

Brittany Cant

Evidence Based Practice II

Fall 2011

PICO Question: Is Tai Chi or Yoga more effective in improving Berg Balance scores in community dwelling adults over 65?

Purpose:

Falls are a very costly event in the lives (emotionally and financially) of both older adults and in general health care costs. Of adults over 65 years old, 30% will fall¹ and 50% of adults over 80 years old will fall^{1,2}. The monetary cost is very high with 27% of all hospital costs resulting from adults over 80 years old who fall³, and in 2000, costs of injuries resulting from the falls of people over 65 equalled a staggering \$19.2 billion⁴. Not only are the medical costs high, but many people may develop a fear of falling after having a fall⁵. Fear of falling may lead to decreased physical activity which can cause many other health problems like increased body fat, pneumonia, decreased bone mineral density, and many other complications. From personal experience, one of the greatest fears of older adults is the loss of independence. A fall that results in injury and fear of falling is a sure way to lose independence.

Research shows that falls prevention education⁶ in conjunction with physical intervention like tai chi or yoga are effective in reducing the number of falls and the number of injurious falls⁶⁻¹³. Older adults have the capacity to make strength and balance gains; although it takes more time for older adults than their younger counterparts but it is possible, according Dr. Mike Gross¹⁴. The purpose of this research is to determine if yoga or tai chi is a more effective intervention to increase balance (and Berg Balance Scale scores) and reduce the number of falls in older adults.

Tai chi is a Chinese martial art that has also been used as an exercise system as well as an effective intervention for older adults at risk for falls¹⁵. There are many forms of the art; some are more modern while others date back to the origination of tai chi. Tai chi has been shown to “demonstrate improvements in lower extremity range of motion, strength, and proprioception”,

increase ankle joint control by improving neuromuscular responses during perturbation, as well as “controlling stepping strategies of the swing leg during gait”¹⁰. All forms of tai chi have seemed to lose their military basis and are most often used for exercise and are shown to be beneficial.

Yoga was originally developed as a very deep “spiritual discipline” according to Hindu, Buddhist, and Jainist beliefs¹⁶. The modern practice of yoga focuses on proper relaxation, exercise, breathing, diet, and positive thinking and meditation¹⁶.

Article Comparison:

There are several research articles available that address tai chi and yoga as interventions for improving balance or decreasing the number of falls in the older adult population. Although the highest level of evidence is achieved through a randomized control trial (RCT), very few studies offer this level of evidence. One study by Li, et. al. looked at tai chi’s ability to improve balance in older adults as well as predicting future falls, this study was a RCT with 256 participants⁹. Other studies used techniques like a longitudinal case study¹², systematic review¹⁰, case-control¹³, and many others. According to Dr. Carol Guiliani’s lecture in PHYT 751, a quasi-experimental study is a strong design¹⁸ where one may expect results to best reflect the theory supporting the study. The results from a quasi-experimental study by Lin et. al. did not show a significant decrease in the number of injurious falls as compared to the control group⁶ as was predicted. Conversely, a study conducted by Zettergren et. al. was a case-control design (weaker than quasi-experimental) and it showed significant increases in Berg Balance Scale (BBS) scores and fast gait speed¹³. Several other comparisons can be made between the strength of the study, as some study designs with similar strengths will yield different results. Sometimes trends in weaker studies can be important for clinical application as with a longitudinal case study by Tatum, et. al. This study discussed the use of yoga to improve balance and floor transfers in older adults. Their results showed statistically significant improvements in all variables including scores on Rate of Perceived Fitness & Mobility Scale, Dorsiflexion ROM, Seated knee extension, BBS, Floor Transfer Ability Scale, and Transfer Difficulty Scale, which demonstrates that this type of yoga may be effective in improving functional mobility¹². However, since this

study is considered a weaker design (there may have also been researcher bias since the researchers were the creators of the program), should the results be discounted? The design of the study is important, but one should also consider all aspects of the study (i.e., the number of subjects, subject/researcher blinding, sample population, etc.) when making clinical decisions for intervention.

