Making Fitness Fun: Parkinson Disease and Nontraditional Community-Based Group Exercise

Acknowledgements

- Madeleine Hackney, PhD, Ryan Duncan, PT, DPT
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- Greater St. Louis Chapter of the APDA
- Marian Chace Foundation of the American Dance Therapy Association
- National Institutes of Health (K01 HD048437)
- Parkinson’s Disease Foundation
- Participants & Volunteers

Session Outline

- Introduction: Parkinson Disease and Physical Inactivity
- Making Fitness Fun
  - Motivation to Exercise
  - Barriers to Exercise
- Synthesis of Evidence from the Literature
  - Tai Chi
  - Dance
  - Boxing
  - Other Approaches
- Recommendations for Implementation
  - In the Clinic
  - In the Community
- Concluding Remarks/Summary
- Questions/Open Discussion

Objectives

- Identify how physical activity levels differ in individuals with PD as compared to age-matched controls.
- Describe non-traditional, community-based exercise approaches for the management of PD that are supported by the literature.
- List the specific benefits across the full spectrum of disability that may be conveyed by different group exercise approaches as supported by current scientific literature.
- Discuss the social and motivational aspects of participation in group exercise.
- Recognize the recommendations for incorporation and implementation of the non-traditional exercise approaches into the clinic and the community.
- Demonstrate knowledge of where to find resources to assist in the process of translating the scientific evidence into practice.
- Interpret the significance of establishing and aligning community partners for long-term promotion of health and fitness for individuals with PD.

Parkinson Disease Symptoms

- 4 cardinal signs:
  - Resting tremor
  - Bradykinesia
  - Rigidity
  - Postural instability
- Common features:
  - Flexed forward posture
  - Mask-like face
  - Quiet, fast, monotonous speech
  - Small handwriting
  - Shuffling gait
- Typically asymmetric

Treatment of PD

- Medication
  - Dopamine
  - Dopamine agonists
- Deep Brain Stimulation
  - Subthalamalic nucleus
  - Globus pallidus internal segment
- Exercise?
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Physical Inactivity in PD

Those with PD are 1/3 less active than people without PD.

Top 10 Reasons People with PD Should Exercise

- Cardiovascular benefits
- Primary or secondary prevention of osteoporosis
- Prevent/postpone cognitive decline
- Prevent depression/improve mood
- Improve sleep
- Decrease constipation
- Decrease fatigue
- Improve functional motor performance
- Improve effectiveness of pharmacotherapy
- Optimize dopaminergic system


PD Risk and Exercise

- Lower with moderate to vigorous physical activity exercisers compared to no exercisers
  - Men >16 Met-h/wk, women > 11.5 Met-h/wk
  - Relative risk 0.6 (p = 0.02, 95% CI = 0.4)

Conclusions
  - Moderate exercise reduces risk?
  - Decreased baseline activity due to preclinical PD?

Plato Said It, So Why Don’t We Don’t Get It?

- "Lack of activity destroys the good condition of every human being, while movement and methodical physical exercise save it and preserve it." - Plato

- 60% of Americans older than 65 do not achieve the RDA of physical activity
- Activity levels for people with Parkinson disease (PD) are even lower than average

Does exercise/rehabilitation benefit those who already have PD?

- People with PD improve function with exercise
  - Early intervention key to improving and preserving function
  - ADLs, stride length, walking speed, balance, strength = YES in the short-term (ES = .4 -.49)
  - Falls, depression, long-term, disease progression = ?

Plato Said It

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- Activity levels for people with Parkinson disease (PD) are even lower than average

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Exercise Motives

<table>
<thead>
<tr>
<th>Older Adults</th>
<th>People with PD (Ene et al., JNPT, 2011)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Health</td>
<td>Slow disease progression</td>
</tr>
<tr>
<td>Fitness</td>
<td>Prevent decline</td>
</tr>
<tr>
<td>Feel better</td>
<td>Exercise is beneficial</td>
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<tr>
<td>Family encouragement</td>
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</table>

Barriers to Exercise in PD

Motivating Exercise

- Enjoyable (Aaltonen et al., Behav Sci, 2012; Dacey et al., Am J Health Behav, 2008)
- Music
- Evidence that it works
- Medical professional guidance
- Convenience (Ene et al., JNPT, 2011)

Barriers to Exercise

<table>
<thead>
<tr>
<th>Older Adults</th>
<th>People with PD (Ene et al., JNPT, 2011)</th>
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</thead>
<tbody>
<tr>
<td>Sickness, pain</td>
<td>Disease severity</td>
</tr>
<tr>
<td>Knowledge</td>
<td>Education</td>
</tr>
<tr>
<td>Motivation</td>
<td>Depression</td>
</tr>
<tr>
<td>Self-efficacy</td>
<td>Self-efficacy</td>
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<tr>
<td>Economics</td>
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<tr>
<td>Environment</td>
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<tr>
<td>Medical advisement</td>
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</tbody>
</table>

