Video Guided T'ai Chi: A Pilot Study to Assess Effectiveness

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Disclosures

- None

Falls Prevalent in Community

- **Geriatric Trauma Institute, MMC**
- Observations
  - 43% of patients ≥ 65 yrs
  - 73% admissions related to falls

Falls:National & Local Problem

- Nationwide
  - 30-45% community dwelling older adults fall each year[1, 2]
  - Direct costs ~ $19-30 billion/year[3]
- United States population is aging
  - 13.3% in US
  - 15.6% in PA
  - 18.7% in Cambria County[4]

Center of Balance (COB)

- Predictor of fall risk
- Complex Process
  - Maintain posture
  - Facilitates movement
  - Recovery of equilibrium
- Measured using a commercial video game system.

Falls Efficacy

- Definition= perceived self-efficacy at avoiding falls during essential, nonhazardous ADL[5]
- Impacts Quality of Life
- Can cause decreased mobility, deconditioning, muscle atrophy and self-imposed isolation[5, 6]

Fall Prevention Strategies[6-17]

- Regular exercise
  - Yoga
  - T'ai Chi
- Balance training
- Medication review
- Vision screenings
- Home safety

T'ai Chi[6-17]

- Ancient Chinese Martial Art
- Slow continuous movement
- Enhances awareness of body position
- Swaying movements shift center of balance
- Decreases fear of falling and increases center of balance

T'ai Chi

- **Video "Yang Style 5 Form"**
  - Locally filmed
  - Copies available
  - Free

Senior Activity Centers

- Adults > 60 years
- Nutritious low cost meals
- Games
- Socialization
- Exercise Classes
  - Self-directed
  - Free

Video Game System

- Commercially available
- Valid and reliable[20-22]
- Low Cost
- “Fun”

Methods

- **Design**
  - Single group pretest-posttest
- **Sample and Setting**
  - Voluntary convenience sample (n=32)
- **Inclusion Criteria**
  - ≥ 60 years
  - Ability to stand independently
  - Not high risk for fall (Hendrich II Fall Risk Model)

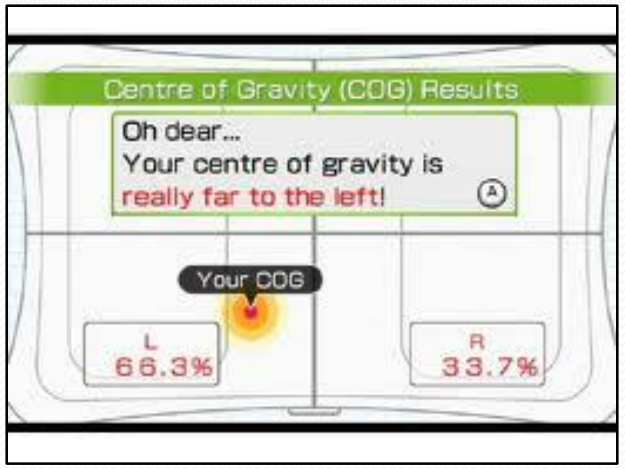
Measures

- **Exclusion Criteria**
  - Hendrich II Fall Risk Model[3]
    - Inability to get rise from chair independently
    - "Yes" to any item listed below
      - Taking Benzodiazepines?
      - Taking Antiepileptics?
      - Dizziness or Vertigo?

Measures

Center of Balance (COB)

- Video game system
- 3 trials double limb standing eyes open
- 3 trials double limb standing eyes closed



Measures

- **Falls Efficacy Scale-International[6] (FES-I)**
  - 16-items
  - Likert scale
    - 1=not concerned to 4=very concerned
  - Higher score=higher fear of falling
    - Examples:
    - Going to the store
    - Getting a bath or shower
    - Reaching for something over your head or on the floor

Intervention Sequence

- Baseline: demographic, COB and FES-I
- Yang-Style 5 Form delivered via video
- 3 times weekly for 12 weeks (36 sessions)
  - Weeks 1 and 2 “training”
  - Weeks 3-12 “5-Form”
    - 20 minute warm-up
    - 21 minutes of 5-Form T’ai Chi
    - 4 minute cool-down

