



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

Rhayun Song, Sukhee Ahn, Heeyoung So, RN, PhD
College of Nursing, Chungnam National University
Eun-hyun Lee, RN, PhD Aju University, Suwon, Korea
Moonkyung Park, RN, PhD, Woosong College, Daejeon,
Korea



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



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
- Manual search by Google scholars and reference lists.



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 I^2 statistics were calculated under the assumption of a fixed-effect model



Risk of bias assessment

<i>First author (year)</i>	<i>Random assignment</i>	<i>Blindness</i>	<i>Allocation concealment</i>	<i>ITT</i>	<i>Groups similar at baseline</i>	<i>Adverse effects</i>
Audette (2006)	Yes (except nonexercise)	Tester blind	NR	No	Yes	No
Chau-Yeung (2009)	Yes	NR	NR	Yes	Yes	No
Chen (2012)	Yes	Tester blind	NR	Yes	Yes	No
Chyu (2010)	Yes	Tester blind	Yes	No	Yes	No
Dechamps (2010)	Yes	Tester blind	NR	Yes	Yes (except ADL)	No
Faber (2006)	Yes	Tester blind	Yes	Yes	Yes	Yes ^a
Frye (2007)	Yes	NR	NR	No	Yes	No
Hackney (2008)	Yes	Tester blind	NR	No	Yes	No
Hall (2009)	Yes (not specified)	Tester blind	NR	No	Yes	No
Hartman (2000)	Yes	Tester blind	NR	No	Yes	No
Hass (2004)	Yes	Tester blind	NR	No	Yes	No
Hones (2012)	Yes	Tester blind	NR	Yes	Yes	No
Jim (2009)	Yes (not specified)	NR	NR	NR	Yes	Yes
Jelard (2010)	Yes (not specified)	NR	NR	NR	Yes	No
Ji (2005)	Yes	Tester blind	Yes	Yes	Yes	No
Ji (2008)	Yes (not specified)	NR	NR	No	Yes	No
Ji (2012)	Yes	Tester blind	NR	Yes	Yes	Yes ^a
Jiu (2010)	Yes (not specified)	NR	NR	NR	Yes	No
Jogghe (2008)	Yes	Tester blind	NR	Yes	Yes	No
McCibbon (2004)	Yes (not specified)	Tester blind	NR	No	Yes	No
Mong (2003)	Yes	Tester blind	NR	No	Yes	Yes ^a
Naylor (2012)	Yes	Tester blind	Yes	Yes	Yes	No
Naylor-Piliae (2010)	Yes	Tester blind	NR	Yes	Yes	No
Naylor-Piliae (2011)	Yes	Tester blind	Yes	No	Yes	Yes
Ousignant (2012)	Yes	Tester blind	Yes	Yes	Yes	Yes
Pasang (2007)	Yes	Tester blind	Yes	Yes	Yes	Yes ^a
Poukelatos (2007)	Yes	Tester blind	NR	No	Yes	No
Vallsten (2006)	Yes (not specified)	NR	NR	No	Yes	No
Vang (2009)	Yes	Tester blind	Yes	Yes	Yes	Yes
Volf (1997)	Yes (not specified)	NR	NR	No	Yes	No
Volf (2006)	Yes	Tester blind	NR	No	Yes	No
Voo (2007)	Yes	Tester blind	Yes	No	Yes	No
Wang (2007)	Yes	Tester blind	NR	Yes	Yes	No
Wang (2005)	Yes	NR	NR	No	Yes	No



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)

