

# **Walk to the Beat of Your Own Drum: The Effects of Self-Selected Music on Responses to Exercise in People with Parkinson's Disease**

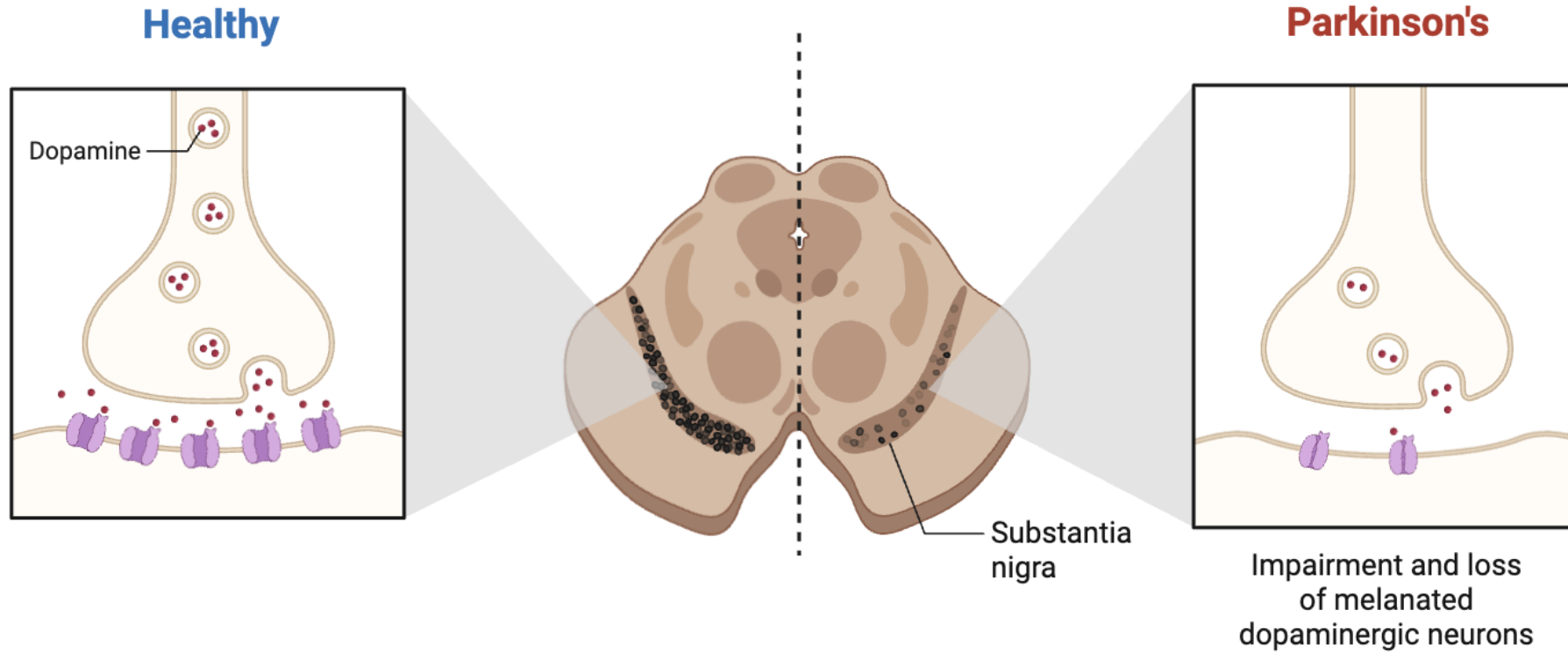
**Christopher Ballmann, PhD, FACSM**

**Associate Professor, Director of Resistance Exercise  
Physiology Lab**

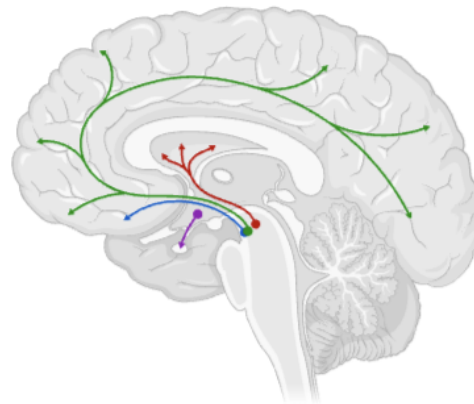
**Kinesiology | UAB**

# Conflicts (Not of interest)

- I am not a neurologist; I am an exercise physiologist.
- I am a classically trained musician.
- I am incredibly passionate about exercise.



