Effect of Tai Chi on balance: A Population-based Meta-analysis

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Learning Objectives

• The learner will be able to understand the specific purpose and the method of performing meta analysis.

• The learner will be able to understand the effect of Tai Chi on balance by comparing health elderly and those with functional limitation.
Background

• Balance as one of the main risk factors associated with falls and fall-related injuries
• Regular exercise is recommended to improve balance, consequently to prevent falls.
• Tai Chi, an ancient Chinese martial art, is reported to improve balance in older adults in previous studies.
Gap in the literature

- Effect of Tai Chi on balance
  - What type of Tai Chi (intensity) is required to improve balance?
  - How long, how often do we have to do Tai Chi to have effects?
  - Is Tai Chi effective compared to the control (or other exercise) group?
  - Is Tai Chi effective on balance for any population?
  - Is Tai Chi effective based on type of balance measure?
Purpose of the study

To determine ES of Tai chi on static balance among population with low versus high fall risks.

To determine ES of Tai Chi on static balance at short term and long term follow-up

To determine ES of Tai Chi on balance according to outcome measures (static, dynamic, mixed, and direct) among population with low versus high fall risks

To determine ES of Tai Chi on balance by outcome measures (static, dynamic, mixed, and direct) at each follow-up
Search Strategy

- Database
  - PubMed/Medline, Cinahl, ProQuest Central, Science direct, Scopus, and Cochrane library for English articles
  - KISS, NDSL, national Central Library, DBPIA, KoreaMed for Korean articles
Study selection

• Medical Subject Heading (MeSH)
• Tai Ji and postural balance
• T’ai chi, Taiji, T’ai Chi
• Valance, stability, equilibrium
• Randomized controlled trial (RCT) or randomized clinical trials
Inclusion Criteria

• published in peer-reviewed English/Korean language journals without specified publication date

• designed to test the effects of Tai Chi with or without qigong for at least 8 weeks or more

• RCT design
Data Analysis

• Comprehensive Meta Analysis software, version 2.0 (Biostat, Englewood, NJ)

• Controlled group used for assessment of the overall effects was selected in the following order of preference

• The Z value (p<0.05) was used to identify the statistical significance of the ES

• Q statistics (p>0.10) and I² statistics were calculated under the assumption of a fixed-effect model
## Risk of bias assessment

<table>
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<tr>
<th>First author (year)</th>
<th>Random assignment</th>
<th>Blindness</th>
<th>Allocation concealment</th>
<th>ITT</th>
<th>Groups similar at baseline</th>
<th>Adverse effects</th>
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PICO

• Population
  – 34 RCT studies
  – healthy elderly with a low risk of falling (n=20)
  – those with chronic disease and a corresponding high risk of falling (n=14)

• Intervention
  – Tai Chi provided for 30-90 minutes per session (n=27)
  – Mostly short term (3-16 weeks, n=22) or long term (20-24 weeks, n=12)
PICO - continued

• Control
  – No exercise or other type of exercise

• Outcome
  – Static balance (one leg standing, functional research test)
  – Dynamic balance (Timed up and go test)
  – Mixed measures of balance (combined static and dynamic)
  – Direct measure (computerized measure COP, sensory organized test)
Identification of the studies

Records identified through database searches
\( n = 357 \)

Records after duplicates removed
\( n = 212 \)

Records screened
\( n = 171 \)

Full-text articles assessed for eligibility
\( n = 61 \)

Studies included in quantitative synthesis (meta-analysis)
\( n = 34 \)

Records excluded
\( n = 41 \)
- after screening by title and abstract

Records excluded
\( n = 110 \)
- No randomized study
- Balance not included

Full-text articles excluded
\( n = 27 \)
- No measurement for balance \( n = 9 \)
- No data available \( n = 2 \)
- Duplicate samples \( n = 5 \)
- \( \text{Ta'ei chi} \) combined with another intervention \( n = 4 \)
- Insufficient quality \( n = 3 \)
- \( \text{Ta'ei chi} \) performed for shorter than 8 weeks \( n = 3 \)
- No randomized group \( n = 3 \)

Song, 2015
Results

• What is the effect size of Tai chi on static balance among population with low versus high fall risks

• What is the effect size of Tai Chi on static balance at short term and long term follow-up
Effects on static balance

Low fall risk for 3 months

ES = 0.73

Low fall risk for 6 months

ES = 0.33
Effects on static balance

High fall risk for 3 months

High fall risk for 6 months

ES = 0.47

ES = 0.46
Effects on dynamic balance

Low fall risk for 3 months

ES = 0.52

Low fall risk for 6 months

ES = 0.66
Effects on dynamic balance

High fall risk for 3 months

High fall risk for 6 months

ES = 0.62

ES = 0.10
Effects on mixed balance

Low fall risk for 3 months

Low fall risk for 6 months

ES = 0.45

ES = 0.83
Effects on mixed balance

High fall risk for 3 months

ES = 0.44

High fall risk for 6 months

ES = 0.09
Effects on direct balance

Low fall risk for 3 months

ES = 0.47

Low fall risk for 6 months

ES = 0.64

Song, 2015
Effects on direct balance

High fall risk for 3 months

ES = 0.33

High fall risk for 6 months

ES = 0.83

Song, 2015
Conclusion

• Tai Chi can be safely and effectively applied for improving balance among those with both low and high risks of falling, even on a short-term basis, and this improvement mostly persists for the longer term.

• For low-risk group, the ES of Tai Chi was consistent, but it varied according to the type of balance measures for high-risk group.
Consideration

• The level of physical functioning or condition of the participants should be considered when choosing the most sensitive and reliable balance measures to examine the effect of Tai Chi.