Rhythm, Music, Singing, Dancing, and the Brain

Notes on some selected research from a person living with Parkinson's

Robert J. Kamper, PhD.

Overture

- What is “the Parkinson’s” (PD)?
- What does current research say (generally speaking)?
- What does the research on rhythm, music, singing and dance (so far) tell us?
- What should a person with PD do?

First Movement

What is “the Parkinson’s” (PD)?

What is “The Parkinson’s”?

- **“Incurable,”**
- **Progressive,**
- **Degenerative,**
- **Neurological disease**

- Described by James Parkinson as “The Shaking Palsy” in **1817**

Diagnosis

- **Clinical diagnosis** is **STILL** based on **observation** of cardinal symptoms described **2 centuries ago**:
  - **Bradykinesia** (slow movement & impaired ability to move the body swiftly on command).

and at least one of the following:

- **Resting tremor** (involuntary trembling of the body or limbs).
- **Rigidity** (Stiffness and inflexibility of the limbs, neck or trunk)
- **Postural instability** (balance issues).

New Criteria

(2015)

- **Movement Disorders Society publication of "prodromal" symptoms and diagnostic criteria "for research"**

(2018)

- *"survey showed that, although innovative and complete,* ***the revised diagnostic criteria produced by MDS task force are still scarcely employed among clinicians.****"*

Prodromal & Nonmotor Symptoms

- **PD associated with non-motor features**
  - ***Sleep disturbances, (RSBD)*** *- Highest predictive value* ***~ 80%***
  - **Mood disorders**, *(***MDD***), Hyposmia, constipation, cognitive impairment*

- **Combination of 2 or more prodromal symptoms = 4x risk for PD**

- ***Essential tremors*** *have been linked genetically to PD risk (LINGO1 gene, increased risk ~ 2x for both ET and PD)*

In General…

(2018) Movement Disorders Society review:

- Evidence based treatments for motor symptoms
- No interventions currently available to delay/slow motor symptoms
- Options for treatment continue to expand

Adjunct/alternative/complementary therapies

- **"Insufficient evidence"** that exercise helps

First Ending

To sum it up:

- Exercise has **NOT** been shown to slow the progression of PD symptoms, in general.
- Exercise **IS** good for the body and the brain/mind
  BUT
  - All forms of exercise improve cognitive functions
  - Aerobic exercise improves memory functions (2019)

But is “exercise” enough?

Second Movement

singing

making music

dancing

Time to Face the Music...

- **"As far back" as 2000...**
  - **"Active Music Therapy"**
    - ***choral singing***
    - ***voice exercises***
    - ***rhythmic & fine body movements***
    - ***active music involving collective invention***
  - Significant difference (SD) in bradykinesia, activities of daily living, Quality of Life (QOL)
  - Physical Therapy (PT) included stretching, motor tasks, strategies for gait
    - PT improved rigidity

Singing versus Aging

(2006) Creativity and Aging - professionally conducted cultural program (choral groups)

- Overall health improved
- Fewer doctor visits (SD for treatment group)
- Fewer prescribed medications
- Fewer OTC medications
- Depression scale scores improved

(Not People with Parkinson's - but possibly generalizable)

Singing versus Neurological Disorders

Therapeutic effects of singing in neurological disorders (2010)

- Parkinson's & other disorders
- Neuroimaging used

- **Singing helps**
  - Regulate speech
  - Improve cardio & pulmonary health
  - Improve expressive language
  - Influence emotional regulation
  - Influence mirror neuron system

Neurochemistry of Music

Meta study of 200 studies on benefits of music (2013)

- **Music and singing:**
  - Engage systems for reward, motivation, pleasure, stress/arousal, immunity and social affiliation
  - Stimulate release of dopamine
  - Reduce stress
  - Increase oxytocin levels/social affiliation
  - Can modify/regulate autonomic systems

A Song in Your Heart

- **(2018) SINGING (internal cue)** while walking improved **gait, stride and speed (PD)**
  - External stimulus (RAS) provided no significant difference over no stimulus.
  - Conclusion, sing while walking to improve gait, etc.

- Did not test whether “in the head” singing made a difference.
- (Study used “Row, Row, Row Your Boat” as the auditory cue - generalizable?)