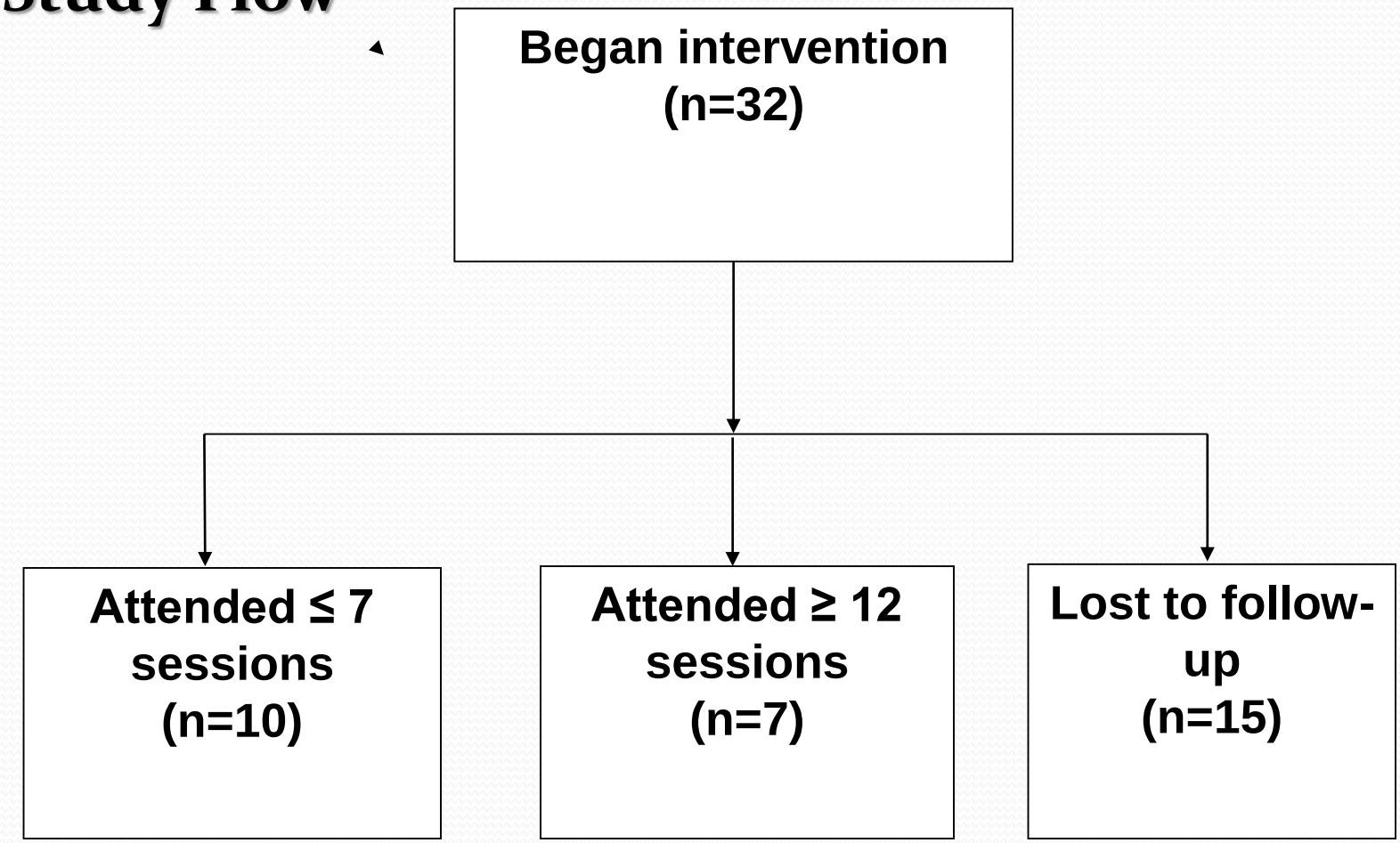
Demographic Information

- Age
- Race
- Gender
- Marital Status
- Education level
- Amount, type and location of physical activity