**Affected dopamine pathways**

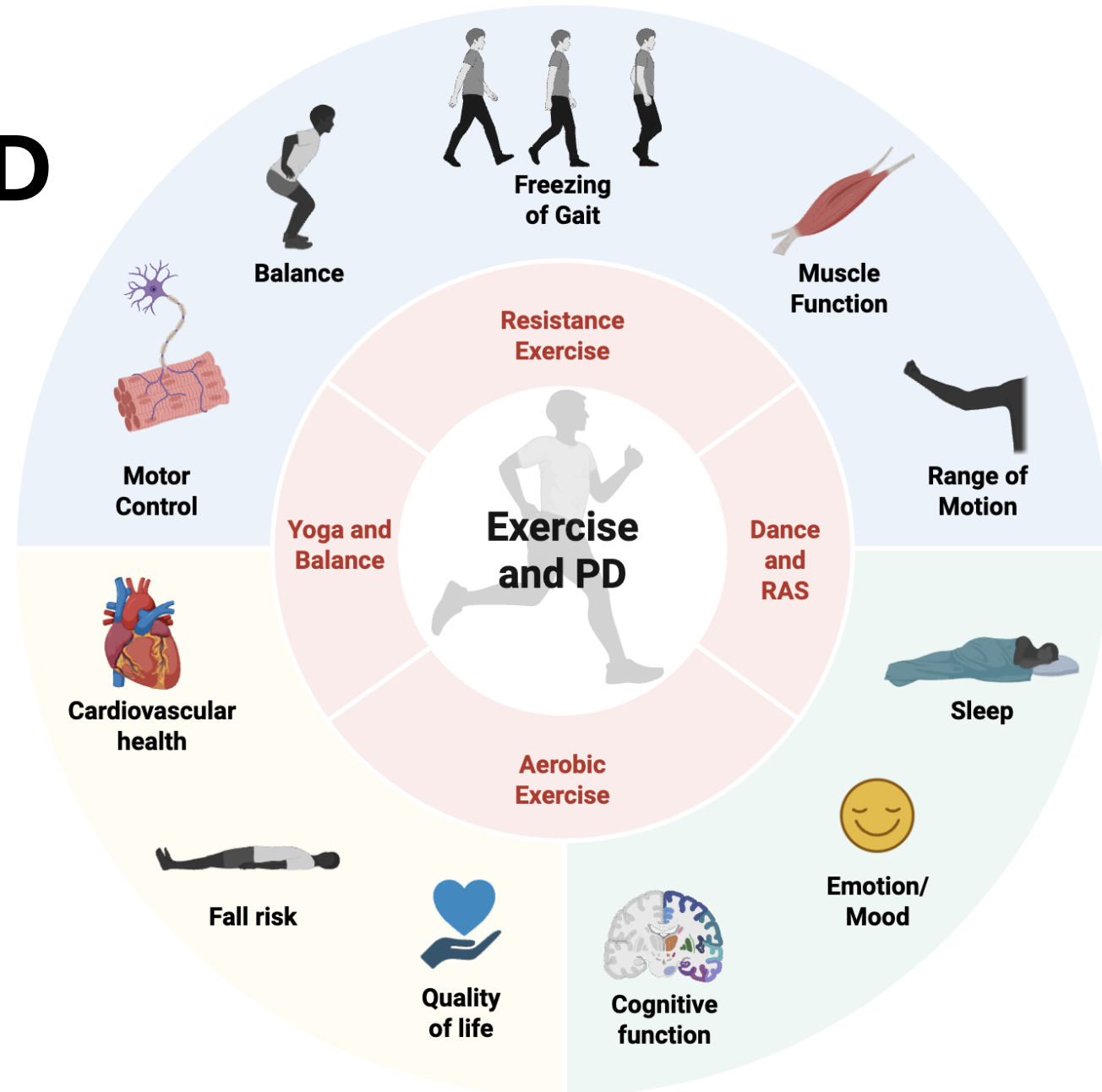


- Nigrostriatal** • Voluntary movement production
- Mesocortical** • Cognition  
• Memory & learning  
• Motivation
- Mesolimbic** • Emotion  
• Perception  
• Reward
- Tubero-infundibular** • Sensory processing  
• Hormonal regulation  
• Maternal nurturing



# Exercise is among the best therapeutics for PD

- Majority of people with PD believe exercise is beneficial. (Prakash, 2021, *Mov Disord Clin Pract*)
- Adherence to exercise in individuals with PD is low. (Afshari, 2017, *JPD*)



# Barriers to Exercise in PD

- 1. Physical Symptoms:** PD symptoms like tremors, rigidity, and altered gait can make physical activity daunting.
- 2. Lack of Motivation:** Depression and apathy, common in PD, can reduce the desire to exercise.
- 3. Low Energy Levels:** Physical and mental fatigue both during and prior to activity can decrease exercise participation and adherence.

# Effects of Self-Selected Music

Review

## Implications for the Ergogenic Benefits of Self-Selected Music in Neurological Conditions: A Theoretical Review

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### Abstract

The ergogenic effects of music have been well described across various modes of exercise with widespread use across competitive athletes and recreational exercisers alike. Underlying the acute beneficial effects of music during exercise are profound physiological and psychological changes which involve an array of different organ systems, including but not limited to cardiovascular, endocrine, skeletal muscle, and nervous systems. While the use of music to enhance physical performance and improve associated mechanisms has been largely optimized in healthy individuals, the investigations of the translation to individuals with neurological conditions are still ongoing. Recently, it has been established that the personalization of music interventions greatly influences performance-enhancing benefits and aids in physical performance optimization in healthy individuals. Self-selected music (SSM) has been documented to impart ergogenic advantages over pre-determined or non-preferred music, including improved cardiorespiratory endurance, power development, and velocity of movement which are characterized by adaptative physiological and psychological changes. Evidence of the benefits of SSM has progressed to the degree to which the overlap of possible benefits between healthy and clinical populations is becoming more apparent. This aim of this theoretical review is to discuss how personalized music influences psychophysiological determinants of exercise ability in healthy individuals and consider how these findings may be applicable to neurological conditions to enhance exercise capacity. The current knowledge on the role of SSM in augmenting physiological and psychological responses to exercise in healthy individuals is presented along with how these mechanisms might be leveraged to overcome exercise limitations in neurological conditions. Overall, SSM appears to have theoretical support to be a promising therapeutic approach to improving exercise ability in neurological conditions through similar ergogenic mechanisms documented in healthy individuals, but further investigation is warranted.