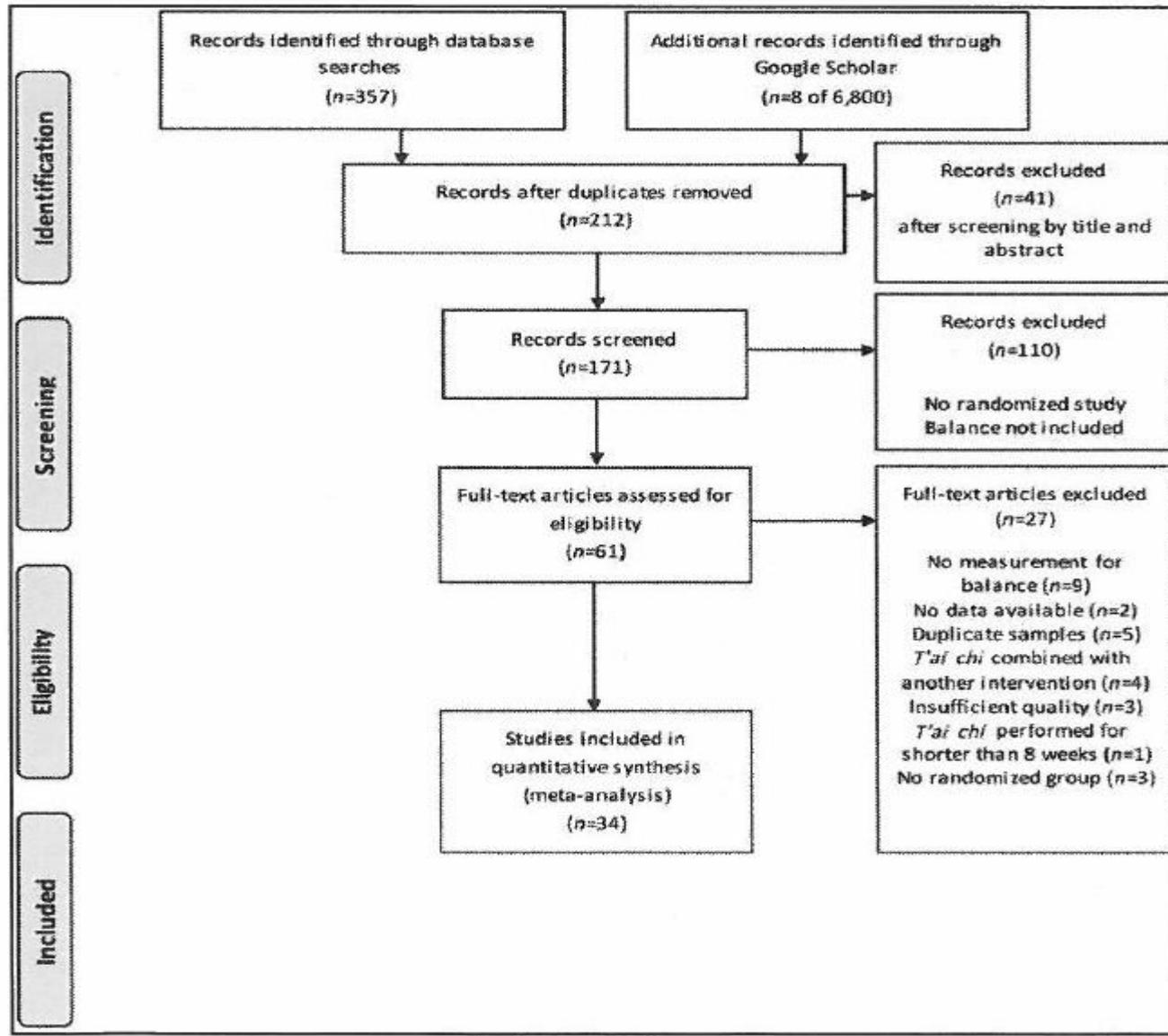


PICO - continued

- 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





Results

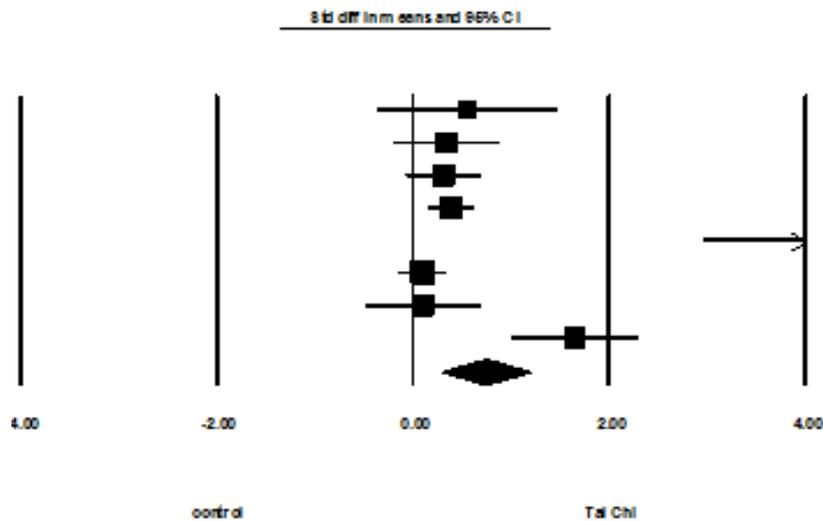
- What is the effect size of Tai chi on static balance among population with low versus high fall risks
- What is the effect size of Tai Chi on static balance at short term and long term follow-up



