>X x</td>
</tr>
<tr>
<td>TUG</td>
<td>x x</td>
</tr>
</tbody>
</table>

**Outcomes**

| Balance | - | x | inc |
| Confidence | Inc. | Inc. | Inc. | x | Inc. |
| Fall Rate | 0 | - | - |
| Mobility | Inc | - |
| Strength | Inc. | Inc. | x |
| Other… | X | X |
| Sig. Adverse Events - reported | 0 | 0 | X | 0 | 0 |

Key: 0 – No change; **ASBCS** – Activity-Specific Balance Confidence Scale; **BBS** – Balance Berg Scale; **BDS** – Beck Depression Scale; **FFWT** – Fifty-Foot Walk Test; **GARS** - Groningen Activity Restriction Scale; **GDS** - Geriatric Depression Scale; **LOE** - Level of evidence; **PPS** - Physical Performance Scores; “/” - indicates that study did not mention; **SLS-EC** – Single leg stance eyes closed; **SLS-EO** - Single Leg-Stance-Eyes Open; **POMA** - Performance Orientated Mobility Assessment Scores; **SAFFE** - Survey of Activities and Fear of Falling in the elderly; **TC** – Tai Chi; **TCMBB** - TC Moving for Better Balance **TUG** – Timed up & go; **X** - Indicates yes;
Appendix K

Fig. 1. Walter Stewart’s PDSA Cycle - Contains 4 stages: Plan, Do, Study, Act (Crawford, 2018).
Fig. 2. MoCA-B Page (1 of 2).
Appendix M

2018 PAR-Q+
The Physical Activity Readiness Questionnaire for Everyone

The health benefits of regular physical activity are clear; more people should engage in physical activity every day of the week. Participating in physical activity is very safe for MOST people. This questionnaire will tell you whether it is necessary for you to seek further advice from your doctor or a qualified exercise professional before becoming more physically active.

<table>
<thead>
<tr>
<th>GENERAL HEALTH QUESTIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1) Has your doctor ever said that you have a heart condition? OR high blood pressure? □ □</td>
</tr>
<tr>
<td>2) Do you feel pain in your chest at rest, during your daily activities or living? OR when you do physical activity? □ □</td>
</tr>
<tr>
<td>3) Do you lose balance because of dizziness OR have you lost consciousness in the last 12 months? (Please answer NO if your dizziness is associated with poor breathing, including during vigorous exercise.) □ □</td>
</tr>
<tr>
<td>4) Have you ever been diagnosed with another chronic medical condition (other than heart disease or high blood pressure)? Please list conditions here: □ □</td>
</tr>
<tr>
<td>5) Are you currently taking pre-surgery medications or a chronic medical condition? Please list conditions here: □ □</td>
</tr>
<tr>
<td>6) Do you currently have (or have had within the past 12 months) a bone, joint, or soft tissue (muscle, ligament, or tendon) problem that could be made worse by becoming more physically active? (Please answer NO if you had a problem in the past, but it does not limit your current ability to be physically active.) □ □</td>
</tr>
<tr>
<td>7) Has your doctor ever said that you should only do medically supervised physical activity? □ □</td>
</tr>
</tbody>
</table>

If you answered NO to all of the questions above, you are cleared for physical activity. Go to page 4 to sign the PARTICIPANT DECLARATION. You do not need to complete Pages 2 and 3.

- Start becoming much more physically active – start slowly and build up gradually.
- Follow International Physical Activity guidelines for your age (www.who.int/dietphysicalactivity/en/).
- You may take part in a health and fitness appraisal.
- If you are over the age of 45 and NOT accustomed to regular vigorous or maximal effort exercise, consult a qualified exercise professional before engaging in this intensity of exercise.
- If you have any further questions, contact a qualified exercise professional.

If you answered YES to one or more of the questions above, COMPLETE PAGES 2 AND 3.

Delay becoming more active if:
- You have a temporary illness such as a cold or fever, it is best to wait until you feel better.
- You are pregnant – talk to your health care practitioner, your physician, a qualified exercise professional, and/or complete the DNP Project Final Report at www.dnpmedx.com before becoming more physically active.
- Your health changes – answer the questions of Pages 2 and 3 of this document and/or talk to your doctor or a qualified exercise professional before continuing with any physical activity program.

Figure 3. 2018 PAR-Q+ (Page 1).
### Appendix N

#### Fear of Falling - Measurement Tool

<table>
<thead>
<tr>
<th></th>
<th>Activities</th>
<th>Not at all concerned</th>
<th>Somewhat concerned</th>
<th>Fairly concerned</th>
<th>Very concerned</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Cleaning the house (e.g. sweep, vacuum, dust)</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>2</td>
<td>Getting dressed or undressed</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>3</td>
<td>Preparing simple meals</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>4</td>
<td>Taking a bath or shower</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>5</td>
<td>Going to the shop</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>6</td>
<td>Getting in or out of a chair</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>7</td>
<td>Going up or down stairs</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>8</td>
<td>Walking around in the neighborhood</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>9</td>
<td>Reaching for something above your head or on the ground</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>10</td>
<td>Going to answer the telephone before it stops ringing</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>11</td>
<td>Walking on a slippery surface (e.g. wet or icy)</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>12</td>
<td>Visiting a friend or relative</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>13</td>
<td>Walking in a place with crowds</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>14</td>
<td>Walking on an uneven surface (e.g. rocky ground, poorly maintained pavement)</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>15</td>
<td>Walking up or down a slope</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>16</td>
<td>Going out to a social event (e.g. religious service, family gathering, or club meeting)</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
</tbody>
</table>

**TOTAL Score**  /64

*Figure 4. Fear of Falling measurement tool: Falls Efficacy Scale-International*
Appendix O

**Participant Fear of Falling Scores**

![Bar chart showing Fear of Falling Total Scores for three intervals: Pre-Tai Chi, Mid-Tai Chi, and Post-Tai Chi. The chart compares scores across three participants: 1, 2, and 3.](image)

*Figure 5. Participant Fear of Falling Total Scores.*