

The Effectiveness of Tai Chi in reducing the fear of falling in the elderly

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CLINICAL SCENARIO

The fear of falling (FOF) is the most commonly reported anxiety among older individuals, surpassing robbery or financial worries (Tishler & Hobson, 2005) and has a huge impact on the life of an elderly individual. "Approximately 20% of older adults who have fallen in the past, then restrict the activities in which they participate" (Gentleman & Malozemoff, 2001, as cited in Tishler & Hobson, 2005, p.38).

This escalating cycle of FOF is an increasing problem and of serious concern among older adults, as observed during fieldwork placement, where an elderly gentleman compromised his quality of life by limiting his valued, physical activities (particularly outdoors), functional ability, which then diminished his sense of well-being, his social interaction (Tishler & Hobson, 2005) resulting in a decreased quality of life.

FOCUSSED CLINICAL QUESTION

In the elderly is Tai Chi effective in reducing the fear of falling?

SUMMARY OF SEARCH 'BEST EVIDENCE' APPRAISED, AND KEY FINDINGS

There was a limited amount of relevant research on our chosen topic. Our search did not find any qualitative articles. The two articles selected, Harling, & Simpson (2008) and Sattin, Easley, Wolf, Chen, & Kutner (2005) were chosen as they both covered our clinical question. Both articles concluded that Tai Chi was effective at reducing the fear of falling in the elderly.

CLINICAL BOTTOM LINE

Based on the research conducted for this critical appraisal, there is strong evidence that Tai Chi is effective at reducing the fear of falling in the elderly.

LIMITATIONS OF THIS CAT

This critical appraisal has been peer reviewed by one lecturer as part of an assignment for Otago Polytechnic, School of Occupational Therapy. The breadth of the review has also been limited by the assignment requirements (ie. 2 articles only were reviewed).

SEARCH STRATEGY

The following databases were used, CINAHL, Cochrane, OT Seeker, PubMed and Google Scholar. To identify relevant articles we used the search terms “tai chi” AND “fear of falling” AND “elderly” AND “occupational therapy”. Hand searching through the reference list of relevant articles identified as pertinent to the clinical question was included.

INCLUSION AND EXCLUSION CRITERIA

Inclusion criteria

- Published in English language
- Participants over 60
- Male and female
- Available in full text
- Tai chi as the main intervention
- Qualitative
- Quantitative
- Systematic reviews
- Published peer reviewed journal articles

Exclusion criteria

- Population with a specific disease or condition
- Articles not able to be retrieved in full text
- Opinion pieces
- Non peer reviewed articles

RESULTS OF SEARCH

Study Design/methodology of Articles Retrieved	Level	Author (Year)
Systematic review	1	Harling & Simpson (2008)
Quantitative	3	Wang, Chang & Wolf (2006)
Quantitative (Randomized control trial)	2	Sattin, Easley, Wolf, Chen & Kutner (2005)
Quantitative	2	Zhang, Ishikawa-Takata, Yamazaki, Morita & Ohta (2006)
Quantitative (meta-analysis)	1	Logge, Verhagen, Rademaker, Bierma-Zeinstra, Von Rossum, Faber & Koes
Quantitative pre-post	2	Taggart (2002)

BEST EVIDENCE

The two articles identified as 'best evidence' and selected for this critical appraisal are

- Harling, & Simpson, (2008). This article was selected because it is a systematic review that critiques a range of research articles that are relevant to the topic. A systematic review has the highest level of research.
- Sattin, Easley, Wolf, Chen, & Kutner (2005). This article was selected because out of the quantitative articles it was the one which focused solely on the fear of falling whereas the other articles focused on falls and fear of falling.

These two articles represent different types of evidence (Randomised control trial and systematic review), considered to be "gold standard for evidence on the effectiveness of interventions" (Taylor, 2007, p.43), and both answer the clinical questions and the inclusion/exclusion criteria.

SUMMARY OF BEST EVIDENCE

Title of article:

“A systematic review to determine the effectiveness of Tai Chi in reducing falls and fear of falling in older adults”.

Aim/Objective of the Systematic Review:

“The aim of the study was to examine the current literature surrounding the effectiveness of Tai Chi in reducing the incidence of and fear of falling in older people” (p.237).

