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BOXING AND OTHER NON-TRADITIONAL MODES OF COMMUNITY-BASED EXERCISE FOR PERSONS WITH PARKINSON DISEASE

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Disclosure

• No financial interests to disclose.
Objectives

The participant will be able to:

1. Identify at least two typical physical activity levels in persons with PD and discuss the social and motivational aspects of community-based group exercise.
2. The participant will be able to describe at least two non-traditional, community-based exercise approaches for the management of PD that are supported by the literature and list their specific benefits across the full spectrum of disability.
3. The participant will be able to identify at least recommendations for incorporation and implementation of the non-traditional exercise approaches into the clinic and the community.
4. The participant will be able to describe the importance of establishing and aligning community partners for long-term promotion of health and fitness for individuals with progressive disorders.
5. The participant will be able to identify at least two implications of community-based partnerships on clinical practice and long-term health promotion.

Exercise Levels

- 60% of Americans older than the age of 65 do not achieve the recommended daily amount of physical activity (Macera et al. Prev Chronic Dis, 2005)
- Activity levels for people with Parkinson disease are 1/3 lower than those without PD (van Nimwegen et al, J Neurol, 2011)
Physical Inactivity in PD

- Parkinson disease
  - Motor features
    - Gait alterations
    - Postural instability
    - Falls
  - Nonmotor features
    - Depression
    - Apathy
    - Cognitive decline
    - Constipation
    - Sleep problems
    - Fatigue

- Sedentary lifestyle and physical inactivity
  - Complication and comorbidities
    - Cardiovascular disease
    - Osteoporosis

- Mortality

Barriers to exercise

- Knowledge/Education
- Support
- Self-Efficacy
- Poor Health/Pain/Severity
- Access/Convenience
- Depression
- Motivation
- Cost

- Quinn et al., JNPT, 2010
- Ellis et al, Phys Ther, 2011
- Ene et al, Disabil Rehabil 2011
- Mathews et al, J Aging Phys Activity, 2010
Barriers to Exercise – Specific to PD

- Low Outcome Expectations
- Fear of Falling
- Lack of Time

Motivators to exercise

- Slow Progression/
  Prevent decline
- Knowledge of exercise benefits
- Setting goals
- Social interaction
- Family support

O'Brien et al, Disabil Rehabil, 2008
Quinn et al, Disabil Rehabil, 2010
Ene et al, JNPT, 2011
Factors Associated with Exercise Behavior in PD

Higher Self-Efficacy

- College Educated
- Age
- Exercise

• People with PD with higher self-efficacy are 2X more likely to regularly exercise than those with low self-efficacy


Other Motivators

- Fun
- Music
- Structure of Program
  - Convenience
  - PD specific
  - Group based
- Novelty of Exercise
  - Intensity
  - Non-traditional

Combs-Miller et al, 2016, In Review
Ene et al, *JNPT*, 2011
Factors that contribute to exercise adherence

• Perceived functional benefits
• Self efficacy
• Reassurance from trained instructors
• Social benefits
• Camaraderie within a group

Rodrigues de Paula et al, Mov Dis, 2006
States et al, JNPT, 2011
O’Brien et al, Disabil Rehabil, 2008
Crizzle & Newhouse, Occup Ther Health Care, 2012
Combs-Miller et al, 2016, In Review

Fraser & Spink, J Behav Med, 2002
O’Brien et al, Disabil Rehabil, 2008
Crizzle & Newhouse, Occup Ther Health Care, 2012
### Group Exercise for PD

<table>
<thead>
<tr>
<th>Benefits</th>
<th>Barriers</th>
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</thead>
<tbody>
<tr>
<td>Increased Adherence</td>
<td>Space</td>
</tr>
<tr>
<td>Social Support</td>
<td>Group Size</td>
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<tr>
<td>Action Oriented vs. Talk-Based</td>
<td>Self-Efficacy</td>
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<tr>
<td>Increased Quality of Life</td>
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<tr>
<td>Cost Effective</td>
<td></td>
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<tr>
<td>Efficient</td>
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</table>


### Non-Traditional Group Exercise

- Tai Chi
- Yoga
- Dance
- Boxing
Tai Chi – Essential Elements

- Body is naturally extended and relaxed
- Mind is tranquil but alert
- Consciousness commands the body
- Body movements are slow, smooth and well-coordinated
Tai Chi Protocols

• Protocols most often consist of:
  • 30-90 minutes of Tai Chi-based training
  • 4-24 weeks in duration, 2-5 times per week
  • Yang-style Tai Chi
    • 6-37 moves, short-form