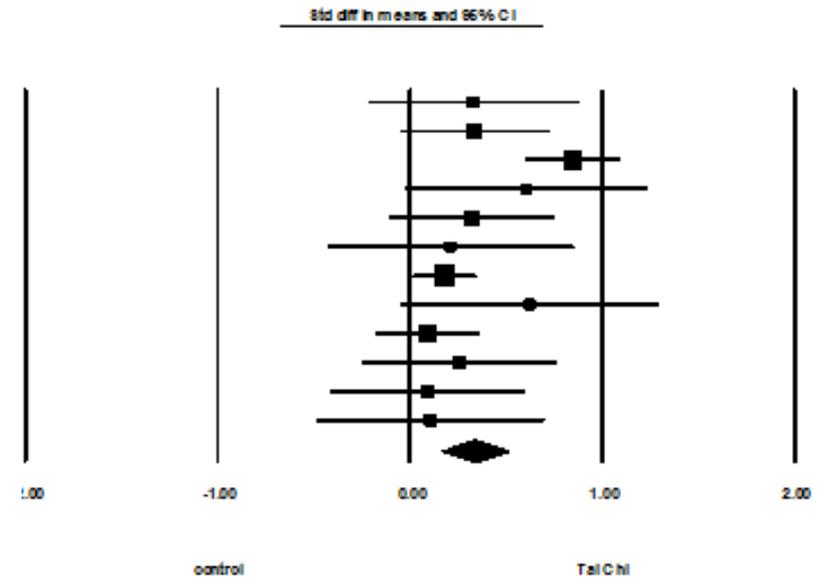
Effects on static balance

Low fall risk for 3 months

Low fall risk for 6 months



ES = 0.73



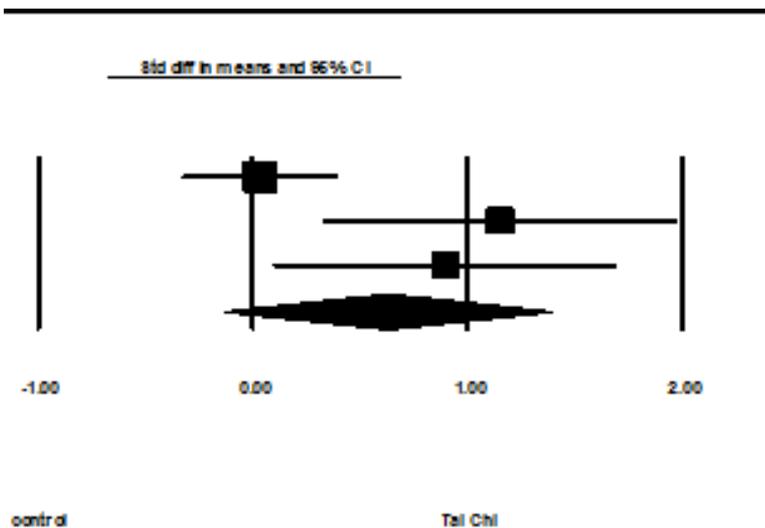
ES = 0.33



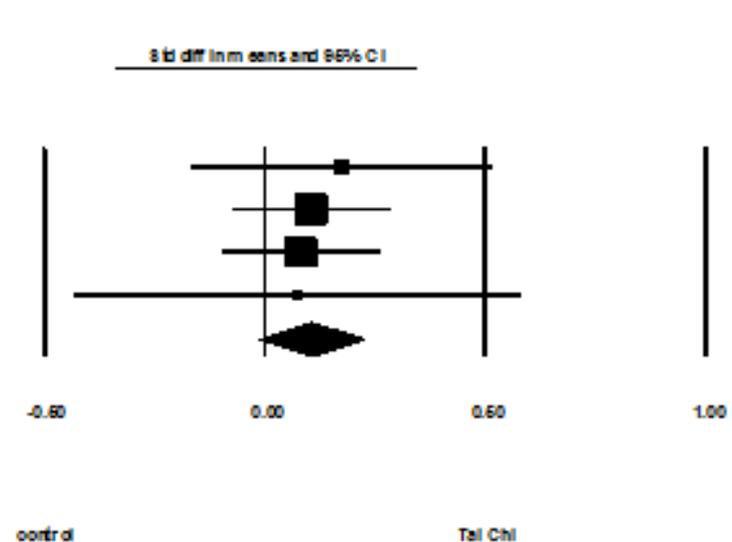
Effects on dynamic balance

High fall risk for 3 months