Most of the studies reviewed used valid outcome measures addressing balance like the Berg Balance Scale^{7,9,11,13} or Timed Up and Go¹³, as well as fear of falling measures¹¹. For every study, the researchers' outcome measure choices were appropriate for the variables they wanted to measure. For instance, the focus of a study by Li, et. al. was to determine if tai chi could improve functional balance and predict future falls in older adults⁹. They used the BBS which research shows can determine whether or not an older adult is at risk for falls. One study, by Hakim, et. al., was a cross-sectional study directly comparing yoga, tai chi, and no exercise with how involvement in these activities affect one's score on balance measures⁸. They used the Fullerton Advance Balance Scale (FAB) and Multidirectional Reach Test (MDRT) which both correlate well with the BBS^{19,20}.

Unfortunately the results of effectiveness of either tai chi or yoga were somewhat mixed. The Lin et. al. study addressing tai chi's effects on injurious falls showed a decrease in the number of injurious falls, but it did not reach statistical significance⁶. Another study on yoga by Schmid et. al., showed a decrease in Illinois fear of falling score, but did not reach statistical significance¹¹. However, other studies showed statistically significant improvements in balance, fear of falling, or number of falls^{7-10,12,13,19}. Although not all results reached statistical significance, all the studies reported improvements in measured variables wither researchers were addressing tai chi or yoga.

All of the reviewed articles addressed either yoga or tai chi in relation to falls or balance. Some of the studies' protocols lasted three months^{7,11,12}, while others lasted from 26 weeks⁹ up to three years¹² (only one study gathered information for up to 3 years, yet the intervention lasted only 13 weeks). Every study included some form of warm up and cool down lasting 5-10 minutes each while one study even included background music during this time⁹. Most studies included 30-45 minutes of intervention (not including warm-up or cool-down)^{6,7,9}, while others

ranged from 50-75 minutes^{11,13}. One thing that was not a theme but should have been, is addressing the number of medications a person uses⁷ as well as comorbidities⁸. The major theme for all the studies is that participants of either a tai chi or yoga intervention group improved scores on outcomes measures wither or not the results were statistically significant.

Conclusions:

The goal was to directly compare a very well-supported technique, tai chi, to a lesser supported but one founded in strong theory, yoga, to determine which would be best for improving balance and reducing falls in older adults. Unfortunately one study directly compares the two methods. It is also very difficult to determine the best method based on information related to the individual techniques because they both show positive results. In a systematic review conducted by Lui et. al., there is no tai chi protocol that has been proven to be the best or used most often¹⁰, which is evidence of missing knowledge. There are also very few randomized control trials on either yoga or tai chi; only one RCT addresses the use of tai chi to improve functional balance as well as predicting future falls⁹. Most studies involve very few participants and are limited to the number of people who volunteer. One study had 1,200 participants but the results of that study were insignificant because the number of falls in the control group decreased dramatically as well as in the intervention group⁶. The major missing information or gap is the lack of the most effective style of yoga or tai chi, as well as frequency and duration of the intervention.

Based on the single available study comparing tai chi to yoga, tai chi is the better method for having higher balance scores⁸. This study was a cross-sectional study so baseline abilities of the participants can not be determined therefore, progress can not be demonstrated. All the other collected studies, including the Hakim et. al. study⁸, show that either tai chi or yoga is more beneficial for improving balance scores than doing nothing at all. Based on the sheer volume of research addressing tai chi as a balance improvement intervention, it seems that tai chi is more effective, but there is no research to completely support this statement.

The goal for this project was to find the best program to recommend to patients following discharge so they could continue to work on their balance after they are no longer appropriate for

physical therapy services. Physical therapists should be cautioned to either ensure the patient can safely participate in traditional yoga, or find a yoga instructor who modifies the poses for varying populations before recommending this to a patient. One aspect of tai chi that makes it a superior technique is that the poses are continuous, theoretically encouraging dynamic balance. In the direct comparison study (cross-sectional) by Hakim et. al., they reported that the tai chi group scored significantly higher than the yoga group or no-exercise group in the Multidirectional Reach Test⁸ indicating superior dynamic balance¹⁷. Since most of the activities occurring in life require dynamic balance as opposed to static balance, tai chi may be the better choice for balance improvement.

In terms of my capstone project, information addressing tai chi and possible intervention protocols may be useful for implementation at a local senior center or in a class through an outpatient physical therapy clinic wishing to develop a wellness program. Although two of the studies reported performing tai chi three times per week⁹ or six times per week⁶ the likelihood of a facility having the ability to provide the class this often may be unrealistic. More research is needed to determine the lowest frequency of intervention needed to ensure benefits of the program. Tai chi does not require any equipment to perform the poses which can allow for ease in the clinic. All poses can be modified to a sitting position, whether on a solid or pliable surface, making it ideal for individuals who are not yet ready for standing balance activities. Although there is no research to support it, tai chi used in conjunction with other physical therapy interventions may prove to be very beneficial for the patient. More research should be conducted in this area to determine the benefits of this treatment combination.