Fong Mei Toh, 2013; Zhou et al, 2015
Motor Function

<table>
<thead>
<tr>
<th>Study or subgroup</th>
<th>Tai Chi</th>
<th>Controls</th>
<th>Std. mean difference</th>
<th>Weight</th>
<th>Year</th>
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</thead>
<tbody>
<tr>
<td>Hackney and Earhart 2008</td>
<td>-1.5</td>
<td>4.6</td>
<td>13</td>
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<td>12.3%</td>
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<tr>
<td>Li 2011</td>
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<td>Zhu et al 2011</td>
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<td>19</td>
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<td>Li et al 2012</td>
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<td>50</td>
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<td>Armare et al 2013</td>
<td>0.57</td>
<td>0.97</td>
<td>22</td>
<td>22</td>
<td>14.7%</td>
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<tr>
<td>Chou et al 2013</td>
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<td>11</td>
<td>13.7%</td>
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<td>Gao et al 2014</td>
<td>0.80</td>
<td>0.57</td>
<td>37</td>
<td>37</td>
<td>16.6%</td>
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</tbody>
</table>

Subtotal (95% CI): 11.9

Heterogeneity: $Q^2 = 0.30, I^2 = 28.6\%$ (P = 0.5903), $I^2 = 78\%$.
Test for overall effect: $Z = 3.11 (P = 0.002)$

- Forest Plot
  - Tai Chi has a significant effect on motor function in persons with PD

Zhou et al, 2015

Balance

<table>
<thead>
<tr>
<th>Study or subgroup</th>
<th>Tai Chi</th>
<th>Controls</th>
<th>Std. mean difference</th>
<th>Weight</th>
<th>Year</th>
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<tr>
<td>Hackney and Earhart 2008</td>
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<td>Li 2011</td>
<td>5.78</td>
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<td>Zhu et al 2011</td>
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<td>Li et al 2012</td>
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<td>65</td>
<td>65</td>
<td>73.3%</td>
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<td>Chou et al 2013</td>
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<td>2.03</td>
<td>11</td>
<td>11</td>
<td>10.5%</td>
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<tr>
<td>Gao et al 2014</td>
<td>4.16</td>
<td>3.83</td>
<td>37</td>
<td>37</td>
<td>30.3%</td>
</tr>
</tbody>
</table>

Total (95% CI): 169

Heterogeneity: $Q^2 = 0.09, I^2 = 13.3\%$ (P = 0.57), $I^2 = 12\%$.
Test for overall effect: $Z = 4.90 (P < 0.0001)$

- Tai Chi has a significantly positive effect on balance in persons with PD

Zhou et al, 2015
Gait

Zhou et al, 2015

Quality of Life

Zhou et al, 2015

• No significant effect on perception of health-related quality of life in persons with PD.
Tai Chi – Summary of Evidence

- Significant effects on motor function and balance
- However...
  - Small treatment effects
  - Small number of studies
    - Heterogeneity among studies
  - Various methods across studies
    - Comparison groups with and without intervention
  - Lack of sufficient follow-up analyses
Yoga - Aim

- The Goal of Yoga: “…the embodiment of focus, discipline, and unwavering concentration. He or she is devoted to the perfection of the asana (poses) and he or she challenges mind and body to achieve a ‘higher state of being.”

https://yoga.com/article/ultimate-goal-yoga

Types of Yoga??

WHAT’S THE EVIDENCE?
Limited Evidence with PD

- Yoga 2X/week for 12 weeks compared to no intervention

Sharma et al., Int J Yoga, 2015

Power Yoga?

- Designed to improve: Speed, Strength, Power, Balance
- Quick/fast transitions between poses
- Example:
  - From the middle of the yoga mat, from Warrior 1 or Warrior 2 move into triangle (bend to straighten) 2 times with hand to shin

Ni et al, 2016, online suppl.
Power Yoga - outcomes

- Compared Power yoga to power (resistance) training
- N=41
- 2X/week for 12 weeks
- Both groups showed significant improvements in:
  - MDS-UPDRS motor score
  - Balance (Berg and miniBEST)
  - Standing functional reach
  - Walking speed tests
  - 1 rep max test and peak power for leg press
Dance

- Many forms....