**Keywords:** music preference; exercise; rehabilitation; disability



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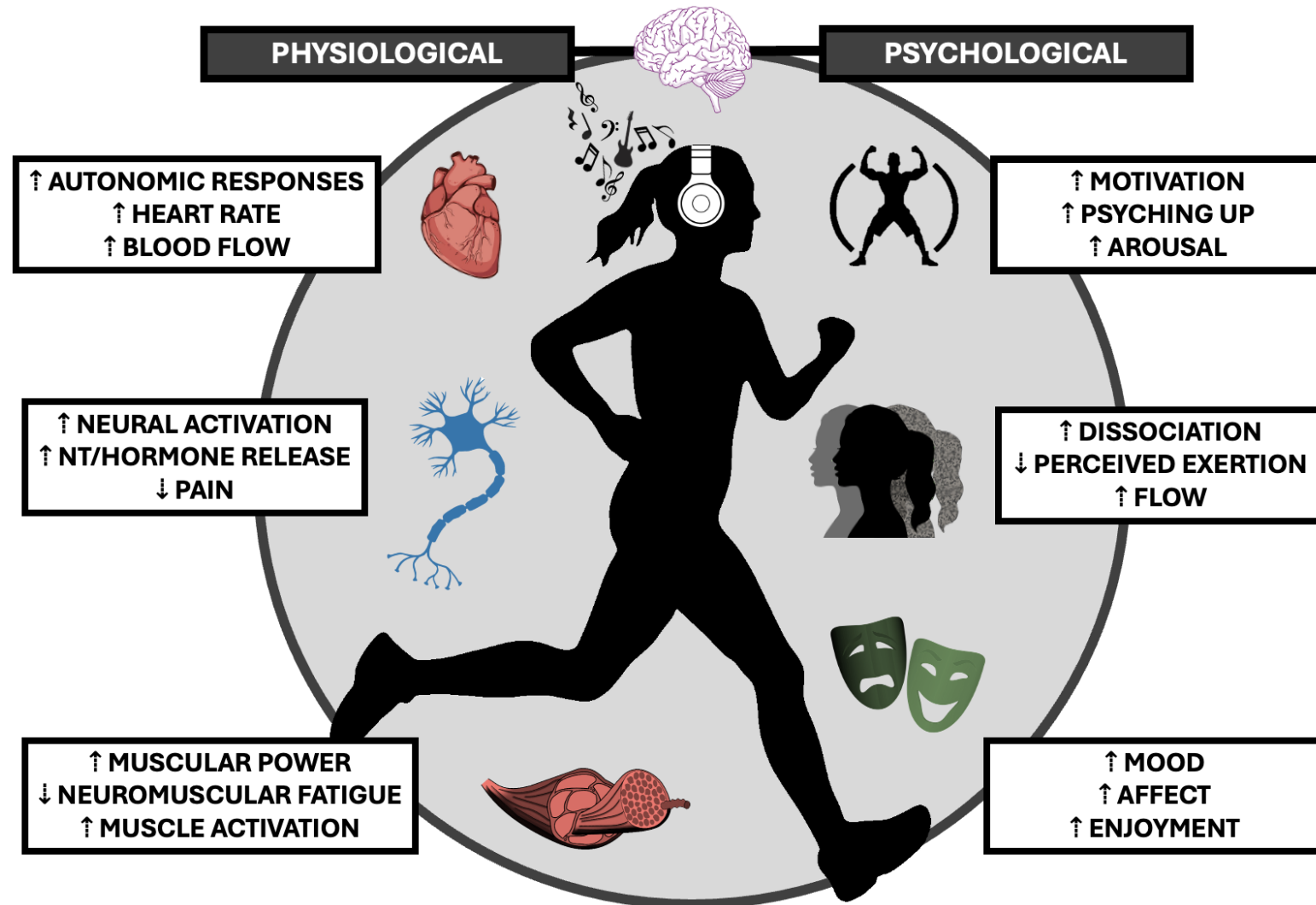
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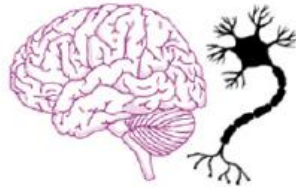
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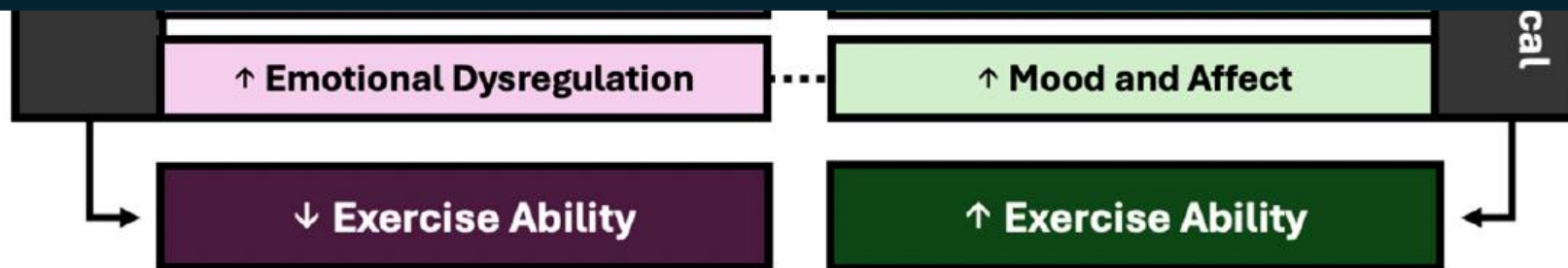
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# Effects of Self-Selected Music

