Why Dancing for Parkinson's?

Investigation of Q of L and motor changes for those with Parkinson's Disease as a result of a 12 week dancing intervention

My personal interest

Parkinson's Disease

Idiopathic Parkinson's Disease:

    - A progressive neurodegenerative movement disorder

    - Prevalence = ~1% of population >65 years, 2% > 80

Stages:

    1) Diagnosis

    2) Maintenance

    3) Complex

    4) Palliative

Causes:

    - Still largely unknown

        - Small genetic risk factor

        - Environment

Parkinson's Disease cont'd

Neural basis of PD:

       -Degeneration of dopimanergic neurons of SN → striatum of BG

      - BG → Motor control and motor learning

           - To organize and control habitual movements and coordinate these movements into a sequenced whole (which movements get selected and in which order)

           - Two pathways:

                  - <u>Direct</u>: Movement selected

                  - <u>Indirect</u>: Movement inhibited

- Disrupted functioning of BG = problems initiating internally-guided movements

Signs and symptoms:

- Cardinal = Resting tremor, rigidity, bradykinesia and akinesia

- Other = Hypomimia (face masking), festinating gait, freezing

- Non-motor = depression, cognitive problems, anxiety, pain, parasympathetic problems, psychosis

* symptoms appear after 50%-90% cell death of these dopaminergic neurons

Impact of symptoms:

- ADL, emotional well-being, QoL, withdrawal, reduced activity, falls, anxiety depression*

Treatment:

- Pharmacological: (levodopa*, dopamine agonists, COMT inhibitors, Anticholinergics, MAO-B inhibitors)

- Surgery: DBS, ablation

Limitation of treatment:

-Fluctuations and dyskinesia ("wearing off" and "on/off" periods)

- Surgical eligibility, invasive

- Treatment limited to issues of dopaminergic neuronal cell dysfuntion (motor symptoms only)

Current Literature: Parkinson's Disease and Dancing

Exercise itself
- Benefits of exercise in general for health, aging, cognition, affect, anxiety
- For PD:
  - Improvement of gait velocity, strength, balance
  - Gait velocity = a predictor of falls
    - Falls = Social isolation, reduction in exercise, further declines in gait which lead to further falls

Dance
 - "increased body and emotional awareness, improved body image, renewed sense of physical and emotional well-being"(Westbrook & McKibben, 1989)
- Increasing movement repertoire/potentials → assist with freezing
- Physical, social, and emotional benefits
- Physical benefits translate into functional benefits*
- Enjoyable = compliance!
- Neuroprotective? Research is heading there... while waiting, we know exercise ≠ aversive (Earhart → suggesting that focus turn to secondary and primary prevention)

- **Motor learning in PD**
  - 2 distinct pathways for ML → one = cortico-basal ganglia-thalamo-cortical loop
    - BG impaired so learning impaired?
      - Learning does happen, just slower and less efficiently (more neural networks recruited)

Impact of a Weekly Dance Class on the Functional Mobility and on the Quality of life of Individuals with Parkinson's Disease
Heiberger et al. (2011)

Hieberger Study Overview

Aims:

    1) ST motor effects immediately after class

    2) LT effects on QoL on PD participants and their caregivers

Rationale:

    - PD= declines in mobility → increased falls

    - PD = Changes in mental status → depression + cognitive abilities

    - Decreased function = withdrawal = decreased QoL

    - Medication for motor symptoms loses efficacy in late stages

    - Dance:

        - Enjoyable and engaging (compliance)

        - Increased QoL

        - Increased coordination and balance

        - Improved balance

        - Improved cognitive performance

* No study as of yet had examined the ST effects of dance class on PD*

Participants, Materials, & Procedures

Participants:

- N = 11 of participants from 8 month dance class (25 meetings) → based on Mark Morris style class
- μ age = 71.3 ± 8.4 years
- 6 women, 5 men → PD diagnosis range (20-16 years)
- - 3 *de novo* participants (only attended last class)
- - 4 caregivers

Materials:

- <u>Motor tests:</u>
    - UPDRS III (motor component of UPDRS)
    - Timed up and Go (TUG)
    - Semitandem (SeTe)
- <u>QoL:</u>
    - QOLS from Oregon Health and Science University + 2 added questions
    - Questionnaire adapted from Westheimer (2008)
    - Well being immediately after class
    - Caregiver questionnaire
        - adapted from Westheimer (2008)

Procedures:

- Motor = immediately before and after class
- Questionnaires = well-being after class immediately post-class + all others were take home

Table 2 | Dance elements in their sequential order.