Argentine Tango

- Elements that may enhance movement for persons with PD
  - Dynamic balance
  - Turning
  - Walking backwards
  - Synchronizing movement to music
  - Multi-tasking
  - Adjustment to the environment
  - Cues from partner
  - Social engagement

- [https://www.youtube.com/watch?v=EajsKP-ARIE](https://www.youtube.com/watch?v=EajsKP-ARIE)

Earhart, 2009
Dance Protocol

- Duration/Frequency of training:
  - 60 to 90-minute classes
  - Daily for 2 weeks or 2-3 times/week up to 1 year
- Participants learn to lead & follow
- Practice frame and steps
- Progressively add more complex dance steps
- Improvisational steps
- PD paired with healthy volunteers
- Dancers wear comfortable shoes

WHAT’S THE EVIDENCE?
Motor Function

- Argentine Tango has a significant effect on improving motor function in persons with PD

Lötzke et al, 2015

Balance

- Argentine Tango has a significant effect on improving balance in persons with PD as measured by MiniBEST, but not with Berg

Lötzke et al, 2015
**Mobility**

- Argentine Tango has a significant effect on improving mobility as measured with the TUG in person with PD.

  Lötze et al, 2015

**Gait**

- No significant effects on gait endurance or freezing of gait.

  Lötze et al, 2015
Other outcomes

- Dual Tasking (Walking and Talking):

- Health Related Quality of Life:
  - Inconsistent findings across studies

Duncan & Earhart, Neurorehab Neural Repair, 2012
Boxing

Non-Contact Boxing
Boxing Training

- **Aim**: to condition body & mind for optimal control to overpower, protect, and outsmart the opponent.

Rock Steady Boxing (RSB)

- Non-traditional exercise program originated in Indianapolis, Indiana
- Community-based for persons with PD
- Anecdotal claims
  - Increased ease in completing activities of daily living
  - Decreased Parkinson symptoms
  - Improved quality of life

www.rocksteadyboxing.org/
Evolution of RSB

Then (2006)
- Designed for young onset
- Mild PD severity
- 1 trainer
- 6-8 classes/week
- 2 class levels
- Small community program

Now (2016)
- Ages 30-90 years
- All levels of PD severity
- 4+ trainers
- 17+ classes/week
- 4 class levels
- 200+ affiliate programs

PD1 → PD2 → PD3 → PD4

www.rocksteadyboxing.org/

RSB Training Program

- **90 minute sessions:**
  - 30 min. stretching/warm up
  - 45 min. boxing workout/PD specific activities
  - 5 min. core strengthening
  - 10 min. cool down/stretching

- **Circuit training** – rotate stations
- **Interval training** – 2-4 minute training bouts/1 minute rest breaks

- **Encouragement:**
  - “train as *intensely* as they can tolerate”
  - “push further than they think they can go”

- **Hand wraps/Boxing Gloves**
RSB Training Program

- Boxing Specific Exercises
- Functional Training
- Calisthenics/Strength Conditioning
- Core Exercises
- Stretching
- Additional activities:
  - Voice Activation
  - Deep Breathing
  - Dual Tasks

Boxing Specific Exercises

- Jumping rope
- Shadow box
- Speed bag
- Double-ended bag
- Heavy bag
- Focus mitts
- Chase the rabbit
Speed Bag
PD1

Speed Bag
PD3

Double-Ended Bag – PD1
Competition Bag – PD1

Focus Mitts
PD1

Focus Mitts
PD4
WHAT’S THE EVIDENCE?

Boxing Training for Patients With Parkinson Disease: A Case Series
Stephanie A. Combs, M. Dyer Diehl, William H. Staples, Lindsay Conn, Kendra Davis, Nicole Lewis, Katie Schaneman

• **Findings:**
  - Boxing training was a **safe and feasible** exercise option for the patients in this study
  
  • **All patients showed improvements** in at least 5 of the 12 outcome measures
  
  • **5 of 6 patients continued with RSB** across 36 weeks of study

Boxing vs. Traditional Exercise
Balance

Balance Confidence

Combs et al., NeuroRehabil, 2013

Boxing vs. Traditional Exercise
Walking Speed

Walking Endurance

Combs et al., NeuroRehabil, 2013
Long-Term Effects of Boxing in PD

- Community-based longitudinal cohort study (n=88)
  - Hoehn & Yahr Stages 1-4

- Assessment:
  - 5 times over 2 years
    - Baseline, 6, 12, 18, 24 months
  - Measures of impairments/activity/participation

Walking speed

![Graph showing walking speed over time with statistical significance notes](Combs-Miller et al., In Review)
Walking endurance

Six-Minute Walk Test

Margin of Stability

Standing Functional Reach Test
Balance Confidence

![Graph showing balance confidence over time for boxers and non-boxers.]

