SciMedCentral

Journal of Preventive Medicine & Healthcare

Original Research

A Comparative Study on the Effects of Matter of Balance and Tai Chi on Measures of Balance in Community-Dwelling Older Adults

G. Diaz PhD[1]*, A. Lamb DO[1], I. Cahatol DO[1], A. Frugoli DO[1], J. Romero MD[1], T Duncan DO[2]

[1]*Associated Institutions: Ventura County Medical Center, 300 Hillmont Avenue, Ventura CA 93003*

[2]*Associated Institutions: Community Memorial Hospital, 147 N. Brent St., Ventura CA 93003*

***Corresponding author**

Graal Diaz, PhD, 147, N. Brent St., Ventura, CA 93003, Tel: (805)948-6099, Email: gdiaz.con@cmhshealth.org

Submitted: 29 April 2021

Accepted: 02 June 2021

Published: 04 June 2021

ISSN: 2576-0084

INTRODUCTION

Falls are a common concern and health risk for aging adults. According to the CDC, more than 30% of persons over 65 years of age will have a fall this year. This risk increases with age. Approximately, 50% of patients 80 years or older will have a fall.(1) Studies have demonstrated that the most significant risk factor for falls is a single fall earlier in the year. Beyond advancing age and prior falls, several other risk factors for falls have been identified, including lower body weakness, difficulty with balance, vision problems, foot pain or choice of footwear, certain medications, vitamin D deficiency, and physical hazards at home.(2)

The importance of fall prevention in our aging population to prevent mortality and morbidity cannot be understated. Data suggests that falls are the leading cause of unintentional death in individuals age 65 and older. Additionally, the CDC reports that one out of five falls will result in serious injuries such as head injury or fractures. In fact, 95% of hip fractures are caused by falls.(3) While the impact on the quality of life for those who fall may be immediately apparent, the resultant financial impact on our healthcare system is also very significant. Each fall-related hospital admission is estimated to cost approximately 20,000 dollars. By 2030, fall-related health care expenditures are estimated to cost approximately 54 billion dollars.(2, 3)

To combat this, numerous interventions have been designed, studied, and attempted at the community level. A recent meta-analysis regarding community-level fall-prevention modalities was conducted by the CDC. The study focused on four main categories to prevent falls: exercise, home modifications, clinical interventions, and multifaceted interventions.(4) There were no clear recommendations for the best fall prevention strategies despite the lengthy review of 41 previous studies. However, evidence-based fall prevention exercises have demonstrated good outcomes. Data from the Journal of Geriatric Physical Therapy suggests that the minimum duration of exercise to protect an older adult against falls is 50 hours.(4) In addition to physical training, management of psychological stressors is also important in preventing falls. Falling can generate fear, leading to limited activity, deconditioning, and eventually further falls.(4, 5) Thus, the CDC recommends that fall prevention programs have physical and psychological components for it to be effective.(4, 5)

Matter of Balance (MOB) is endorsed by the National Council on Aging as one of the best evidence-based fall prevention program.(6) The original concept for MOB was first developed at Boston University in the 1990s and can be described as an 8-week structured group intervention focused on practical strategies to increase strength and activity and to reduce the fear of falling.(7.8) This is accomplished through exercise, cognitive restructuring, and group skill-building and problem-solving activities. It originally involved physical therapists, occupational therapists, social workers, and registered nurses.(6,7,8) To reduce costs associated with having classes led by these health care professionals, many of these classes have been adapted to a lay leader model, making MOB more accessible to members of the general community.(7,8,9)

The CDC Compendium of Effective Fall Interventions also discusses Tai Chi (TC) as an effective exercise program for fall prevention. TC was developed in China as a form of martial art. Several studies show that TC have several health benefits (6, 7, 8) Sometimes described as "meditation in motion," TC focuses on

low-impact, coordinated motions to improve balance, flexibility, and strength. In addition to the physical impact which helps reduce falls in participants, TC has also demonstrated stress reduction. When applied to geriatric populations, evidence suggests there may be a decrease in fall risk for those who have completed TC programs; however, continued practice was advocated.(8, 9)