  RAS: Rhythmic Auditory Stimulation

Therapeutic Singing

(2018) Individual therapeutic singing intervention

Treatment consisted of

- **Vocalization**
- **Breathing techniques**
- **Larynx and voice exercises**
- **Auditory feedback**

Therapeutic Singing continued

Results:

- **Measurements**
    - Maximum phonation time
    - Voice handicap index
    - Voice related QOL
    - Geriatric depression scale
- Significant difference on all scales over pre-treatment

Making Music

Engaging
the
whole
brain

We Got The Beat

DRUM-PD (2016)

- West African drum circles 2 x week for 6 weeks
- Significantly improved QOL scores*
- Improved connection with peers*

- But - reversible:
  - QOL declined after classes stopped*

*(measures are surveys, not neuroimaging data)

Rationale for Music Training

(2018) Review and rationale for new direction in music therapy for PD

- Rhythmic Auditory Stimulation (RAS)has been shown to improve mobility, balance, and gait (But providing your own RAS through singing is even better)

- However, RAS not shown to prevent cognitive decline

Rationale for Music Training (continued)

(2018)
Hypothesis: Keyboard training can improve executive functions through neural plasticity

- Fine motor skills enhance cognitive performance
- Music training improves connections between brain hemispheres
- Possible creation of new neural adaptations (to compensate for the decline of “normal” frontal cortex to motor systems pathways)

Dance

Dance

Dance

Dance

Dance for Neuroplasticity

Review (2018)

- Dance practice **integrates brain areas**
- Connections between both hemispheres
- **Structural**
  - Increased volume in gray matter
  - Increased integrity of white matter
- **Functional improvements**
  - Memory
  - Attention
  - Body balance
  - Psycho-social

*(There are many more studies)

Dance: Better for the Brain

Dance training is superior to repetitive physical exercise in inducing brain plasticity in the elderly
https://www.ncbi.nlm.nih.gov/pubmed/29995884 (2018)

- Extensive pre/post-assessment
  - general cognition,
  - attention,
  - memory,
  - postural and cardio-respiratory performance,
  - neurotrophic factors and
  - MRI

Dance: Better for the Brain

Results:

- **Both** interventions **increased physical fitness**
- Pronounced differences were seen in **brain volumes:**
  - **Dancing** vs. conventional fitness activity
    - **Larger volume increases in more brain areas,**
    - cingulate cortex, insula, corpus callosum and sensorimotor cortex.
- Only dancing associated with **increase** in **plasma Brain-Derived Neurotrophic Factor (BDNF) levels.**
- **Cognition**:
  - both improved in **attention** and **spatial memory,** but no SD.
  - May indicate that cognitive benefits develop later - after structural brain changes.

2nd Ending

- **Much of research on music's impact on the brain**
  - **musicians vs. non-musicians**
  - **Few if any involve people with Parkinson's**
  - **Much limited to affect and surveys**
- **NEED** studies into effects of music/dance/singing interventions on the brains of people with neuro-degenerative diseases.
- **NEED** studies into individual treatments as well as combinations of treatments.
  - **Singing**
  - **Dancing**
  - **Playing musical instruments**
  - **Collective invention/improvisation**

Repeat

- A lot has been learned since 2012 about PD
- There is still a lot to be learned
- “Exercise” by itself: Doesn’t delay the progression of PD
- **Not enough research has been done with rigorous methodology and information on brain functions to say what the impact of dance, music training, and singing is - or could be**
- **In theory, music/singing/dance can build new neural connections in the brain**
- So
  - **Don’t stop moving to the music**

Coda

- **DISCLAIMER:**
- **This presentation is biased towards the hypothesis that music, playing music, singing, dancing and improvisation are good things to do - whether you have Parkinson's or not.**

- **Repeat:**
  - **music,**
  - **playing music,**
  - **singing,**
  - **dancing and**
  - **improvisation / "collective invention"**

- **Are Good For You - any age, any state of health**

Finale

- This is the end...

Thank
You!

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Slide 3

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- **Premotor and Non-motor Symptoms of Parkinson's Disease**
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References

Slide 20-21

- **A Rationale for Music Training to Enhance Executive Functions in Parkinson's Disease: An Overview of the Problem**
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- **Dance training is superior to repetitive physical exercise in inducing brain plasticity in the elderly(2019)**
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- **Dance for neuroplasticity: A descriptive systematic review.(2018)**
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Slide 24-25

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This ends this presentation as of June 4, 2019. It may be revised as new information becomes available.

Research will continue,

- **For better treatments of symptoms,**
- **Better diagnosis for risk and early onset, perhaps**
- **Ways to delay the progress of symptoms, and**
- **Cure(s) for Parkinson's Disease**

Thank you for your interest. Please support research and programs that provide services to people with PD.