Quality of Life

![Graph showing PDQ-39 summary index over time for boxers and non-boxers.]

Combs-Miller et al; In Review
Does Mode Matter?

- Probably not....
BUT…. Dose Does Matter!!!

• Data from registry of 2252 people with PD
• Regular exercise (> 150 minutes/week) associated with better:
  • Mobility/physical function
  • Cognition
  • Quality of life
  • Less progression after 1 year!

COLLABORATIVE PARTNERSHIPS
Long-term health promotion
Where do healthcare professionals fit in?

Identified needs

- Coaches recognize their boxers often need:
  - Medical guidance to manage progression of PD.
  - Management of orthopedic problems related to physical activity.

They are Athletes!!
Importance of collaborative partnership

- Community-based fitness centers (e.g. RSB):
  - Many have no formal relationships with local clinicians or rehab services for transition.
  - Immediate need:
    - Develop an ongoing, interactive collaboration between volunteer physical therapists and community-based fitness centers to serve needs of members with disability.

- Long-term plan:
  - Develop a sustainable community-based collaborative network.
Importance of collaborative partnership

• Aims for partnership:
  1. Improve access to healthcare services
  2. Reduce potential risks for secondary complications
  3. Enhance adherence to exercise
  4. Generate immediate and appropriate referrals to health care professionals
  5. Greater awareness by health care professionals of community-based fitness opportunities
  6. Sustainable partnership through engaged volunteers

Development of partnership

• Identified key partners:
  • Coaches and Executive Director at RSB
  • Healthcare professionals
  • Physical Therapist volunteers:
    • Neuro Team
    • Ortho Team
    • Other healthcare providers….
Development of partnership

- Identified PT volunteers to conduct screenings
- Identified PT student volunteers to assist with screenings

Implementation

- Monthly screening sessions
  - 3 hours
  - Saturday mornings
  - 30 minute screen per boxer
- Performed at RSB gym
- Also offer “on call” consultations if needed
Implementation

• Triage
  • Neuro or ortho schedule based on primary complaint
  • RSB staff makes schedule and collaborates with PTs prior to screenings.

Ortho Screen

• Region Specific

• Assessment of ROM, Strength, Function

• Special Tests as needed to rule in or out pathology
Neuro Screen

- Selected outcome tools with established norms and/or cut off scores
  - Motor function
  - Gait
  - Standing Balance
  - Balance/Falls confidence
  - Cognition

Referral Sources

- Primary Care/Specialists
  - Orthopedic
  - Neuro
- Rehabilitation specialists
  - Physical therapy
    - Orthopedic
    - General Neuro
    - Vestibular
  - Occupational therapy
  - Speech therapy
  - Neuropsychology
3-Month Screening Breakdown

- Total screens completed = 63
  - Ortho screens = 43
  - Neuro screens = 20
  - ** Out of about 170+ current RSB boxers

3-Month Screening Follow Up Plan

- HEP with phone/email follow up by screener = 29
- PT referral = 25
- MD referral = 7
- OT referral = 1
- Speech referral = 2
**RANDY**

**Coach's Observation**
- Hip and groin pain
- Exacerbated by impact
- Coaches taught corrective exercise w/out much result
- Pain with running
- Frustration

**PT Screening Findings**
- Decreased left hip ROM due to muscular and capsular tightness
- Provided HEP for hip stretching

**Current Status**
- Pain free
- Has since ran a mini marathon

**MARY**

**Coach's Observation**
- Blurred vision
- Droopy eyelids
- Vertigo
- Frustration with medication not addressing her "mystery symptoms"

**PT Screening Findings**
- Signs of vestibular dysfunction
- DHI = 36 (moderate handicap)

**Current Status**
- No more complaints of dizziness
- Resumed all activities at RSB
Implications of Collaborative Partnership

- Enhanced adherence:
  - 98% of boxers screened were retained in the program 6 months later
- Win-win for all involved!
  - Improved access and awareness of healthcare services
  - Many referrals generated
- Sustained partnership for almost 2 years:
  - Growing volunteer base

Future Implications

- Within RSB
  - Evaluation for long-term assessment of screening program
  - Additional healthcare disciplines to screening team
  - Expand to RSB affiliates

- Beyond RSB
  - Develop a model for a sustainable community-based collaborative network.
Acknowledgements

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  • University of Indianapolis
  • Parkinson’s Awareness Assoc. of Central Indiana
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• Community PT volunteers
• University of Indianapolis
  • Faculty
  • Student researchers

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• Stephanie Combs-Miller, PT, PhD, NCS
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