Community-Based Group Exercise Approaches

- Tai Chi (19, 10 are data driven)
- Dance (34, 12 data driven)
- Boxing (2, 1 data driven)
- Others
  - Yoga (1 case report)
  - Aquatics (1)
- Tai Chi
  - Randomized to 3 groups:
    - Tai Chi
    - Resistance Training
      - 5% BW vest, 3lb. ankle weights
    - Stretching
    - 65 per group
    - 24 weeks, twice weekly
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\[ \text{Tai Chi} \]

- Improved balance, stride length, functional reach more so than strength training or stretching
- Tai Chi improved gait velocity, peak knee extension torque, Timed Up and Go, and UPDRS III more so than stretching

\[ \text{Clinical Application: Tai Chi} \]

- Class specific for PD
- Involve local Tai Chi masters
- Tai Chi for Energy and Renewal: Living Well with Parkinson’s Disease (Boehringer Ingelheim, Inc. 2007)

Tai Chi Literature


Increasing Physical Activity Through Dance

- Long time social dancers have better balance and walking (Verghese J, J Amer Ger Soc, 2006)
- Waltzing improved quality of life and heart function in people with congestive heart failure (Belardinelli et al., Circ Heart Fail, 2006)
- Tango improved balance/walking more than walking for exercise among frail elderly (McKinley et al., J Aging Physical Act, 2008)

Tango for PD?

- Tango may target specific PD-related movement deficits
  - Tremor
  - Rigidity
  - Bradykinesia
  - Postural instability/gait disorder
- Music and partner may serve as cues to facilitate movement
- Social, engaging, caregiver can participate

Tango and PD: Research to Date

Tango Classes

- 1 hr lessons twice a week for 3 months
- Person with PD dances with partner who does not have PD
- Everyone dances leader and follower roles
- Change partners every 10-15 minutes
- Open embrace or practice hold

Class Structure

- Greeting
- Warm up
- Step of the day
- Rhythm training
- Synthesis
- Closing
- Volunteers

Tango Vs. Traditional Exercise

- Both Tango and Exercise improved significantly on the UPDRS Motor Subscale 3 (i.e., severity of motor symptoms decreased over course of intervention)
- 4 of 9 Tango and 0 of 10 Exercise participants took part in extra classes after completing study

Tango Vs. Waltz Vs. Tai Chi

- .92* 
- .93* 
- .85* 
- .14
- .63* 
- .50* 
- .36* 
- .01

Tango Vs. Waltz Vs. Tai Chi

- Change in 5-Minute Walk Distance (m)
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Tango Vs. Waltz Vs. Tai Chi

<table>
<thead>
<tr>
<th>Change in Balance Scale</th>
<th>Length (m)</th>
</tr>
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<tbody>
<tr>
<td>Tango</td>
<td>.57</td>
</tr>
<tr>
<td>Waltz/Foodst</td>
<td>.47</td>
</tr>
<tr>
<td>Tai Chi</td>
<td>.47</td>
</tr>
<tr>
<td>Control</td>
<td>.10</td>
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</tbody>
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Two to Tango?

Short and Long-Term Effects of Tango in PD

- 1 year intervention compared to no exercise control group
- Community-based, 1 hour classes, 2x/wk
- Assessments performed OFF medications
  - Baseline, 3, 6, and 12 months

Balance

Walking
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Walking While Talking

Upper Extremity Function

Motor Symptoms

Participation: Activity Retention

Participation: New Activities

Clinical Application: Tango

- Weight shifts
- Partnering and frame
- Walking
- Basic step
Increase Physical Activity to Break The Vicious Cycle

Summary
• Dance as an alternative approach to exercise is feasible and appropriate for people with PD
• Dance has the advantage of not seeming like exercise
• Dance can convey significant benefits to people with PD in a very short time period and does not have to be done with a partner
• It is possible that exercise may modify disease progression!