High fall risk for 6 months



ES = 0.62



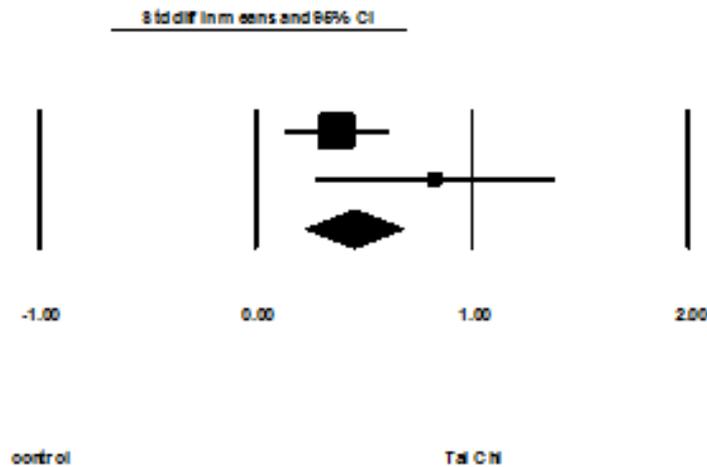
ES = 0.10



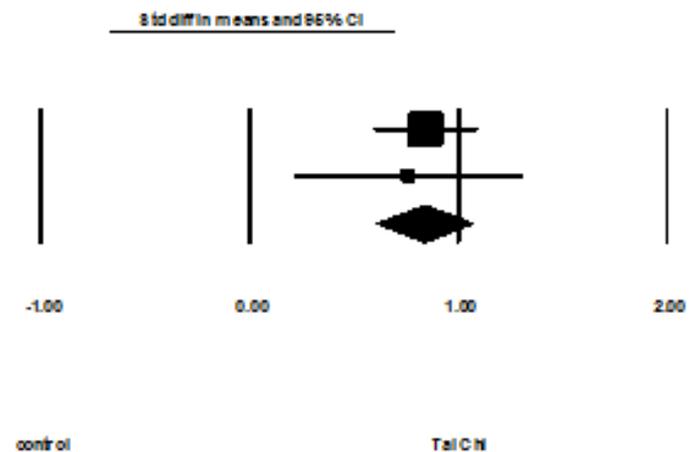
Effects on mixed balance

Low fall risk for 3 months

Low fall risk for 6 months



ES = 0.45



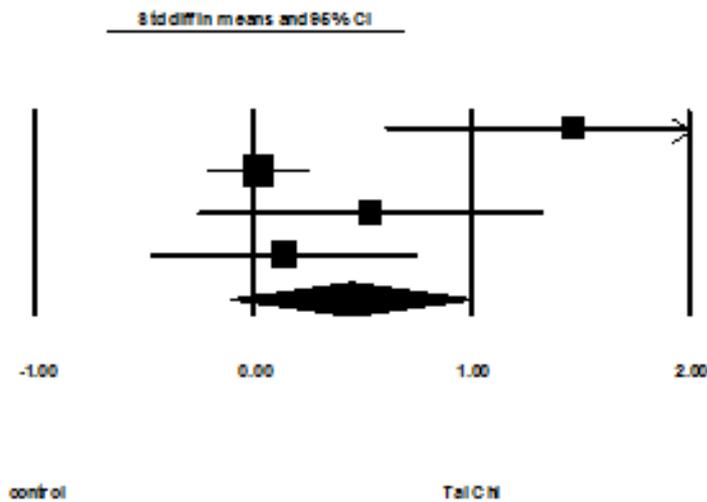
ES = 0.83