Study Design:

Systematic review

Search strategy:

A computerised literature search of Medline, AMED, CINAHL, the Cochrane Central Register of Controlled Trials, PubMed, PEDro and Scirus was performed.

Key search terms used were: Tai Chi; Tai Chi Chuan; Falls: Falls prevention; Elderly; Older Person; Older People; Randomised Control Trial; Clinical Control Trial.

Titles and abstracts identified published articles and were screened for topic relevance to identify potentially relevant trials. The reference lists of all potential articles and relevant reviews were hand checked (citation tracking) to identify any additional topic related titles for review. The full text of studies was then screened, and included or excluded on the basis of inclusion criteria.

Only randomised controlled trials (RCTs), with a study population aged over 60 years, investigating Tai Chi as an intervention to reduce incidence of falls and/or fear of falling were included.

Setting:

Five trials were with participants living in the community with the remaining two trials in long term care and independent care facilities.

Participants:

From the 7 trials selected there were 1146 participants in total, ages 60 years and older, of either sex living in the community or in institutionalised care. Mean age of the population was 78.0 years, with the overall percentage of females was higher. All individuals had a history of one or more falls in the past year, or if they had one or more physical performance impairments indicating a risk factor for falls, or if falls constituted the reason for their admission to hospital.

Some participants were volunteered from local advertisements and fliers within pre-selected facilities. Others were from; general practice clinics, geriatrics hospital and patients enrolled in a local health system.

Method:

Quality of the included trials was independently rated by the authors using the Delphi List. Agreement was achieved on all items of the Delphi List, which is a comprehensive criteria list of nine items regarded as being reliable and valid for the assessment of the methodological quality of clinical trials. It is recommended by many authors because it assesses different aspects of a trial; not only the internal validity, but also external validity and the quantitative aspects of the trial. For each study, data regarding the patient population, intervention and outcome measures used were summarised.

Results

The results from this article show that there is sufficient evidence that Tai Chi is an effective method for reducing fear of falls.

Original Author's Conclusions

The authors concluded the “despite the relatively small number of RCT's identified and the heterogeneity between studies, the overall methodological quality of the studies was high. This made it possible to draw the conclusions that Tai Chi is an effective method for reducing FOF and the incidence of falls in older adults” (p.246).

Critical Appraisal

Validity/trustworthiness of the results

The research has a clearly focused aim and research question. The populations being studied are clearly outlined as is the inclusion and exclusion criteria (Taylor, 2007). A flowchart summarises excluded studies and reasons for exclusion. The researchers used a

broad computerised literature search of 7 different data bases; key words were used in the search and were appropriate for the study. The use of RCTs ensured the study design was based on the highest-quality evidence, ensuring rigour. The use of the Delphi List, regarded as being reliable and valid for the assessment of the methodological quality of clinical trials ensured validity, reliability and also the clinical application of the results.

The results were summarised in a table, which clearly indicated the results of included studies. Descriptive and inferential analysis was applied to the separate studies then compared with the results of the other studies. This allows data comparison between participant groups/studies determining whether there are differences between the interventions, control groups and the outcomes (Taylor, 2007). The use of the confidence interval (CI) and the p values both in-text and in tables allowed studies to be statistically analysed. The results showed significant reduction in the FOF ($p \leq 0.001$). The authors also discussed the biases/limitations and considerable differences (heterogeneity) found between studies concerning the definitions of falls, treatment duration or outcome measures which did not allow for statistical pooling. The conclusion suggests that although only a small number of RCTs were identified and the heterogeneity between studies, the overall methodological quality of the studies was high, making it possible to conclude that Tai Chi is an effective method for reducing FOF and the incidence of falls in older adults.

Summary

This review represents a valid, trustworthy method of analysing the beneficial use of Tai Chi as an intervention to reduce the FOF. Due to the heterogeneity of data it is difficult to find the optimum duration, intensity and type of Tai Chi which would most benefit clients. The review has relevance to occupational therapy through the use of therapeutic activities which can enable individuals to reduce the cycle of FOF in order to participate in meaningful daily and leisure occupations.

Title of article:

Reduction in Fear of Falling Through Intense Tai Chi exercise Training in Older Transitionally Frail Adults.

