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

Elizabeth D. Katrancha, DNP, CCNS, RN
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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\textsuperscript{5}

- Impacts Quality of Life

- Can cause decreased mobility, deconditioning, muscle atrophy and self-imposed isolation\textsuperscript{5, 6}
Fall Prevention Strategies

- Regular exercise
  - Yoga
  - T’ai Chi
- Balance training
- Medication review
- Vision screenings
- Home safety
T’ai Chi\textsuperscript{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
- 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
    - 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
  - \( \leq 7 \text{ sessions} \) & \( \geq 12 \text{ sessions} \)
- Pearson’s Correlation coefficients used to explore between group differences
Demographic Characteristics
<table>
<thead>
<tr>
<th>Characteristic*</th>
<th>Total Sample (n=32)</th>
<th>Attended ≤ 7 sessions (n=10)</th>
<th>Attended ≥12 sessions (n=7)</th>
<th>Lost to follow-up (n=15)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender (n, % female)</td>
<td>29 (90.6%)</td>
<td>10 (100%)</td>
<td>5 (71.4%)</td>
<td>14 (93.3%)</td>
</tr>
<tr>
<td>Age, years (M, SD)</td>
<td>73.3 ± 8.6</td>
<td>74.6 ± 7.8</td>
<td>66.9 ± 4.6</td>
<td>76.5 ± 7.8</td>
</tr>
<tr>
<td>Race (n, % Caucasian)</td>
<td>32 (100%)</td>
<td>10 (100%)</td>
<td>7 (100%)</td>
<td>15 (100%)</td>
</tr>
<tr>
<td>Marital Status (n, %)</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Married</td>
<td>10 (31.3%)</td>
<td>2 (20.0%)</td>
<td>6 (85.7%)</td>
<td>2 (13.3%)</td>
</tr>
<tr>
<td>Divorced, Separated</td>
<td>3 (9.4%)</td>
<td>0</td>
<td>0</td>
<td>3 (20%)</td>
</tr>
<tr>
<td>Never Married</td>
<td>6 (18.8%)</td>
<td>1 (10.0%)</td>
<td>1 (14.3%)</td>
<td>4 (26.7%)</td>
</tr>
<tr>
<td>Widowed</td>
<td>13 (40.6%)</td>
<td>7 (70.0%)</td>
<td>0</td>
<td>6 (40%)</td>
</tr>
<tr>
<td>Education level (n, %)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>High school</td>
<td>19 (59.3%)</td>
<td>7 (70.0%)</td>
<td>4 (57.1%)</td>
<td>8 (53.3%)</td>
</tr>
<tr>
<td>Vocational/Technical</td>
<td>6 (18.8%)</td>
<td>0</td>
<td>1 (14.3%)</td>
<td>5 (33.3%)</td>
</tr>
<tr>
<td>Bachelor degree</td>
<td>3 (9.4%)</td>
<td>1 (10.0%)</td>
<td>1 (14.3%)</td>
<td>1 (6.7%)</td>
</tr>
<tr>
<td>Master’s or higher</td>
<td>4 (12.5%)</td>
<td>2 (20.0%)</td>
<td>1 (14.3%)</td>
<td>1 (6.7%)</td>
</tr>
<tr>
<td>Characteristic</td>
<td>Total Sample (n=32)</td>
<td>Attended ≤ 7 sessions (n=10)</td>
<td>Attended ≥12 sessions (n=7)</td>
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<td>-----------------------------</td>
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<tr>
<td>Currently exercise (n, %)</td>
<td>24 (75%)</td>
<td>6 (60.0%)</td>
<td>6 (85.7%)</td>
<td>12 (80%)</td>
</tr>
<tr>
<td>Exercise Frequency (n, %)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0-2 days/week</td>
<td>15 (46.9%)</td>
<td>7 (70.0%)</td>
<td>2 (28.6%)</td>
<td>6 (40%)</td>
</tr>
<tr>
<td>3-5 days/week</td>
<td>11 (34.4%)</td>
<td>1 (10.0%)</td>
<td>5 (71.4%)</td>
<td>5 (33.3%)</td>
</tr>
<tr>
<td>6-7 days/week</td>
<td>6 (18.8%)</td>
<td>2 (20.0%)</td>
<td>0</td>
<td>4 (26.7%)</td>
</tr>
<tr>
<td>Exercise Location** (n, %)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>At home</td>
<td>15 (46.9%)</td>
<td>2 (20.0%)</td>
<td>5 (71.4%)</td>
<td>8 (53.3%)</td>
</tr>
<tr>
<td>Fitness center</td>
<td>2 (6.3%)</td>
<td>0</td>
<td>1 (14.3%)</td>
<td>1 (6.7%)</td>
</tr>
<tr>
<td>Senior activity center</td>
<td>8 (25%)</td>
<td>5 (50.0%)</td>
<td>1 (14.3%)</td>
<td>2 (13.3%)</td>
</tr>
<tr>
<td>Characteristic*</td>
<td>Total Sample (n=32)</td>
<td>Attended ≤ 7 sessions (n=10)</td>
<td>Attended ≥12 sessions (n=7)</td>
<td>Lost to follow-up (n=15)</td>
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<td>---------------------------------</td>
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</tr>
<tr>
<td><strong>Transportation (n, %)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Private</td>
<td>16 (50%)</td>
<td>9 (90.0%)</td>
<td>7 (100%)</td>
<td>NA***</td>
</tr>
<tr>
<td>Public</td>
<td>1 (3.1%)</td>
<td>1 (10.0%)</td>
<td>0</td>
<td>NA***</td>
</tr>
<tr>
<td><strong>Used video at home (n, %)</strong></td>
<td>2 (6.3%)</td>
<td>1 (10.0%)</td>
<td>1 (14.3%)</td>
<td>NA***</td>
</tr>
<tr>
<td><strong>Reason for quitting (n, %)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Too difficult</td>
<td>2 (6.3%)</td>
<td>2 (20.0%)</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Schedule conflict</td>
<td>3 (9.4%)</td>
<td>2 (20.0%)</td>
<td>0</td>
<td>1 (6.7%)</td>
</tr>
<tr>
<td>Illness/health issue</td>
<td>8 (25%)</td>
<td>4 (40.0%)</td>
<td>0</td>
<td>4 (26.7%)</td>
</tr>
<tr>
<td>Did not like T’ai Chi</td>
<td>2 (6.3%)</td>
<td>2 (20.0%)</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>
COB & FES-I Scores

Subjects completing

\leq 7 \text{ sessions}

\geq 12 \text{ 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.

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

*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

- ≤ 7 Sessions
- ≥12 Sessions

Pre and Post Scores:

- ≤ 7 Sessions: Pre ~ 30, Post ~ 28
- ≥12 Sessions: Pre ~ 18, Post ~ 18

Legend:
- Blue: Pre
- Red: 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
  - $\frac{3}{4}$ lost
  - $\frac{1}{2}$ 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?


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.