Type of exercise	Exercise	Usefulness	Music
Welcome	"Name game"	Individual presentation, establishing contacts, improvisation, creativity, observation, memory	Royal Academy Vol. 4 Track 1
Warming-up/breath	"Swimming and flying"	Body awareness, breathing, posture, proprioception	Royal Academy Vol. 5 Track 1
Suppleness	"Joint movements," "water lily"	Exercises against rigidity for neck, shoulders, wrists, hands, and ankles	Royal Academy Vol. 5 Track 3, Dance with Margot Track 4
Foot exercises	"Tendus," "Jettés"	Warming-up and stretching of the feet, coordination, reactivity	Royal Academy Vol. 5 Track 5, Royal Academy Vol. 5 Track 8
Ballet barre exercises	"Ronds de jambs" "Balançoire"	Balance, postural stability	Royal Academy Vol. 4 Track 13
Jazz steps	"New Orleans Jazz"	Walking exercise, rhythm, coordination	Putumayo presents: "New Orleans" Track 3
Telling stories	"Butterfly", "Spanish dance"	Expression, esthetics and grace, imagination, motor imagery	Royal Academy Vol. 4 Track 23 (instrumental version "my way," Frank Sinatra), Soundtrack "Chocolat" Track 18 "Caravan"
Contact improvisation	"The ant"	Stimulation of proprioception, mobility, reactivity, agility	Royal Academy Vol. 4 Track 40
Hand/finger exercises	"The seasons: petals, leaves, snowflakes," "the piano"	Fine motor skills, dexterity, contact, exchange, interaction, use of external input	Royal Academy Vol. 4 Track 39, Soundtrack Amélie Poulain Track 4 "Comptine d'un autre été »
Pair dance	"Chocolat" "Clouds" "Waltz"	Relationship, contact, balance, postural stability, movement initiation, walking, synchronicity, proprioceptive feedback	Soundtrack "Chocolat" Track 4 "Viane sets up shop" Dance with Margot Track 29, Royal Academy Vol. 4 Track 34
Group dance	"Folk dance"(Breton, Greek), "Louis Armstrong – Dance"	Synchronicity, movement initiation, walking, sense of community, proprioceptive feedback, balance	Putumayo presents: "New Orleans" Track 3
Choreography dance theater	Modified "Pina Bausch" Dance (Kontakthof 13/16) "Boat trip"	Memory, cognition, coordination, synchronicity, expression facial expression, imagination, motor imagery, humor, laughing	Soundtrack Amélie Poulain Track 7 "Guilty" Soundtrack Amélie Poulain Track 1 «J'y su is jamais allé »Track 5 «la noyée »
Farewell	"la révérence"	Body awareness, perception, relaxing, breathing, posture, relationship, sense of community	Royal Academy Vol. 4 Track 27 (Gymnopédie No. 1, Eric Satie)

Findings

Findings:

- Used sign test (non-parametric) for all motor tests
- Absolute frequency of responses for QoL
    - Motor:
        - UPDRS III score
        - TUG = NS but trend of improvement
- QoL: (frequencies from q #18)
    1 = Active recreation and mobility
    2 = Socializing
    3 = Health, relationships, helping others, expressing creatively
- Well-being:
    - Improvements post-class for majority of participants
- Caregiver:
    - QoL and relationship to patient improved

Limitations

Limitations:

- Testing for comparison = directly after the dance class → fatigue?
- Improvements may only be developed on a LT scale
  - Testing was done on ST only
  - Re: balance and gait being NS
- Few and coarse measurements for balance/gait → the need for more sensitive measures
- QoL → looking at long term but no baseline to compare against + only looking at frequencies