Aim/Objective of the study:

To determine whether an intense Tai Chi exercise program could reduce fear of falling better than a wellness education (WE) program in older adults who had fallen previously and meet criteria for transitioning to frailty.

Study Design:

Randomized Controlled Trial – Cluster.

Setting:

Ten matched pairs of congregate living facilities in the greater Atlanta metropolitan area, USA.

Participants:

Participants were recruited first by being identified from the staff at the facilities that they met the inclusion criteria. They then attended a recruitment presentation and everyone who signed an interest sheet was called. Additional potential participants were contacted via cold calls from a supplementary list.

Inclusion criteria was; aged 70 and older, ambulatory (with or without assistive device), no severe or unstable medical conditions, absence of severe psychological conditions, no significant cognitive impairment (Mini Mental State Examination score > 24), history of one or more falls in the previous year, and transition to frailty.

Initially 311 persons of both sexes were enrolled in the trial with 217 persons completing the entire 48 week trial. 158 in the tai chi group 153 in the WE group, the mean age of the tai chi group was 80.4 and the mean age of the wellness education was 80.5.

Method:

Participants were randomised into either the Tai Chi (experimental group) or Wellness Education Programme (WE) (control group) within the 20 congregate living facilities. Participants were clustered or nested within living facilities, with living facility pairs as a random effect and the participants as the experimental unit.

Trained evaluators collected demographic, medical, functional, and behavioural data at baseline and every four months for each study participant. Evaluators were blinded to intervention allocations, instructors were blinded to outcome measures, and participants were instructed not to disclose the intervention they received. Interrater reliability of the evaluation team was maintained at a kappa of 0.98 or greater. Demographic variables and selected measures were included based on their proven reliability and validity or their known association with FOF.

All Tai Chi exercises were standardized by having the two instructors practice with one another so that what was taught in each class was identical. Intense Tai Chi was defined as two sessions per week at increasing durations starting at 60 minutes contact time progressing to 90 minutes over the course of 48 weeks. The WE programme was given for an hour a week and consisted of educational instruction about falls prevention; exercise and balance; diet and nutrition; pharmacological management; legal issues relevant to health; changes in body function; and mental health issues, such as stress, depression, and life changes. Interactive hand-out materials were provided, but there was no formal instruction in exercise.

Outcome measures used, were standardised commonly used assessments including a modified Falls Efficacy Scale (FES) from the Frailty and Injuries: Cooperative Studies of Intervention Techniques (FICSIT) trial and the Activities-Specific Balance Confidence Scale (ABC) used to measure the FOF. Measurements occurred at baseline and at 4-month intervals for 12 months. A clear overview of data analysis was given.

Statistical analysis included a one sample *t* test to compare baseline characteristics of completers and non completers. Repeated measure analysis used mixed linear models for the ABC and FES. A Bonferroni adjustment ($P \leq 0.01$) was used for comparison of interventions.

Results

The Tai Chi group showed significant reduction in the FOF from baseline to 12 months compared with the WE group.

ABC scores were similar in both cohort groups at the time of randomisation (baseline) but became significantly higher (or better) in the tai chi cohort at 8 months (57.9 vs 49.0, $p \leq 0.001$) and at 12 months (59.2 vs 47.9, $p \leq 0.001$) indicating that the intervention was significant and not due to chance. After all variables (listed in Table 2) were included and adjusted in a multivariable model, the mean ABC after 12 months was significantly greater in

the tai chi group than the WE group (Table 3). The mean difference after 12 months was 9.5 points higher in the tai chi group (95% CI = 4.8-14.2) with the mean percentage increase from baseline – 12 months = 13.4%, 95% CI= 6.4-20.4, while the WE group decreased below baseline after 12 months. The confidence level (CI) indicated a true and better result.

Original Author's Conclusions

“The results from this study show that a 48 week tai chi intervention for transitionally frail older persons led to a significant reduction in fear of falling...and was greatest an 12 months” (p.1172), as compared to the WE participants. “Tai Chi should be considered in any program designed to reduce falling and fear of falling in transitionally frail older adults” (p117).