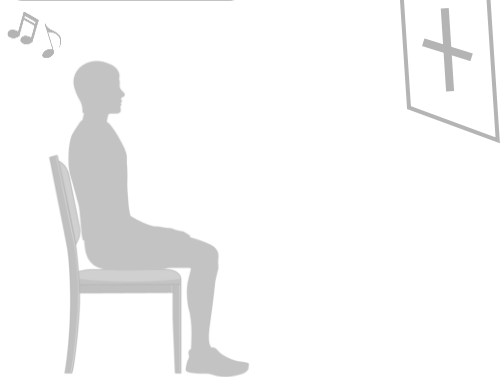
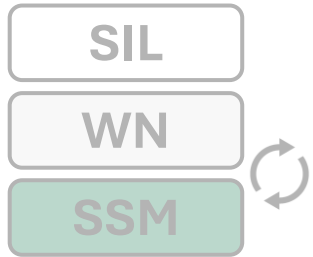


**Can listening to self-selected music help people with PD exercise better?**



# Study Design

## 5-Minute Rest



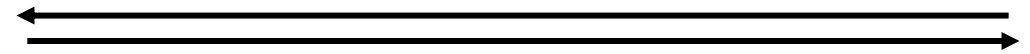
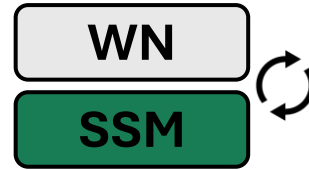
### Markers of Arousal