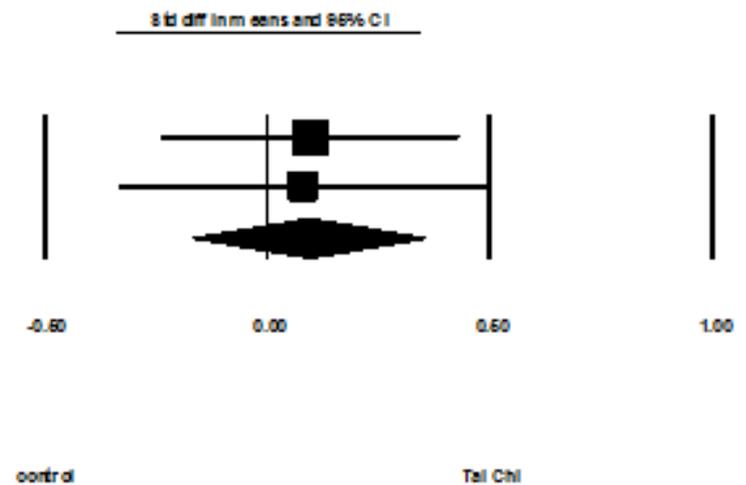
Effects on mixed balance

High fall risk for 3 months

High fall risk for 6 months



ES = 0.44



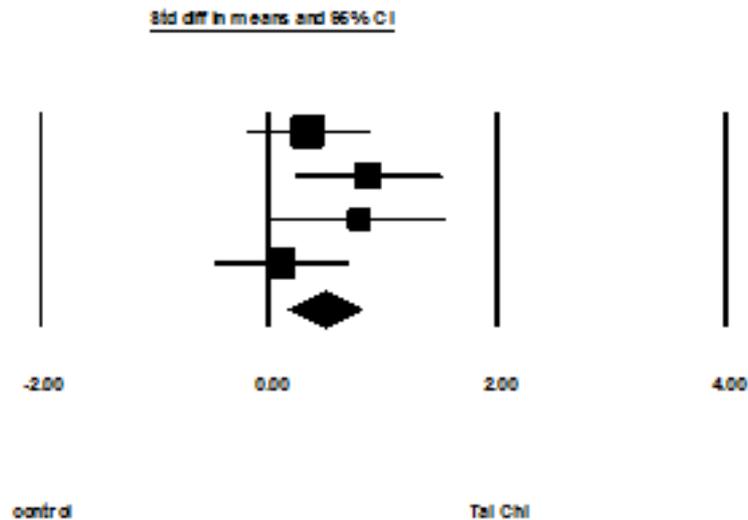
ES = 0.09



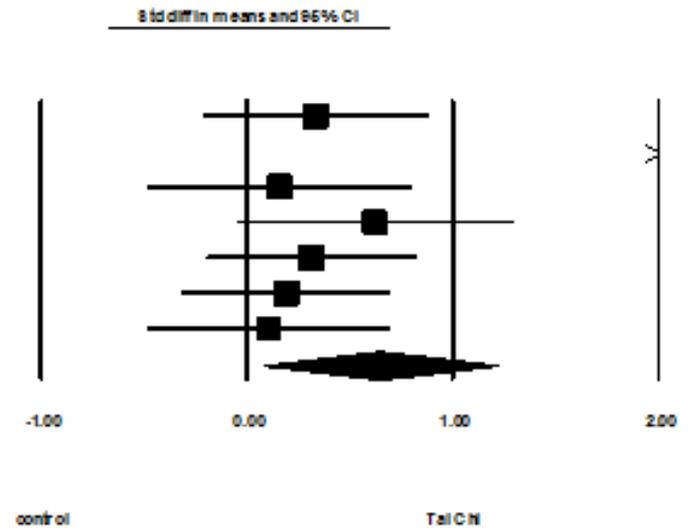
Effects on direct balance

Low fall risk for 3 months