Based on all the collected research, either tai chi or yoga is better at improving balance than no exercise at all. There may even be added benefits for older adults participating in a group program including socialization and other medical benefits. If a patient is interested in improving balance and getting involved in a physical activity program, tai chi and yoga are fantastic choices.

References:

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.
2. Campbell AJ, Borrie MJ, Spears GF. Risk factors for falls in a community-based prospective study of people 70 years and older. *Journal Gerontological Medicine Science* 1989; 44: M112-7.
3. Robertson MC, Devlin N, Scuffham P et. al. Economic evaluation of a community based exercise programme to prevent falls. *Journal of Epidemiology Community Health* 2001; 55:600-6.
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. *Journal of the American Geriatric Society*. 2001; 49:664-7.
5. Vellas BJ, Wayne SJ, Romero LJ, Baumgartner RN, Garry PJ. Fear of falling and restriction of mobility in elderly fallers. *Age and Ageing* 1997;26:189-193.
6. Lin M-R, Hwang H-F, Wang Y-W, Chang S-H, Wolf SL. Community based Tai Chi and its effect on injurious falls, balance, gait, and fear of falling in older people. *Phys Ther*. 2006; 86: 1189-1201.
7. Brown KD, Kaziol JA, Lotz M. A Yoga-based exercise program to reduce the risk of falls in seniors: a pilot and feasibility study. *J Altern Complement Med*. 2008; 14: 454-457.
8. Hakim RM, Kotroba E, Cours J, Teel S, Leininger PM. A cross-sectional study of balance-related measures with older adults who participated in Tai Chi, yoga, or no exercise. *Phys Occup Ther Geriatr*. 2010; 28: 63-74.
9. Li F, Harmer P, Fisher KJ, McAuley F. Tai Chi: improving functional balance and predicting subsequent falls in older persons. *Med Sci Sports Exerc*. 2004; 36: 2046-2052.
10. Lui H, Frank A. Tai Chi as a balance improvement exercise for older adults: a systematic review. *J Geriatr Phys Ther*. 2010; 33: 103-109.
11. Schmid AA, Van Puymbroeck M, Kocejka DM. Effect of a 12-week yoga intervention on fear of falling and balance in older adults: a pilot study. *Arch Phys Med Rehabil*. 2010; 91; 576-83.
12. Tatum NG, Bradley RC, Igel C. Therapeutic yoga to improve balance and floor transfer in older adults. *Topics in Geriatr Rehab*. 2011; 27: 134-141.
13. Zettergren KK, Lubekski JM, Viverito JM. Effects of a yoga program on postural control, mobility, and gait speed in community-living older adults: a pilot study. *J Geriatr Phys Ther*. 2011; 34: 88-94.
14. Gross M. Effects of Aging on the Musculoskeletal System. [Powerpoint]. University of North Carolina Chapel Hill, Division of Physical Therapy. November 2011.
15. Kurland. History of T'ai Chi Ch'uan. Adapted From H Kurland, "The Web of Tai Chi Chuan" parts 1 & 2 Karate/Kung fu Illustrated, July & August 1998. <http://www.dotaichi.com/Articles/HistoryofTaiChi.htm>. Accessed on November 18, 2011.
16. Yoga: The art of meditation, breathing, relaxation, and spirituality. Yoga History. <http://iml.jou.ufl.edu/projects/fall05/levy/history.html>. Accessed on November 18, 2011.
17. Clark S, Rose DJ, Fujimoto K. Generalizability of the limits of stability test in the evaluation of dynamic balance among older adults. *Arch Phys Med Rehabil*. 1997;78:1078-1084.

18. Guiliani C. Research Design Overview. [Powerpoint]. University of North Carolina Chapel Hill, Division of Physical Therapy. Fall 2008.
19. Rose D, Lucchese N, Wiersma LD. Development of a multidimensional balance scale for use with functionally independent older adults. *Arch Phys Med Rehabil.* 2006; 87:1478-1485.
20. Newton R. Validity of the multi-directional reach test: a practical measure for limits of stability in older adults. *Journal of Gerontology: A, Biological and Medical Sciences.* 2001;56:M28-M24.