Session Attendance

- 32 subjects enrolled
- Variable participation
  - 10 subjects ≤ 7 sessions early in study
  - 7 subjects ≥ 12 sessions
  - 15 subjects lost to follow-up

Study Flow


Began intervention
(n=32)
Attended ≤ 7 sessions
(n=10)
Attended ≥ 12 sessions
(n=7)
Lost to follow-up
(n=15)

Data Analysis

- SPSS v21
- MANOVA
  - Pre / post scores FES-I & COB
  - ≤ 7 sessions & ≥ 12 sessions
- Pearson's Correlation coefficients used to explore between group differences

Demographic Characteristics

Characteristic*		Total Sample (n=32)	Attended ≤ 7 sessions (n=10)	Attended ≥12 sessions (n=7)	Lost to follow-up (n=15)
Gender (n, % female)		29 (90.6%)	10 (100%)	5 (71.4%)	14 (93.3%)
Age, years (M, SD)†		73.3 ± 8.6	74.6 ± 7.8	66.9 ± 4.6	76.5 ± 7.8
Race (n, % Caucasian)		32 (100%)	10 (100%)	7 (100%)	15 (100%)
Marital Status (n, %)					
	Married	10 (31.3%)	2 (20.0%)	6 (85.7%)	2 (13.3%)
	Divorced, Separated	3 (9.4%)	0	0	3 (20%)
	Never Married	6 (18.8%)	1 (10.0%)	1 (14.3%)	4 (26.7%)
	Widowed	13 (40.6%)	7 (70.0%)	0	6 (40%)
Education level (n, %)					
	High school	19 (59.3%)	7 (70.0%)	4 (57.1%)	8 (53.3%)
	Vocational/Technical	6 (18.8%)	0	1 (14.3%)	5 (33.3%)
	Bachelor degree	3 (9.4%)	1 (10.0%)	1 (14.3%)	1 (6.7%)
	Master's or higher	4 (12.5%)	2 (20.0%)	1 (14.3%)	1 (6.7%)

Characteristic*		Total Sample (n=32)	Attended ≤ 7 sessions (n=10)	Attended ≥12 sessions (n=7)	Lost to follow-up (n=15)
Currently exercise (n, %)		24 (75%)	6 (60.0%)	6 (85.7%)	12 (80%)
Exercise Frequency (n, %)					
	0-2 days/week	15 (46.9%)	7 (70.0%)	2 (28.6%)	6 (40%)
	3-5 days/week	11 (34.4%)	1 (10.0%)	5 (71.4%)	5 (33.3%)
	6-7 days/week	6 (18.8%)	2 (20.0%)	0	4 (26.7%)
Exercise Location** (n, %)					
	At home	15 (46.9%)	2 (20.0%)	5(71.4%)	8 (53.3%)
	Fitness center	2 (6.3%)	0	1(14.3%)	1 (6.7%)
	Senior activity center	8 (25%)	5 (50.0%)	1(14.3%)	2 (13.3%)

Characteristic*		Total Sample (n=32)	Attended ≤ 7 sessions (n=10)	Attended ≥12 sessions (n=7)	Lost to follow-up (n=15)
Transportation (n, %)					
	Private	16 (50%)	9 (90.0%)	7 (100%)	NA***
	Public	1 (3.1%)	1 (10.0%)	0	NA***
Used video at home (n, %)		2 (6.3%)	1 (10.0%)	1(14.3%)	NA***
Reason for quitting (n, %)					
	Too difficult	2 (6.3%)	2 (20.0%)	0	0
	Schedule conflict	3 (9.4%)	2 (20.0%)	0	1 (6.7%)
	Illness/health issue	8 (25%)	4 (40.0%)	0	4 (26.7%)
	Did not like T'ai Chi	2 (6.3%)	2 (20.0%)	0	0