To evaluate the effectiveness of fall prevention programs an objective measurement has to be used. A tool that was used for fall risk evaluation in several studies is the timed up and go (TUG) test.(14, 15, 16) The TUG test, is a simple test that involves having a patient stand-up from a standard chair, walk a fixed distance, turn around, walk back to their chair, and sit down in the same chair.(14) The TUG test is widely used in global risk assessment for falls and is even used for an annual assessment of fall risk by Medicare. Prior studies have suggested that worse TUG scores are associated with prior history of falls.(15, 16) Although the predictive utility of the TUG test is thought to be less useful in relatively healthy adults; it may serve more predictive utility in patients who are older with more comorbidities and worse functional baselines.(16)

In this prospective non-randomized analysis, we set out to investigate the impact of community-based MOB and tai chi programs on decreasing the risk of fall in older adults (age 65 and older) in Ventura County, California.

METHODS

This study used a quasi-experimental design (pretests and post-tests with MOB and TC groups). Participants were from Ventura County Area Agency on Aging' Fall Prevention Program from 2014-2018. Participants were assessed via a pretest to post-test using the Timed Up and Go (TUG) test. This study's outcome variable was the delta score of the TUG test pre and post completion of the fall intervention programs. Delta Tug Score (DTS) of zero or less (no change or negative DTS) was classified as "Negative." Any DTS of one or greater (improvement in DTS) was classified as "Positive." The pre-TUG assessment took place at the start of the program, and the post TUG assessment was completed within two weeks of the final MOB and TC sessions.

RESULTS

A total of 527 elderly adults enrolled in the evidence-based programs for the study period, 385 (144 MOB, 241 TC) were able to complete it (Table 1). The mean delta TUG score (DTS) was 1.27 seconds. Sixty-two percent of the participants had positive DTS. MOB had a significantly higher number of positive DTS than TC (69.4% vs. 57.3%, *P*=0.02) (Table 1). Among those who completed the evidence-based programs, 77% were females. Females who took MOB had significantly higher DTS scores compared to those who took TC (Table 2). The mean age in years of participants who completed the program was 75.8. Approximately 8% of the participants were aged 55 to 64, 37.9% were aged 65 to 74, 38% were aged 75 to 84, and 16% were age >85 (Table 3). MOB participants who were age > 75 had a higher proportion of positive DTS than those with age <75. For TC, the age group had a statistically significant association with positive DTS (*P*=0.01); participants who were age >85 had the most positive DTS. Those who were age 75 to 84 had the lowest number of improved DTS (Table 3). Among those who completed the EB programs, 31.85% reported pain or numbness in their feet, 33.2% had vision problems, 24.8% had hearing problems, 60.3% had arthritis, 39.8% had difficulty-climbing stairs, 21.3% reported taking-sleeping medications, 38.5% reported taking more than five medications daily, 39% had a history of fall during the last 12 months (Table 4). Some factors were reviewed to determine which program would be better suited for certain patients. Only one factor demonstrated statistical difference. Elderly adults who took Matter of Balance, and reported taking sleep aid medications saw a greater improvement in their Delta TUG Scores (P=0.02). In comparing MOB and TC in regards to DTS, the following variables were evaluated but didn't show statistical difference: feet pain or numbness, vision problems, hearing problems, arthritis, use of assistive walking devise, falls in the past 12-months, and taking more than five medications daily (Table 5).

Table 1: Delta TUG Score by type of EB class (MOB=144, Tai Chi=241).

Delta TUG score (+/-)	N	MOB	Tai Chi	P-value
Positive Outcomes	**238**	**69.40%**	**57.30%**	0.02
Negative Outcomes	**147**	**31.60%**	**43.70%**	

Table 2: Positive Delta TUG Score by gender and type of EB class.

Gender	N	% + DTS (MOB)	% + DTS (Tai Chi)	P-value
Male	**296**	**67.50%**	**65.30%**	1
Female	**89**	**70.20%**	**55.20%**	0.02

Table 3. Percent of positive TUG score by EB class type and age category.