- Brain activity (EEG)
- Heart rate
- Electrodermal activity

### Psychological

- Motivation
- Enjoyment
- Arousal

## 6-Minute Walk Test



10 meters

### Markers of Capacity

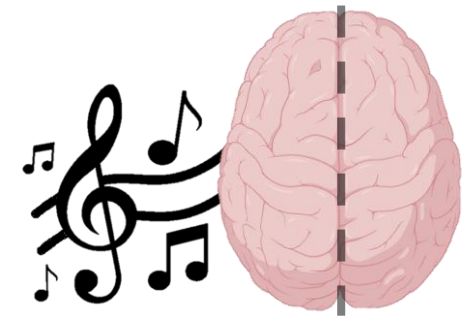
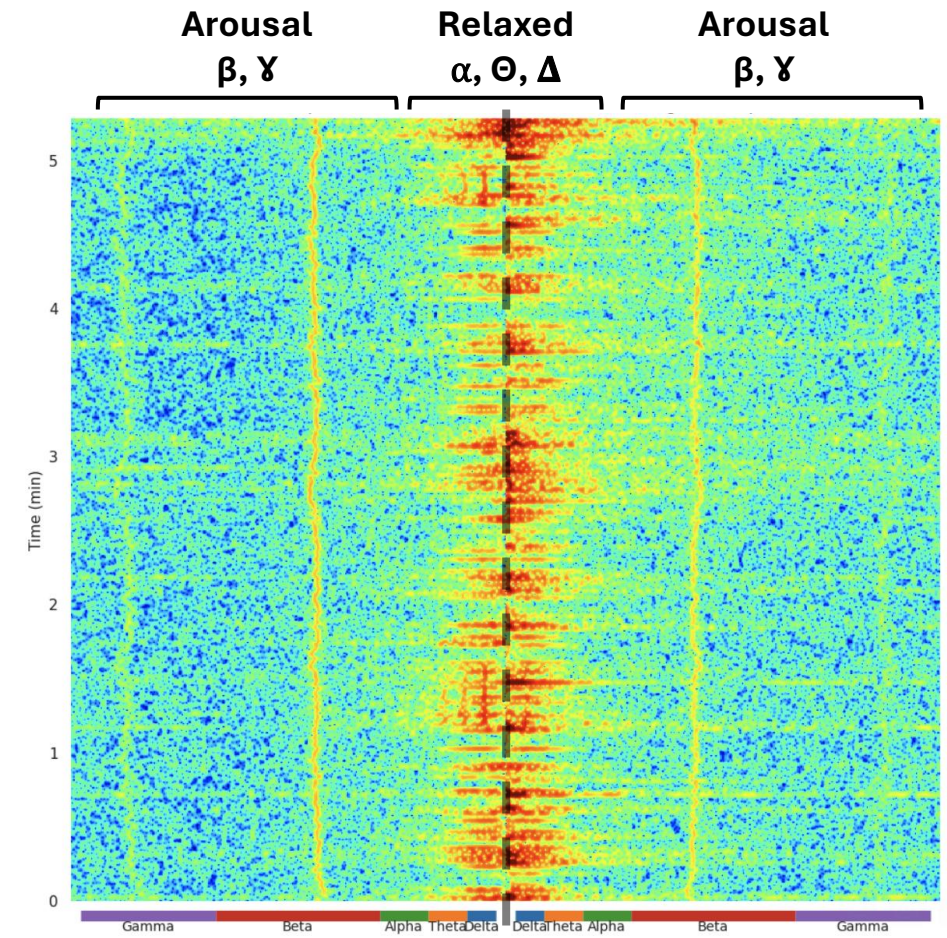
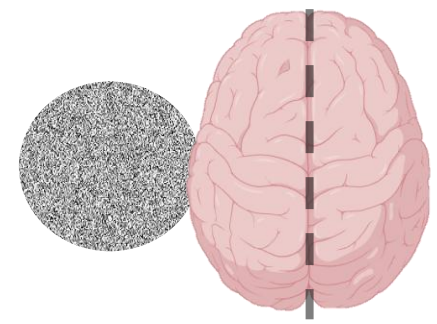
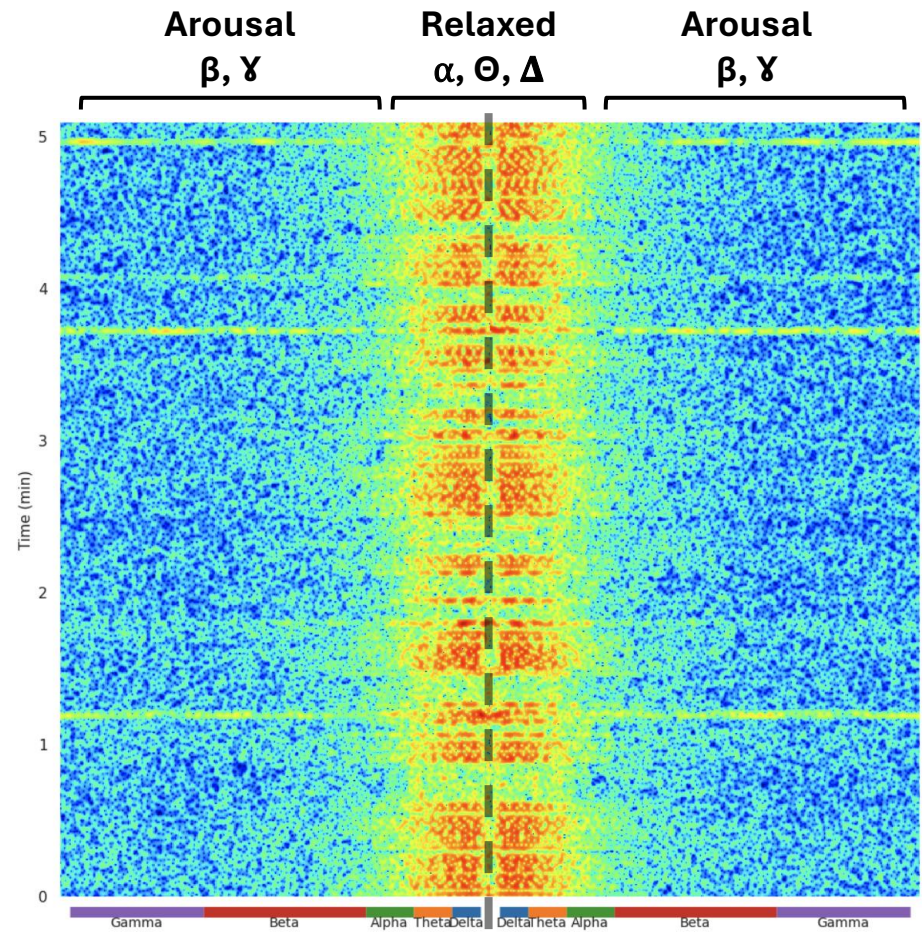
- Distance
- Steps
- Walking Velocity