COB & FES-I Scores

Subjects completing

≤ 7 sessions

≥ 12 sessions

COB

- **NSD multivariate analysis**
- Between groups (7v 12)
  - F=1.301; df=5, 11; p=0.331
- Over time (pre/post)
  - F=1.09; df=5, 11; p=0.417
- Interaction effect of groups over time
  - F=0.803; df=5, 11; p=0.570

COB

- **Significant changes** univariate analysis
  - EOR (p=.044)

    pre to post, irrespective of intervention
  - EOL (p=.035)

    pre to post, irrespective of intervention
- EOR increased 3%
- EOL decreased 3.2%
- Closer to optimal COB

Center of balance measures pre and post intervention.

		Group	
		Attended ≤ 7 sessions (n=10) Mean(SD)	Attended ≥ 12 sessions (n=7) Mean (SD)
Center of Balance Measures			
Eyes open Right*			
	Pre	48.0 (6.0)	48.6 (2.2)
	Post	52.2 (8.0)	50.5 (3.1)
Eyes open Left ¹			
	Pre	51.9 (6.0)	51.3 (2.2)
	Post	47.7 (8.0)	49.0 (3.9)
Eyes Closed Right			
	Pre	49.2 (5.2)	47.2 (3.1)
	Post	51.2 (8.4)	49.9 (1.8)
Eyes closed Left			
	Pre	50.9 (5.4)	52.7 (3.1)
	Post	48.8 (8.4)	50.1 (1.8)

