

# Falling for Tai Chi

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# Objectives

Following completion of this module, readers will:

1. Develop an understanding of tai chi
2. Describe appropriate populations for this intervention
3. Describe possible modifications to the intervention for various patient populations
4. Summarize evidence supporting tai chi as a falls prevention technique

# Falls are Common

- 30% of adults over 65 years old
- 50% of adults over 80 years old
- 27% of all hospital costs will result from falls from adults over 80 years old
- 77% of all elderly injury-related hospital admissions



1. American Geriatrics Society, British Geriatrics Society, American Academy of Orthopedic Surgeons Panel on Falls Prevention. Guideline for the prevention of falls in older persons. *Journal of American Geriatrics Society*. 2001; 49:664–72.
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# Falls are Costly

- In 2000 injuries costs \$19.2 billion in 65+
- Estimated \$43.8 billion by 2020



4. Guidelines for the prevention of falls in older persons. American Geriatrics Society, British Geriatrics Society, and American Academy of Orthopedic Surgeons Panel on Falls Prevention. *J Am Geriatr Soc.* 2001; 49:664–7.

5. Englander F, Hodson TJ, Terregrossa RA. Economic dimensions of slip and fall injuries. *J Forensic Sci.* 1996; 41:733–46.

# Leading Risk Factors

Risk Factor	RR
Muscle weakness	4.9
Balance problems	3.2
Gait problems	3.0
Poor vision	2.8
Limited mobility	2.5
Cognitive impairment	2.4
Functional limitations	2.0
Postural hypotension	1.9

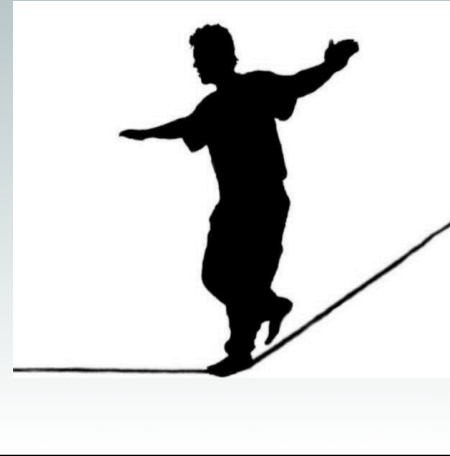


Rubenstein, *Age & Aging*, 2006

These are the leading risk factors for falling, with muscle weakness at the top. RR is the relative risk, which is a measure of the risk of a certain event happening in one group compared to the risk of the same event happening in another group. So, someone with muscle weakness is 4.9 times more likely than average to fall.

# What Can We Do?

- Falls education
- Increase physical activity
- Improve balance
- Group exercise
  - Tai chi



Research shows that falls education in conjunction with physical intervention can help reduce fall risk (Zettergren, 2011<sup>6</sup>). Older adults tend to decrease physical activity as they age (Li, 2001<sup>7</sup>). This can lead to decreased functional abilities and increase in comorbidities (Li, 2001<sup>7</sup>). Many people benefit from group activities both physically and psychologically (Lui, 2010<sup>9</sup>) One great option is tai chi

# History of Tai Chi

- Under umbrella of qigong
  - Preventative or therapeutic
- Created between 1279-1368
  - 1960 - became therapeutic



Therapeutic qigong typically focuses on recovery (Farrell, 2004<sup>9</sup>)

In 1960, tai chi really began to be used as a therapeutic agent. It had be used for many years informally as exercise but in the 1960s people began to use it more as a treatment option for poor balance and for its other health benefits (Farrell, 2004<sup>9</sup>).

# Tai Chi in Action

- Focuses on mind/body relationship
  - Breathing and relaxation
- Warm up and cool down
- May include between 36 to 128 movements
  - Standing: <http://www.youtube.com/watch?v=0LHlx1IhdUM>
  - Seated: <http://www.youtube.com/watch?v=WjkSGiqft3g>
  - Movements for balance

Slightly similar to yoga in that this includes focus on breathing and relaxing the body as well as focusing on the movement technique (Farrell, 2004<sup>9</sup>).