Additional Dance Literature

Acknowledgements
• M. Dyer Diehl, PT, PhD
• Parkinson Awareness Association of Central Indiana (PACCI)
• Rock Steady Boxing Foundation
• University of Indianapolis
• Participants

Boxing
• There is a strong positive relationship between grip strength and boxing performance (Guidetti et al, J Sports Med Phys Fitness, 2002)
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Boxing vs. Non-Contact Boxing for PD

Why Boxing for PD?
- Boxing involves a diversity of skills:
  - Endurance, strength, power, speed
  - Agility, flexibility
  - Hand-eye coordination
  - Balance
  - Mental focus

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

Rock Steady Boxing (RSB)
- Non-traditional exercise program located in Indiana
- Community-based for persons with PD
- Anecdotal claims
  - Increased ease in completing activities of daily living
  - Decreased Parkinson symptoms
  - Improved quality of life

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 to different 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”
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Boxing Specific Exercises
- Jumping rope
- Shadow box
- Speed bag
- Double-ended bag
- Heavy bag
- Focus mitts
- Chase the rabbit

Functional Training
- Walking/running
- Getting out of chairs/off floor
- Climbing in/out of boxing ring
- Rolling (to prevent injury)
- “Get up and go” drills
- Rotational drills
- Balance Challenges

Calisthenics/Strength Conditioning

Calisthenics/Endurance
- Jumping jacks
- Skipping
- Mountain climbers
- Treadmill – walk/run
- Overground – walk/run
- Stationary bike

Strengthening
- Squats
- Lunges
- Push ups
- Tricep dips
- Pull ups
- Calf raises

Core Exercises
- Crunches/Sit ups
- Plank work
- Leg lifts/scissors/grapevine
- Bicycles

Stretching
- Core static stretching
- Dynamic stretching

RSB: Additional Activities
- Voice activation
  – “Get to know ya” sessions
  – Singing
  – Count loudly with coaches
  – RSB Cadence
  – “Whoo Haa’s”
- Deep breathing
- Dual tasks
Boxing and PD: Research to date

- PTJ Video Central: http://ptjournal.apta.org/site/misc/videos.xhtml
- Boxing concepts in other programs:

Boxing vs. Traditional Exercise

- Pilot randomized controlled trial (n=31)
- Pre-test/post-test design
  - Outcomes: Balance, balance confidence, walking function, quality of life
- 24-36, 90 minute sessions for 12 weeks

Boxing Training for Patients With Parkinson Disease: A Case Series

Stephanie A. Combs, M. Dan Diehl, William H. Staples, Lindsay Conn, Kendra Davi, Nicole Lewis, Katie Schaneman

- Purposes:
  - Feasibility of boxing training
  - Examine changes in balance, mobility, and quality of life in persons with PD over time
- Methods:
  - 7 patients with PD, all new to RSB
  - Participated in 24-36 boxing sessions in first 12 weeks of the study
  - Measured balance, mobility, and quality of life 12, 24, and 36 weeks after starting the boxing training

Boxing Training for Patients With Parkinson Disease: A Case Series

Stephanie A. Combs, M. Dan Diehl, William H. Staples, Lindsay Conn, Kendra Davi, Nicole Lewis, Katie Schaneman

- Findings:
  - Patients with mild PD showed improvements earlier than those with moderate to severe PD
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**Boxing vs. Traditional Exercise**

- Both the boxing and traditional exercise group significantly improved mobility on the TUG and dual-task TUG.
- Both groups reported significant improvements in their perception of their quality of life after participating in their respective training program.

**Long-Term Effects of Boxing in PD**

- Community-based longitudinal cohort study
- Non-randomized: boxers and non-boxers
- Assessment: 5 times over 2 years, Baseline, 6, 12, 18, 24 months

**Boxing vs. Traditional Exercise**

- Walking Speed
  - Both groups significantly improved walking speed.
- Walking Endurance
  - Both groups significantly improved walking endurance.

**Boxing & Cognitive Flexibility**

- Hoehn & Yahr Stage 1
- Non-randomized: boxers and non-boxers
- Assessment: 5 times over 2 years, Baseline, 6, 12, 18, 24 months

**Boxing & Grip Strength**

- Hoehn & Yahr Stage 1
- Non-randomized: boxers and non-boxers
- Assessment: 5 times over 2 years, Baseline, 6, 12, 18, 24 months

**Boxing & Walking Function**

- Hoehn & Yahr Stage 1
- Non-randomized: boxers and non-boxers
- Assessment: 5 times over 2 years, Baseline, 6, 12, 18, 24 months
Increase Physical Activity to Break The Vicious Cycle

Summary

- Boxing is a safe and feasible alternative community-based exercise approach for people with PD.
- Boxing training can significantly enhance cardiovascular fitness (endurance) and mobility in people with PD.