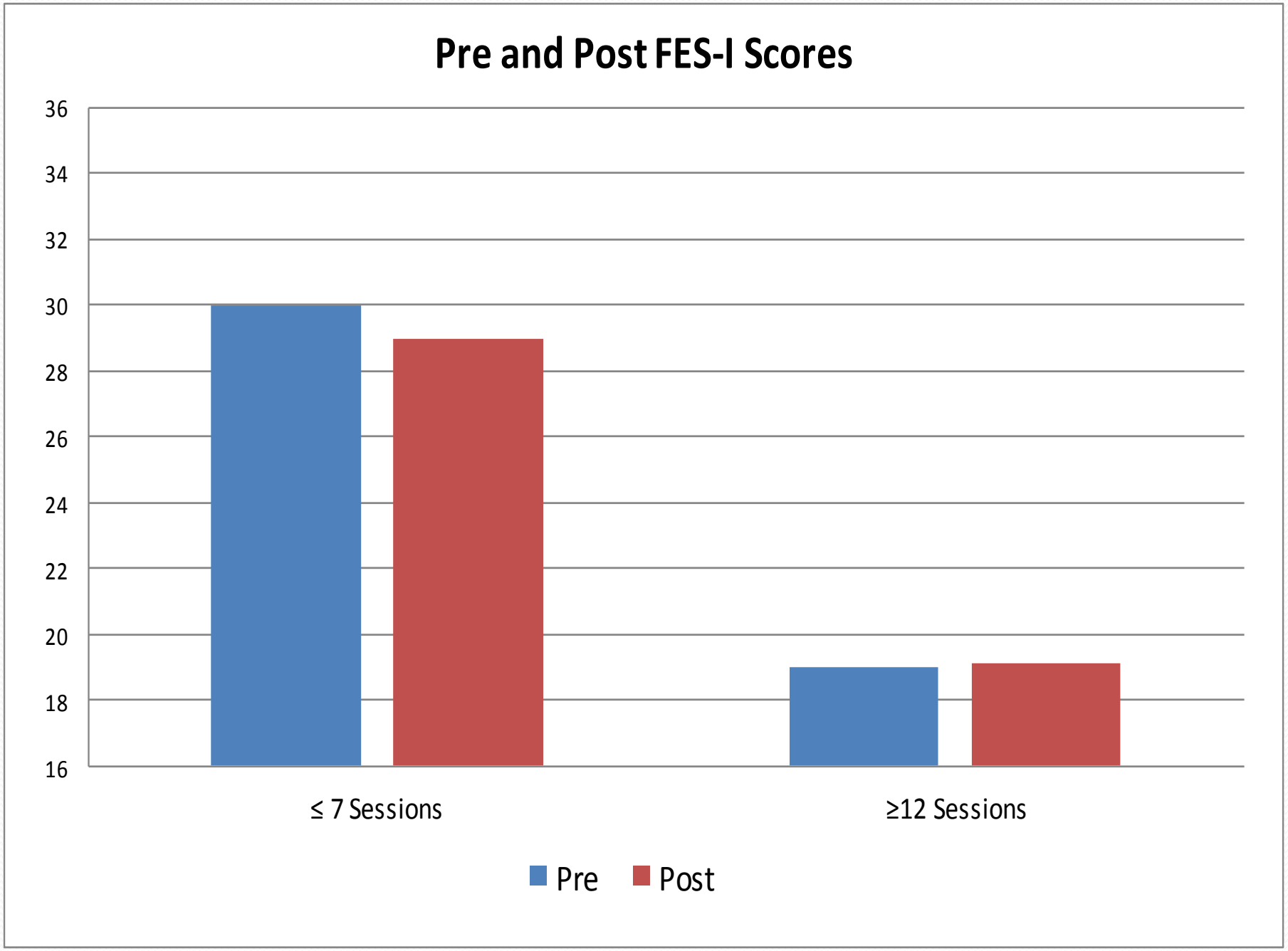
*p=.044

¹ p=.035

FES-I

- NSD FES-I scores (p=.056)
  - Positive trend (less fear of falling)
  - Change not significant

- Cronbach's alpha 0.96


Pre and Post FES-I Scores
36
34
32
30
28
26
24
22
20
18
16
≤ 7 Sessions
≥12 Sessions
Pre
Post

Additional Differences

- Lost to follow up vs. Continued in study
  - MANOVA F=2.297; df 12; p=0.021
  - Those lost to follow-up were:
    - older
    - higher perceived fear of falling(FES-I)
    - Lower COB scores

      EOL, EOR, ECR, ECL

Additional differences

Correlation between FES-I/Attendance

- Spearman's Rho
  - PRE r=-.682, p=.003
  - POST r=-.723, p=.001

THOSE WITH HIGHER FEAR OF FALLING LESS LIKELY TO CONTINUE

Major Findings

- Support literature regarding physical activity reducing falls
- All had unequal COB at start
- All had improvement of COB at conclusion
- Higher FES-I = lower attendance

Limitations

- Attrition
  - ¾ lost
  - ½ completed 3 or fewer sessions
  - Season
  - Video
  - Simultaneous activities
- Small sample size
  - Homogeneous
  - Recruiting sites

Conclusion

- Video guided T'ai chi is a low cost measure
- May improve COB and Fear of Falling
- Challenges seen in this study
  - Similar to those prior studies
  - Difficult to capture those who were older and more fearful of falling

Future Directions

- Future Intervention
  - Larger more heterogeneous sample
  - Blind to Balance Display
  - Different video (slower, repeated instruction)
  - Include intervention directly related to fear of falling

Questions?