Dancing with Parkinson's at NBS

- Canada's National Ballet School – 400 Jarvis Street
- 75 min class 1X/wk – 12 weeks
- Class structure:
  - Ballet-based
  - Seated, barre work, centre work, dance
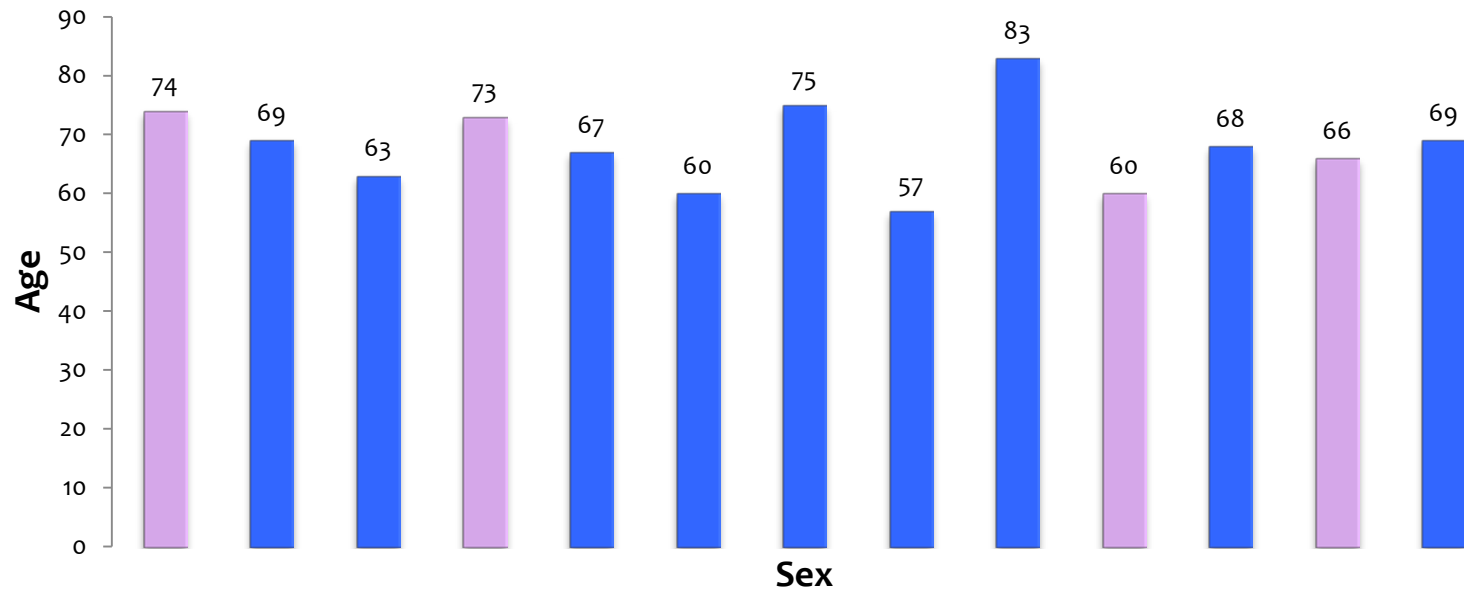 - Live accompaniment
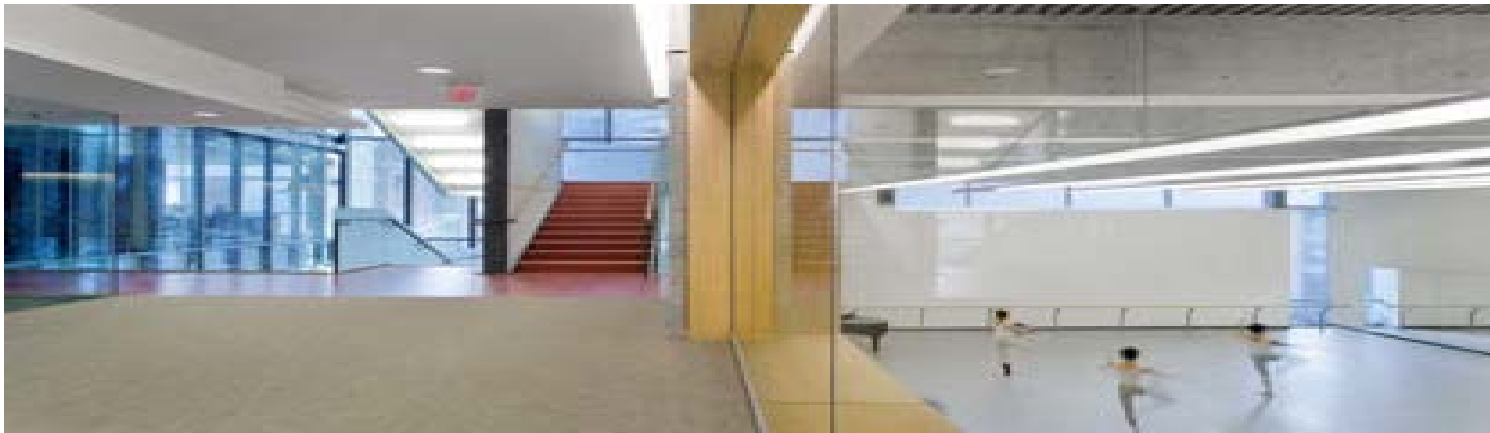
Participants