Warm-up typically includes, stretching, deep breathing, and range of motion, often in sitting (Lui, 2010<sup>8</sup>)

Cool-down includes similar activities as warm-up but may also include visualization or socialization (Lui, 2010<sup>8</sup>)

Although standing is the preferred position, most movements can be done in sitting if the person gets tired or is unsteady in standing (Farrell, 2004<sup>9</sup>)

Leg movements and knee bends are good for increased lower extremity power and strength related to balance (Chen, 2008<sup>10</sup>)

As you watch the video think about how these movements may challenge balance and cognition in different populations (i.e. Big movements for people with PD, multi-tasking for people with cognitive deficits, and many challenging dynamic balance movements)



# Yay for Evidence!!



- Cost effective
- Overall health benefits
- Variety of population
- Increases balance and flexibility
- Overall health benefits
- Easily modified

Because tai chi requires no equipment it can be done in many settings including public parks (Frick 2010<sup>11</sup>). No required costs for establishments unless the instructor is paid.

Many studies show improvements in overall health, especially in reducing blood pressure (Thornton, 2004). Participants also report decreased stress levels as well as sleeping better at night and having more energy (Thornton, 2004; Jahnke 2010).

Tai chi has been shown effective for improving balance in many populations including community dwelling older adults, long term care residents, and with people with progressive diseases like multiple sclerosis or Parkinson's disease (Frick 2010<sup>11</sup>, Li 2007<sup>12</sup> Voukelatos 2007<sup>13</sup>).

Research also shows that people with cognitive impairments are able to learn the poses and therefore may also receive physical benefits. It can also be said that tai chi helps slow the progression of cognitive impairments (Chang 2011<sup>14</sup>).

Studies show increases in balance and decreases in falls as well as increased flexibility in the lower extremities (Frick 2010<sup>11</sup>, Voukelatos 2007<sup>13</sup>, Hakim 2010<sup>15</sup>, Chen 2007<sup>16</sup>).

# Community Dwellers

- Hakim et. al., 2010
  - Cross-sectional study (tai chi, yoga, no exercise)
  - Tai chi and yoga better than no exercise
  - Tai chi better on functional and balance tests
- Li et. al., 2001
  - Randomized controlled trial, 94 participants
  - Tai chi group, wait list control group
  - 60 min, 2x/w, 6 months
  - 65% improvement in all functional measures

Hakim et. al.<sup>15</sup>. – cross-sectional of tai chi, yoga, or no exercise. Tai chi and yoga did better than no exercise, and tai chi did better than yoga in MDRT and functional test (timed floor transfer).

Li et. al.<sup>7</sup>. – Functional outcomes included: Short Form General Health Survey, physical function measure (sport/exercise, carrying groceries, climbing stairs, and walking)

# Community Cont.

- Voukelatos et. al., 2007
  - Randomized controlled trial, 702 participants
  - 60 min, 1x/w, 16 weeks
  - Outcome measures used
  - Less falls and improved balance scores

Voukelatos et. al<sup>13</sup>. – sway measured with swaymeter (on floor then on foam); leaning balance; lateral stability c feet in near tandem, eyes open; choice stepping, step on lighted panel as fast as possible. Tai chi group reported less falls than control group and had superior scores on 5/6 balance measures.

# Long-Term Care

- **Chen et. al., 2007**
  - Quasi-experimental, one-group, time-series
  - Data 2x before intervention, 4x during intervention
  - 51 male participants
  - Warm-up, intervention, cool-down
  - Cardio, BP, flexibility, hand-grip strength, quality of sleep improved
- **Chen et. al., 2008**
  - Single group, multiple time points
  - 51 male participants
  - 50 min, 3x/w, 6 months, STEP modification
  - Insignificant balance results

Chen et. al., 2007<sup>16</sup> – In military long-term care facility. Outcome measures included physical health: cardiorespiratory function, resting BP, body fat, lower body flexibility (sit and reach), balance (SLS), hand-gripping strength, and physical health actualization; Mental health: quality of sleep and mental health actualization.

Chen et. al., 2008<sup>10</sup> – Authors state that this population is healthier than typical LTC residents. Hypothesize that since STEP does not include as many deep knee bends, or leg movements.

# Cognition

- Chang et. al., 2011
  - Pilot study, 11 participants
  - 20-40 min, 2x/w, 15 w, Sun-style TC for Arthritis
  - Increased attendance = improved accuracy
  - Maintained cognition
  - Impact on cognitive function and processing speed

Chang et al<sup>14</sup>, Ultimately, people with cognitive impairments have the ability to participate in TC intervention.