References

1. Centers for Disease Control (CDC). Falls among older adults: An overview. 2012. Available at: http://www.cdc.gov/homeandrecreationalsafety/falls/adultfalls.html . Cited February 5, 2014.
2. Stevens JA, Baldwin GT, Ballesteros MF, et al. An older adult falls research agenda from a public health perspective. Clinics In Geriatric Medicine 2010; 26:767-79.
3. Heinrich S, Rapp K, Rissmann U, et al. Cost of falls in old age: A systematic Review. Osteoporosis International 2010; 21:891-902.
4. U. S. Census Bureau. State and county quickfacts. 2012. Available at http://quickfacts.census.gov/qfd/states/42/42021.html ,
5. Tinetti M, Richman D, Powell L. Falls efficacy as a measure of fear of falling. Journal of Gerontology 1990; 45:239-43.
6. Greenberg, SA. Analysis of measurement tools of fear of falling for high-risk community- dwelling older adults. Clinical Nursing Research 2012; 21:113-30.
7. Rose DJ, Hernandez D. The role of exercise in fall prevention for older adults. Clinics In Geriatric Medicine 2010; 26:607-31.
8. Sherrington C, Whitney JC, Lord SR et al. Effective exercise for the prevention of falls: A systematic review and meta-analysis. The American Geriatrics Society 2008; 56:2234-43.
9. Soriano TA, DeCherrie LV, Thomas DC. Falls in the community-dwelling older adult: A review for primary-care providers. Clinical Interventions in Aging 2008; 2:545-53.
10. Zijlstra GAR, van Haastregt JCM, van Rossum E, et al. Interventions to reduce fear of falling in community-living older people: A systematic review. Journal of the American Geriatrics Society 2007; 55:603-15.
11. Gillespie LD, Robertson MC, Gillespie WJ, et al. Interventions for preventing falls in older people living in the community (Review). The Cochrane Database of Systematic Reviews 2012; 9. Art. No.: CD007146.
12. Lui H, Frank, A. Tai Chi as a balance improvement exercise for older adults: A systematic review.Journal of Geriatric Physical Therapy 2010; 33:103-109.
13. Bula CJ, Monod S, Hoskovec C, et al. Interventions aiming at balance confidence improvement in older adults: an updated review. Gerontology 2011; 57:276-86.
14. Haung, TT, Yang, LH, Liu, CY. Reducing the fear of falling among community-dwelling elderly adults through cognitive-behavioural strategies and intense T'ai Chi exercise: A randomized controlled trial. Journal of Advanced Nursing 2010; 67:961-71.
15. Li F, Harmer P, Fisher KJ et al. T'ai chi and fall reductions in older adults: A randomized controlled trial. Journal of Gerontology 2005; 60:187-94.

16. Maciaszek J, Osinski W. The effects of T'ai Chi on body balance in elderly people-A review of studies from the early 21st century. The American Journal of Chinese Medicine 2010; 38:219-29.
17. Logghe IJ, Verhagen AP, Rademaker ACHJ, et al. The effects of T'ai Chi on fall prevention, fear of falling and balance in older people: A Meta-analysis. Preventative Medicine 2010; 51:222-7.
18. Hendrich A. Fall risk assessment for older adults: The Hendrich II fall risk model. 2013. Available at http://consultgerirn.org/uploads/File/trythis/try_this_8.pdf . Cited February 5, 2013
19. Murphy L, Singh BB. Effects of 5-form, yang style tai chi on older females who have or are at risk for developing osteoporosis. Physiotherapy Theory and Practice 2008; 24: 311-320.
20. Clark RA, Bryant AL, Pua Y, et al. Validity and reliability of the Nintendo Wii balance board for assessment of standing balance. Gait & Posture 2010; 31:307-10.
21. Huurnink A, Fransz DP, Kingma I et al. Comparison of a laboratory grade force platform with a Nintendo Wii balance board on measurement of postural control in single-leg balance tasks. Journal of Biomechanics 2013; 46:1392-95.
22. Holmes JD, Jenkins ME, Johnson AM et al. Validity of the Nintendo Wii balance board for the assessment of standing balance in Parkinson's disease. Clinical Rehabilitation 2012; 27:361-6
23. Yardley L, Beyer N, Hauer L, et al. Development and initial validations of the falls efficacy scale-international (FES-I). Age and Ageing 2005; 34:614-19.
24. Mullen SP, Wojcicki TR, Mailey EL, et al. A profile for predicting attrition from exercise in older adults. Prevention Science 2013; 14: 489-96.
25. Commonwealth of Pennsylvania, Department of Aging. The Pennsylvania Senior Community Center Capacity Survey. Available at www.education.state.pa.us/portal/.../pa_senior_centers_2007_survey_pdf . Cited March 1, 2014