Age Category	N	MOB	Tai Chi	P-value
A (55-64)	30	71.40%	56.50%	0.79
B (65-74)	146	64.40%	62.40%	0.96
C (75-84)	147	73.20%	47.30%	<0.01 *
D (85+)	62	69.40%	73.10%	0.98

Table 4: Percent of participants with comorbid conditions (N=385, total EB participants).

Comorbid Condition	N	% of EB participants (MOB+Tai Chi)
Pain and numbness in feet	100	31.85
Vision problems	107	33.23
Hearing problems	80	24.84
Arthritis	194	60.25
Stair difficulty	128	39.75
Sleeping medications	67	21.34
Assistance walking device	29	9.24
Falls past 12 months	146	45.34
More than 5 meds	125	38.46

Table 5: Positive Delta TUG score by presence of comorbid conditions.

Comorbid Condition	% of + DTS (MOB)	% of + DTS (TC)	P-value
Pain and numbness in feet	71.11	61.82	0.45
Vision problems	63.27	63.79	1
Hearing problems	60.98	53.85	0.68
Arthritis	65.88	55.05	0.17
Stair difficulty	70.00	67.24	0.89
Sleeping medications	76.47	45.45	0.02 *
Assisting walking device	57.89	62.90	1
Falls in past 12 months	70.23	62.90	0.45
More than 5 meds	67.92	61.11	0.55

DISCUSSION

Results from this study indicate that MOB participants had better outcomes in the delta tug score than TC participants did. Sixty-four of all participants demonstrated improvement in delta TUG score. By extrapolation, the decline in TUG score may represent a reduction of each patient's overall fall risk as well. The improvement for participants of both groups may likely be due to the multimodal nature of each approach, as both MOB and Tai Chi aim to improve physical function while also equipping participants with mental tools to address the fear of falling. Notably, participants in MOB were on average older than those who participated in Tai Chi but still demonstrated similar improvement in delta TUG score. Perhaps, this indicate that MOB may be more effective in older participants or at least have more appeal to these participants. Despite a majority improvement in delta TUG score, 21% of all participants had no change in delta TUG score and 15% had a worsened delta TUG score. Although the ideal program would eliminate the risk of falling altogether, this is unfortunately, an unrealistic goal. Moreover, it is possible that participants with multiple comorbidities will have worsening fall risk over time no matter what intervention is chosen. However, slowing functional decline and maintaining baseline functionality may help prevent falls on a long-term basis. While some participants in this study had no change or worsened delta TUG score, participation in the evidence-based programs may have slowed the decline of functional status and lead to long-term improvements not measured within the 12-week time-span of this study. Future studies may demonstrate that. In addition, starting these programs at an earlier age may be more effective.

Although this study did not have a control, group, previous studies have demonstrated overwhelming evidence that both Matter of Balance and tai chi often result in a reduction for fall risks. MOB has been shown in several studies to improve fall risk reduction.(7.8.9) Some studies suggest that Tai chi, on the other hand, does not have long-term risk reduction effect. (3, 12) The evidence suggests improved outcomes is dependent on continued practice.(12)

Focus should be made not only on improving the DTS for each program, but also how to minimize attrition rates. In this study, 142(27%) participants did not complete the evidence-based programs. Future study should include determining the reasons for the fall out.

This study found that TC had better completion rate compared to MOB. One possible explanation may be that on average, participants in the TC group were younger. Age may have an impact on participation in these fall prevention programs. There are factors that could have influenced non-completion of the program, but were not measured in this study such as transportation, distance, time, or health of participant's family members. Additionally, style and preference may also explain differences in completion rates.

There were more female participants in this study. Perhaps because women, on average live longer than men, and in this particular community, the elder population has bigger proportion of females.(17)

Aside from the lack of a control group and the difference in gender representation, another limitation of this study included

the lack of follow-up data after program completion. Although the decline in TUG scores suggests an improvement in fall risk, a follow-up study examining falls for a period after course completion may be useful to investigate the effectiveness of the programs. Additionally, this study did not quantify the amount of time participants practice at home; a follow-up study investigating practice outside of the classroom may help elucidate differences in the long-term effects of each program.

The third edition of the CDC Compendium of Effective Fall Interventions discusses dozens of fall prevention programs. An investigation of these programs may help pinpoint effective interventions that influences better compliance, improved outcomes, increase accessibility and minimize financial burden. Regardless of the direction of future studies, one thing remains certain; with an aging population, the importance of finding solutions to reduce falls is important.