Clinical Application: Boxing

- Shadow Boxing
  - Focused punches in boxing stance
  - Combinations
    - 1-2
    - 1-2 hook
    - 1-2 hook 2
  - Slipping and ducking
  - Blocking

Other Non-Traditional Community-Based Exercise Approach

- Yoga
- Aquatic
- Qigong

Recommendations for Implementation into the Community

- Group Exercise
- Facility
- Staff
- Class structure
- Assessment
- Other

Adherence

Motivation

Social Support

Group Exercise

Cohesion
**Making Fitness Fun: Parkinson Disease and Nontraditional Community-Based Group Exercise**

### Group Exercise for PD

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

*O’Brien et al, Disabil Rehabil, 2008; Crizzle & Newhouse, Occup Ther Health Care, 2012; Fraser & Simp, J Behav Med, 2002; Rodrigues de Paula et al, Mov Dis, 2006*

### Implementation in the Community: Facility Recommendations
- Accessibility
  - Location
  - Time/schedule of classes
  - Outdoor environment of the facility
  - Indoor facility environment
- Exercise equipment
  - Tango Dance/Tai Chi
  - Boxing
- Separate space for caregiver interaction

### Implementation in the Community: Staff Recommendations
- Leadership/Coach
  - Engagement/Motivator
  - Reassurance
  - Education/knowledge regarding exercise & PD
- Staff/participant ratio
- Volunteers to assist
  - Tango – Partner individuals with PD with individuals WITHOUT disability
  - “Floating” volunteers

*O’Brien et al, Disabil Rehabil, 2008; Crizzle & Newhouse, Occup Ther Health Care, 2012*

### Implementation in the Community: Class Structure Recommendations
- PD specific classes
  - Similar stage of disease severity
  - Rock Steady Boxing class structure:
    - **PD1**
      - Mild symptoms
      - No assistance required
      - Focus of class:
        - High intensity
        - Rapid transitions between exercises
        - Improve fitness
        - Maintain healthy body
    - **PD4**
      - Severe symptoms
      - Cognitive impairments
      - Caretaker assistance required
      - Focus of class:
        - Flexibility
        - Balance
        - Improve self-awareness
        - Walking

*O’Brien et al, Disabil Rehabil, 2008*

### Implementation in the Community: Class Structure Recommendations
- Modification of activities when necessary
  - Safety
  - Balance
  - Pain
- Monitor cardiovascular response
  - Heart Rate
  - Rate of Perceived Exertion Scale

*Rating of Perceived Exertion Scale*:

- **6**: No exertion at all
- **7**: Slightly light
- **9**: Very light
- **12**: Light
- **13**: Somewhat hard
- **15**: Hard (slower)
- **17**: Very hard
- **19**: Extremely hard
- **30**: Maximum exertion

### Implementation in the Community: Assessment Recommendations
- Ongoing measurement to:
  - Demonstrate individual change
  - Improve confidence
  - Demonstrate program outcomes
- Assessor:
  - Preferably NOT the trainers
  - Volunteers/Students
  - Ongoing training for reliability
Assessment Example

- Rock Steady Boxing Assessment Format
  - Completed every 6 months
  - Based on levels of the ICF

<table>
<thead>
<tr>
<th>Impairment</th>
<th>Activities</th>
<th>Participation</th>
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<tbody>
<tr>
<td>Purdue Pegboard</td>
<td>Fullerton Balance Assessment</td>
<td>PDQ-39</td>
</tr>
<tr>
<td>Sit and Reach</td>
<td>TUG</td>
<td></td>
</tr>
<tr>
<td>Davies Test</td>
<td>Jump Rope Test</td>
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</table>

Implementation in the Community: Other Recommendations

- Develop a plan for sustainability
- Create a team environment
- All participants should experience success
  - End class with applause (dance) or a cadence (boxing)
- Include music
  - Tango: Begin with slower tempo, simple beat for rhythmical training and increase sophistication of musical selection as able (Hackney & Earhart, Am J Dance Ther, 2010)
  - Boxing: “Rocky” theme, holiday music
- Have FUN!!

Establishing Community-Based Exercise Programs

- Needs of community?
- Partnerships
  - Established programs
  - Senior Centers
  - Churches
  - YMCA
  - Fitness Facilities
  - Rehab Centers
- PT Collaboration with:
  - Personal Trainers
  - Inclusive Trainers

Resources for Established Community-Based Exercise Programs

- Where can we find resources?
  - NCHPAD: National Center on Health, Physical Activity and Disability (www.ncpad.org)
  - Parkinson disease organizations
    - Example: PAACI – Parkinson’s Awareness Association of Central Indiana
    - State Departments of Health
    - Hospitals/Rehabilitation Centers
    - Universities/Researchers

Establishing Community-Based Exercise Programs

- Developing a relationship with a community partner:
  - Interested in collaboration
  - Aligned missions
  - History of engagement/connections in the community
  - Staff/volunteers to participate

Increase Physical Activity to Break The Vicious Cycle

Additional References

- Martz CA. Using a model of reciprocal mentorship to develop, implement, and sustain a group-based exercise program for the frail elderly. *Phys Occup Ther Geriatrics.* 2008;26:41-56.