Critical Appraisal

Validity/trustworthiness of the results

The study was a single-blinded, cluster-randomised controlled intervention trial. The aim of a RCT is to test the effectiveness of an intervention. This RCT addresses a clearly focused aim to determine that tai chi is better at reducing the FOF than a WE programme. Clear descriptions of the randomised population participants, the intervention and control groups being studied, is given. Clear inclusion and exclusion criteria is stated in text and summarised in a flow chart. There is clear overview of the interventions being compared. All participants within the trial were accounted for. These above “factors ensure that trials are rigorous” (Taylor, 2007, p.47). Ethical issues were considered - The Emery University human investigation committee and the Centres for Disease Control and Prevention institutional review board approved the study. Written informed consent was obtained from all participants before their enrolment.

The control group were not denied an intervention, as this would have been unethical. The groups were treated equally; the total time for individual attention from the instructor to participants in each group was comparable although it was not clear who took the WE programme. Participants were not blinded although instructed not to disclose the received intervention. Instructors were blinded to the outcome, and evaluators were blinded to intervention allocation, thus reducing bias and ensuring rigour. Measures were used to increase interrater reliability increasing trustworthiness

Internal Validity was ensured by groups being similar on all key variables at baseline, which provides the reader with confidence that any significant differences between final results are not due to group inconsistency. There is clear evidence of outcomes being measured, over

time and analysed, using valid and reliable tools. Several tables and graphs were used to clearly summarise the comparisons, providing statistical information supporting changes between the two cohort groups and increasing the validity that they measure what they are supposed to; the FOF.

The difference in reported reduction in the FOF from baseline to outcome was highly significant ($p=0.001$) indicating that the differences are not from chance, but from the intervention of Tai Chi. The results illustrated a clinically significant reduction of FOF in the Tai Chi group compared to the WE group.

Summary/Conclusion

The critical appraisal has found this study has provided clear details and similarities of the studied population with clear methodology and used standardised reliable assessment tools to measure both the control and intervention groups' outcomes. Data determining differences in outcome are clearly displayed on graphs, flowcharts, and tables providing inferential statistical results such as the p value supporting the improvement of the intervention group compared to the control group.

IMPLICATIONS FOR PRACTICE, EDUCATION AND FUTURE RESEARCH

Based on the critique of the two articles we can conclude that Tai Chi is a significant and beneficial intervention for reducing the fear of falling in the elderly. The overall methodological quality of both articles was considered high. Although the review was inconclusive regarding the optimal duration, intensity and type of Tai Chi, the RCT provided evidence that at 12 months the benefits increased in reducing the FOF. Both articles establish that Tai Chi can be used for adults living independently in the community or institutions, thus for practitioners working with older persons in a variety of settings Tai Chi is an effective intervention. Occupational therapists focusing on maintaining or improving an elder persons level of independence through meaningful occupation, despite the risk or fear of falling (Woodland & Hobson, 2003), can use Tai Chi as an intervention as part of a prevention programme.

Both articles refer to the limitation of a small sample size which could affect the outcome results. Recommendations for future research include; increasing the sample size, establishing a clear definition of a fall in order to compare interventions and outcomes effectively, collecting long term data beyond the study period to determine whether benefits gained, will persist in reducing fall incidence and FOF in older adults.

Both studies said that Tai Chi does not reduce falls, but does reduce FOF which is of interest to OTs' because the FOF reduces activities, decreases physical and psychological wellbeing, increasing the likelihood of falling, and so the cycle begins. Our aim is to keep people active and being confident to do their activities of daily living.

Currently, for practitioners' there is a strong push through government and health agencies such as Accident Compensation Corporation (ACC) to provide education and research, targeting Tai Chi through participation in fall prevention programmes for older people. ACC statements supporting Tai Chi are "In an environment of escalating health costs and emphasis on evidence-based practice, current review findings should provide incentives for further research regarding the use of Tai Chi as a fall prevention-based exercise for older people" (ACC, 2008) Tai Chi classes are becoming widely available throughout New Zealand.

In conclusion, these two studies provide relevant, valid and trustworthy evidence that Tai Chi can reduce the FOF in the elderly. As practitioner's we would recommend Tai Chi to increase balance, strength, meaningful activities and wellbeing in an individual with a FOF. These results can be transferrable from trial to occupational therapy for use as a tool in programmes to reduce the FOF in elderly.