Low fall risk for 6 months



ES = 0.47

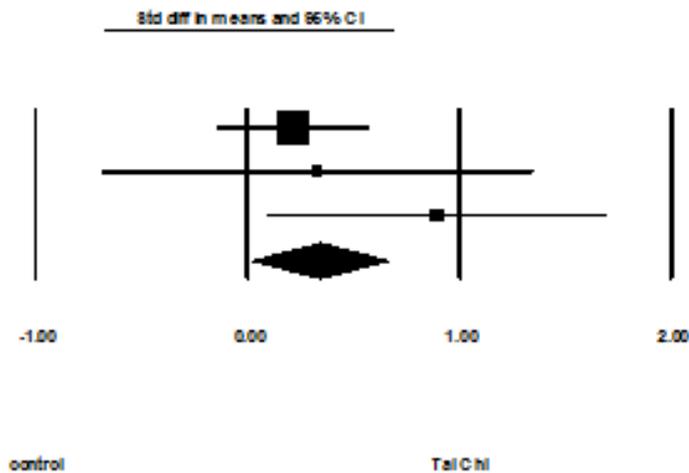


ES = 0.64



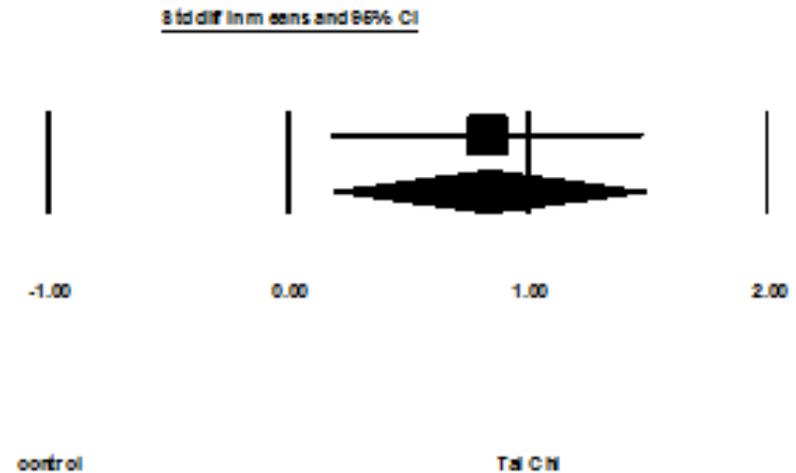
Effects on direct balance

High fall risk for 3 months



ES = 0.33

High fall risk for 6 months



ES = 0.83



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.