Volunteer subjects attending classes at NBS

- N = 13 with PD

- μ age = 68 ± 7.16 (range = 60 – 83)

- μ age of PD onset = 63 ± 10.92

- μ years living with PD = 4.4 ± 4.7

Participants

Population Demographics

The BBS, TUG, and OQOLS

Usage and validity

-TUG

- Strong inter-rater and retest reliability
- Able to differentiate different phases of the levodopa cycle
- Strongly correlated with the Berg (r = -.76)

-BBS

- Internally reliable and valid
- recent study removed 2 measures in order to achieve this validity
- BBS-12 (not 14 - static sitting and standing removed)

-Oregon Quality of Life Scale

- Reliable and valid
- "Content validity analysis indicates that the instrument measures domains that diverse patient groups with chronic illness define as quality of life."

Measurements

Baseline – Day 1 (Sept 24th, 2013)

      - Before or after – or both.

      - Behaviour measures:

            - The Berg Balance Scale

            - Timed up and Go

    - QoL Questionnaires:

            - Oregon QOLS

Measurements cont'd

Follow up – Day 2 (December 3rd*)

    - Before or after – or both.

    - Behaviour measures:

        - The Berg Balance Scale

        - Timed up and Go

  - QoL Questionnaires:

        - Oregon QOLS + 2 questions form Hieberger

        - Question of well-being (immed. after class)

        - Care giver questionnaires – taking class

Visualization Diary

Visualize learned dance: (showdown hoedown)

-Showdown music from the Ballet "Rodeo" composed by Aaron Copland

Diary:

- Throughout program (in class and at home)
- For how long did you visualize? What did you visualize? With music Eyes open/closed?

Visualization:

- Popular in sport psychology, due to it's efficacy in improving performance
- Overlap in brain systems for imagery and action (imagery rehearsal translates to physical gains)
- "motor imagery can activate brain regions associated with actual motor movement, motor imagery is expected to enhance motor skill performance and become an underlying principle for physical training in sports and physical rehabilitation "

"I'll try a few times to get out of a chair and I can't do it, but if I close my eyes and visualize it I can stand up."