CONCLUSION

Both the MOB and TC intervention groups demonstrated improvement in delta TUG scores, suggesting a decreased risk of fall for both groups. MOB may be better for older adults and those who take sleeping medications, have hearing problems, have difficulty climbing stairs, and have history of falls in the past year. TC on the other hand may be better for younger elderly adults and for those who use assistive walking devices.

REFERENCES

1. Shubert, Tiffany E. Evidence-Based Exercise Prescription for Balance and Falls Prevention: A Current Review of the Literature. Journal of Geriatric Physical Therapy. 2011; 34(3): 100–108.
2. Stevens JA, Corso PS, Finkelstein EA, Miller TR. The costs of fatal and non-fatal falls among older adults. Inj Prev. 2006; 12(5): 290-295
3. Centers for Disease Control and Prevention. Injury prevention & control: data & statistics (WISQARSTM). Centers for Disease Control and Prevention. 2020.
4. National Council on Aging: Evidenced- Based Falls Prevention Programs. National Council on Aging. 2020.
5. Howland, Peterson, Levin, Fried, & Pordon. Fear of falling among the community dwelling elderly. J Aging Health. 1993; 5(2): 229-243.
6. Matter of Balance (MOB). Matter of Balance: A program summary. Mater of Balance. 2020.
7. Cheng Peng, Margaret S. Haynes, Elaine M. McMahon, Joel L. Botler, Laurence Gross et al... The Feasibility and Effectiveness of Translating a Matter of Balance Into a Volunteer Lay Leader Model. J South Geriatric Society. 2008; 27(1).
8. Palmer WE, Mercer VS. Effects of the Matter of Balance Program on Self-Reported Physical Activity in Community-Dwelling Older Adults. Gerontol Geriatr Med. 2019; 5.
9. Sartor-Glittenberg C, Bordenave E, Bay C, Bordenave L & Alexander JL. Effect of a Matter of Balance programme on avoidance behaviour due to fear of falling in older adults. Psychogeriatrics. 2018; 18(3):224-230.
10. Low S, Ang LW, Goh KS, Chew SK. A systematic review of the effectiveness of Tai Chi on fall reduction among the elderly. Arch Gerontol Geriatr. 2009; 48(3):325-331.
11. Schleicher MM, Wedam L, Wu G. Review of taichi as an effective exercise on fall prevention in elderly. J Sports Med. 2012;20(1): 37-58.
12. Logghe HJ, Verhagen AP, Rademaker ACH, et al. The effects of Tai Chi on fall prevention, fear of falling and balance in older people: A meta-analysis . Prev Med. 2010;51(-4); 222-227.
13. Logghe, HJ, Verhagen, AP, Zeeuwe, PEM, et al. Tai Chi as a falls prevention strategy in older adults compared to conventional physiotherapy exercise: A review. J Am Geriatr Soc. 2017; 57(1): 7-75
14. Schoene D, Wu SM, Mikolaizak AS, Menant JC & Smith ST et al. Discriminative ability and predictive validity of the timed up and go test in identifying older people who fall: systematic review and meta-analysis. J Am Geriatr Soc. 2013; 61(2):202-208.
15. Beauchet O, Fantino B, Allali G, Muir SW & Montero-Odasso M et al. Timed Up and Go test and risk of falls in older adults: a systematic review. J Nutr Health Aging. 2011; 15(10):933-938.
16. Barry E, Galvin R, Keogh C, Horgan F & Fahey T. Is the Timed Up and Go test a useful predictor of risk of falls in community dwelling older adults: a systematic review and meta-analysis. BMC Geriatr. 2014; 14:14.
17. U.S Census Bureau Ventura County Quick Facts. U.S. Census Bureau. 2020.

Cite this article

Diaz G, Lamb A, Cahatol I, Frugoli A, Romero J, et al. (2021) A Comparative Study on the Effects of Matter of Balance and Tai Chi on Measures of Balance in Community-Dwelling Older Adults. J Prev Med Healthc 3(1): 1021.