### Markers of Intensity

- Heart rate
- METs
- RPE

### Psychological

- Motivation
- Enjoyment
- Arousal





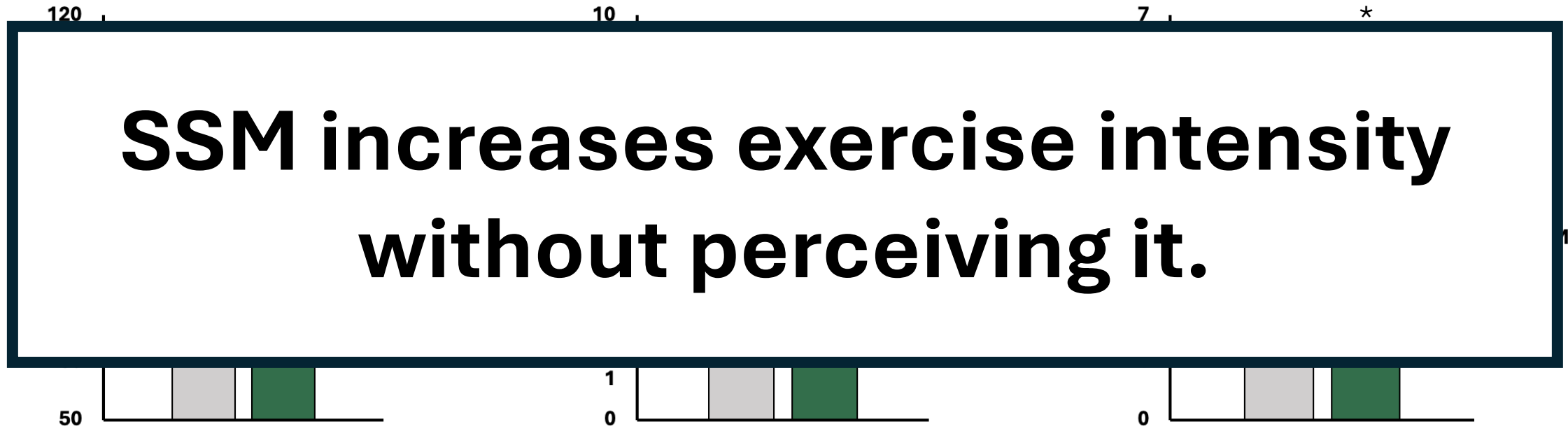
# Results – Markers of Exercise Capacity