- Participant at NBS

Comparing Populations

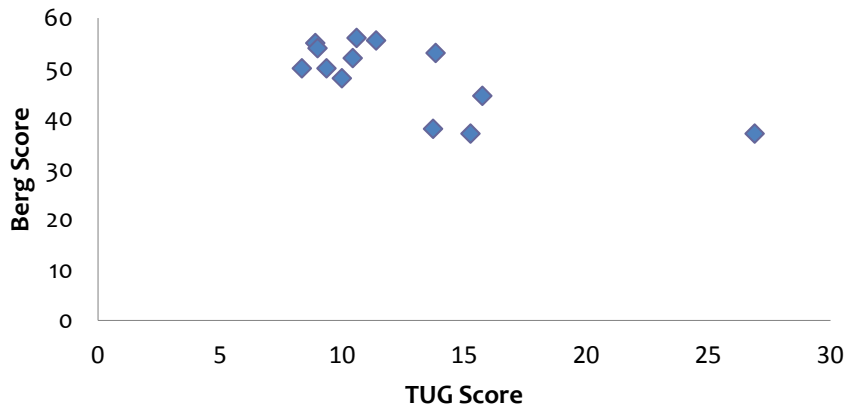BBS (max score is 56, higher more desirable)
- Joelab: $\mu = 48.4 \pm 1.97$ (SEM)
  - N = 13
- Hackney (2007): $\mu = 46.8 \pm 1.00$ (SEM)
  - N = 9
  - $P > .20$ ($t(20) = 1.39$)
- Hackney and Earhart (2010): $\mu = 47.8 \pm 4.6$ (SEM)
  - N = 20
  - $P > .50$ ($t(31) = 0.101$)
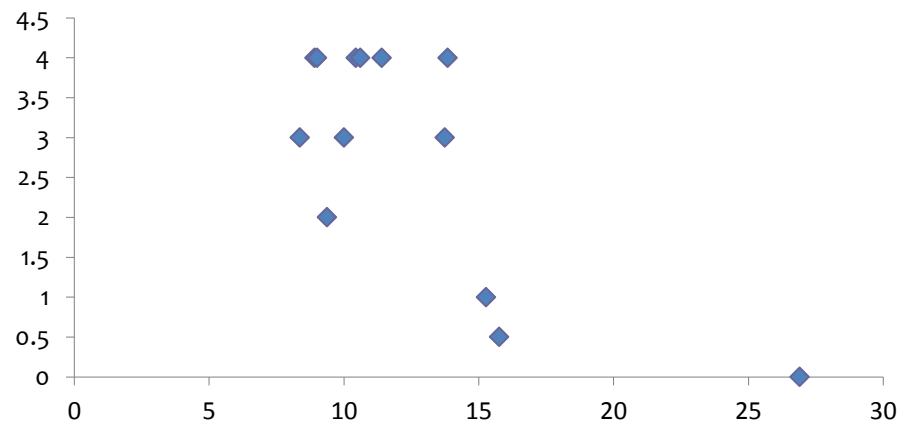
TUG (secs, under 10 = normal)
- Joelab: $\mu = 12.58 \pm 1.38$ (SEM)
  - N = 13
- Hackney (2007): $\mu = 10.7 \pm 0.4$ (SEM)
  - N = 9
  - $P > .20$ ($t(20) = 1.10$)
- Hieberger (2010): $\mu = 10.6 \pm 0.5$ (SEM)
  - N = 11
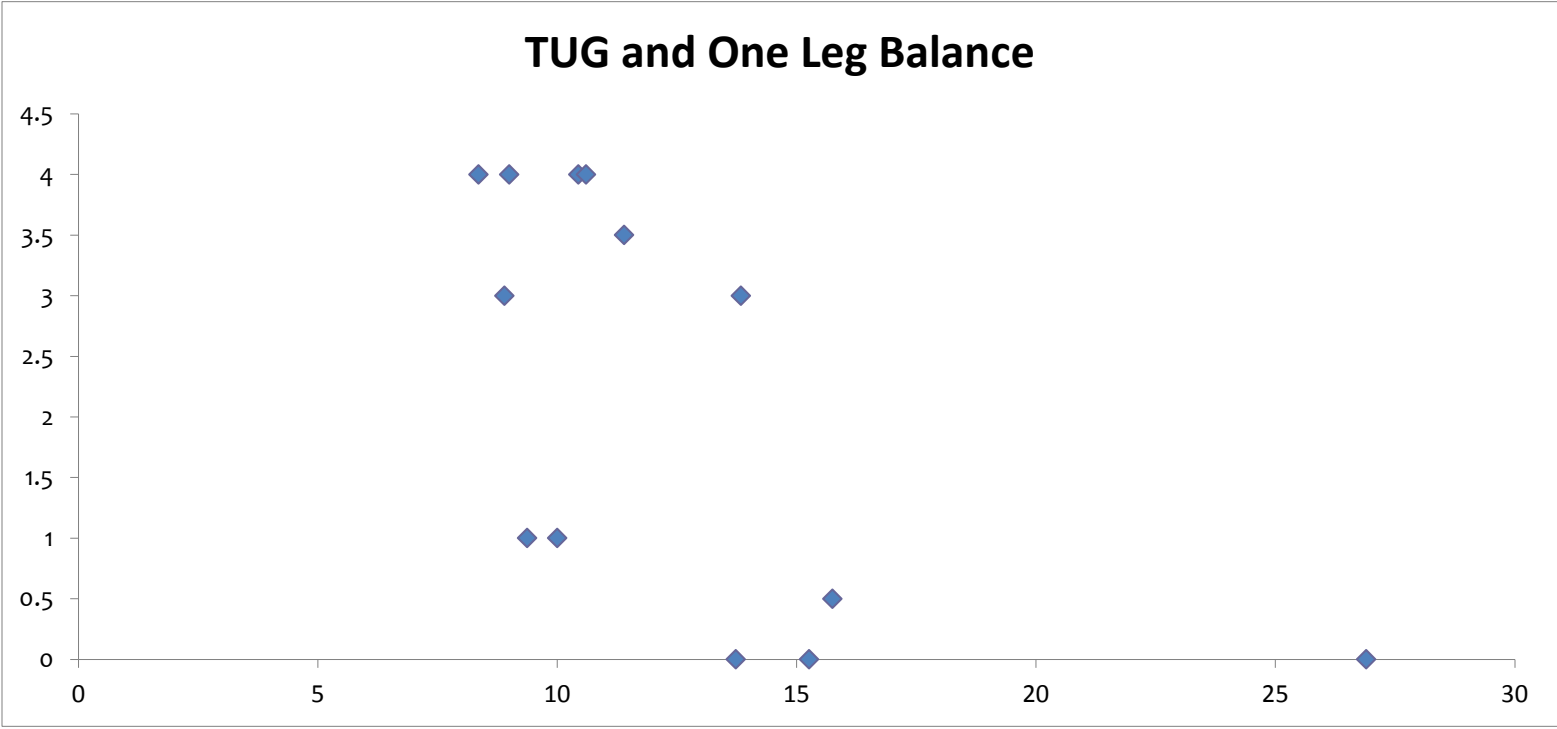 - $P > .20$ ($t(22) = 1.258$)

The Data
(so far...)

TUG and Berg

TUG and Tandem

TUG and One Leg Balance

Future Analyses of To-Be-Obtained Data

1) Changes in balance score?
2) Changes in gait velocity?
3) Changes in Q of L?
   - Overall? Only some of the questions?
4) Well-being after the class?
5) Attendance rates/ motivation
   - How many classes attended?
   - Involved until week 12?
6) Caregiver responses – congruent?
7) Relationships between any of the variables?

Possible Limitations

Small sample size

- N = 13 for baseline, repeated measuring N = ?

Morning testing

-Those in "wearing off' stage of PD → symptoms worse in morning

- Furthermore cannot manipulate testing in order to measure confounding effects of medication cycle

Post-class testing fatigue

Sampling selection bias

- More physically active participants with higher QoL
    - More willing to attend classes
    - More willing to participate in assessments

Questionnaires = some take home (self-report bias)

Berg Balance Scale

- Ceiling effect = max of 56 points
- 8/13 participants scored 50+
    - Score change of at least 8 to reflect a change in function
        - But the tandem test and one-legged balance measurements were very sensitive

Thank you!