# Parkinson's Disease

- Venglar, 2005
  - Case report
  - 63 yo, female
  - 1x/w, 60 min, 8 weeks
  - ABC, TUG, FRT
  - Decrease in TUG time and # of steps
  - Overcoming “freezing”
- Li et. al., 2007
  - One group, pre-test/post-test
  - 17 community-dwelling adults, mild/mod PD
  - 90 min/d, 5 days
  - 50-ft speed walk, TUG, FRT
  - Pilot results show improvements in outcomes

Venglar, 2005<sup>17</sup> – practice on their own for 90 minutes each week with a video/paper instructions. TUG was measured in time and in # of steps because people with PD tend to have a shorter step length. No explanation about why ABC dropped but was trending upward. MT reported was able to overcome freezing episodes. Author thinks if intervention lasted longer, MT would have improved ABC

Li et. al. <sup>11</sup>

# PD Continued

- Kim et. al., 2011
  - One group, pre-test/post-test
  - 10 community-dwelling adults, mild/mod PD
  - 60 min/d, 3x/w, 12 w, focus on weight shift
  - Significant improvements in tested measures
- Li, 2012
  - RCT
  - N=195, mild-mod PD
  - Tai chi, stretching, resistance
  - 2x/w, 60 min, 24 weeks
  - Limits of stability, TUG, FRT, # falls, UPDRS
  - Better than other groups in all measures
  - 3 month follow up

Kim et. al. <sup>18</sup> – Intervention focused on weight shift with arm swing as well as static balance movements. The point of this study was to determine if tai chi interventions can help increase center of pressure displacement during gait which tests dynamic postural control with gait initiation. The study found large increases in COP displacement (122% A–P and 130% M–L, an average 15.2cm) after intervention. This indicates that tai chi is effective in helping generate momentum for gait initiation or at least maintain balance and lateral stability.

Li et. al., 2012<sup>19</sup> – Each group performed exercises for the same duration and frequency with one group focusing on stretching techniques, on group on resistance training and the other group on Tai chi. Their outcome measures included limits of stability, the TUG, the functional reach test, the motor portion of the Unified Parkinson's disease Rating scale, and self-reports of the number of falls during the intervention. Overall this study shows that TC is effective in improving balance in older adults which reduces the number of falls and increases functional mobility and the TC group was able to maintain their results 3 months after the conclusion of the study.

# Stroke

- Taylor-Piliae & Coull, 2011
  - Two-group, pilot study with randomization
  - 28 participants
  - 60 min, 3x/w, 12w, chair close by for rest
  - Short Physical Performance Battery. other QoL measures
  - Positive changes

Taylor-Piliae<sup>20</sup> – SPPB measures balance, gait speed, and lower body strength. Changes were all positive but did not reach statistical significance due to the small number of participants. This is a safe form of physical activity/exercise for people with stroke. It should also be noted that modifications were made for this and other groups who use tai chi to improve balance.



# Modifications

- Intensity
- Duration
- Simplified version
- Instructor qualifications
- Various diagnoses



Intensity and duration should be modified based on the endurance and physical abilities of participants (Wolf, 2003<sup>21</sup>)

Intensity was higher for community-dwelling older adults and lower for those with more involved diagnoses or lower endurance.

Some researchers integrated specific rest breaks into their procedure, others provided chairs for participants to take breaks as needed.

One study looked at a simplified version which included a warm up and cool down period and focused only 12 movements (STEP). They reported increased lower extremity flexibility but not balance. Although most movements incorporate deep knee bends and many leg movements, this intervention did not and may contribute to no change in balance measures (Chen 2008<sup>10</sup>).

It is very important for the instructor to be sensitive to participants' needs and be experienced in teaching tai chi and should choose a style that is simple and easy to learn, the Yang style is very popular (Chen 2005<sup>22</sup>).

As with all PT interventions, it is very important to take people's comorbidities into consideration when designing a program. For example, if someone has difficulty following verbal instructions, visual demonstrations are important, allow for rest breaks both scheduled and unscheduled as well as balance aides to ensure safety.

# Take Home Points

- More research
- Most effective protocol
- Tai chi is beneficial
- Many populations
- Appropriate for older adults



As always, more research is needed to determine the true value of tai chi. RCTs are important for high quality research. Many of the studies included in this presentation had small and convenient sample sizes. Some did not have a great representation of the general population (i.e. one had only females while another had only males). There is also a great deal of information Tai Chi's effects on non-balance related health. Although most of the studies lasted about 1 hour each, many lasted longer with varying lengths of time spent on warm-up, intervention, and cool-down.

More information is needed on how effective tai chi is for frail older adults as well as different populations like people with PD, MS, as well as with people with cognitive impairments.

Tai chi has been shown to be beneficial both physically as well as psychologically. Many populations also experience benefits from tai chi.

The bottom line is that this is a cost effective intervention that is appropriate for older adults. Although tai chi may not be included in physical therapy treatment sessions, it is an excellent thing to suggest to patients following discharge. It is also a very beneficial program to implement at senior centers.

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