Comparisons of (a) total steps (steps), (b) total distance (m), and (c) walking velocity (m×s<sup>-1</sup>) between white noise (WN; grey bars) and self-selected music (SSM; green bars) during a 6-minute walk test (6MWT). Data are presented as mean ± SD. \* indicates significantly different from WN (p≤ 0.05).



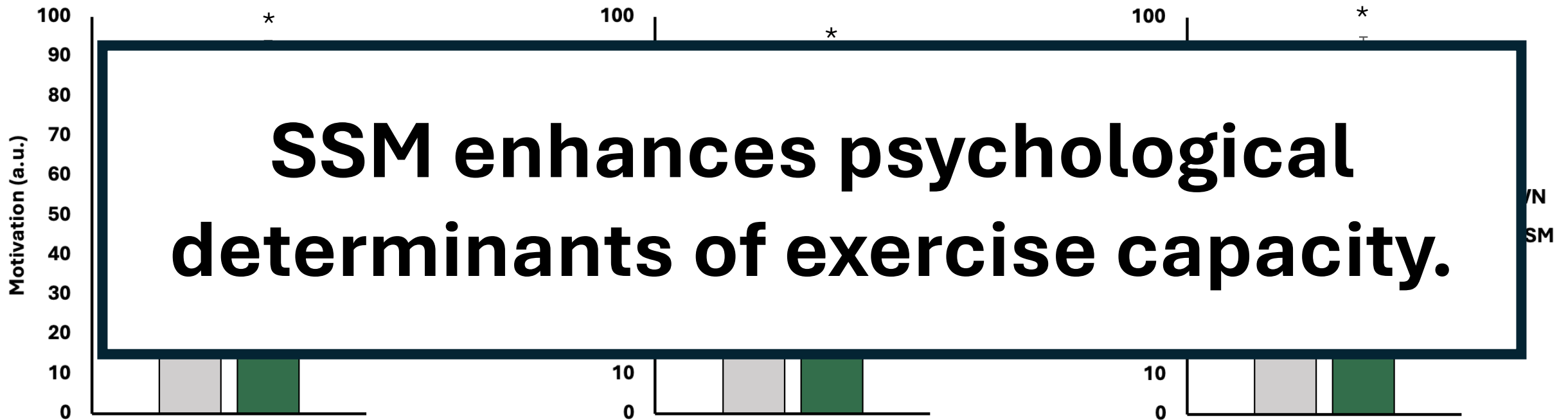
# Results – Markers of Intensity



Comparisons of (a) mean heart rate (HR; beats per minute), (b) rating of perceived exertion (1-10 scale), and (c) metabolic equivalent of task (measure of energy used during physical activity) between white noise (WN; grey bars) and self-selected music (SSM; green bars) during a 6-minute walk test (6MWT). Data are presented as mean ± SD. \* indicates significantly different from WN (p ≤ 0.05).



# Results – Psychological



**Figure 5.** Comparison of (a) motivation (arbitrary units; a.u.), (b) enjoyment (arbitrary units; a.u.), and (c) arousal/readiness to give effort (arbitrary units; a.u.) between white noise (WN; grey bars) and self-selected music (SSM; green bars) during a 6-minute walk test (6MWT). Data are presented as mean ± SD. \* indicates significantly different from WN (p ≤ 0.05).

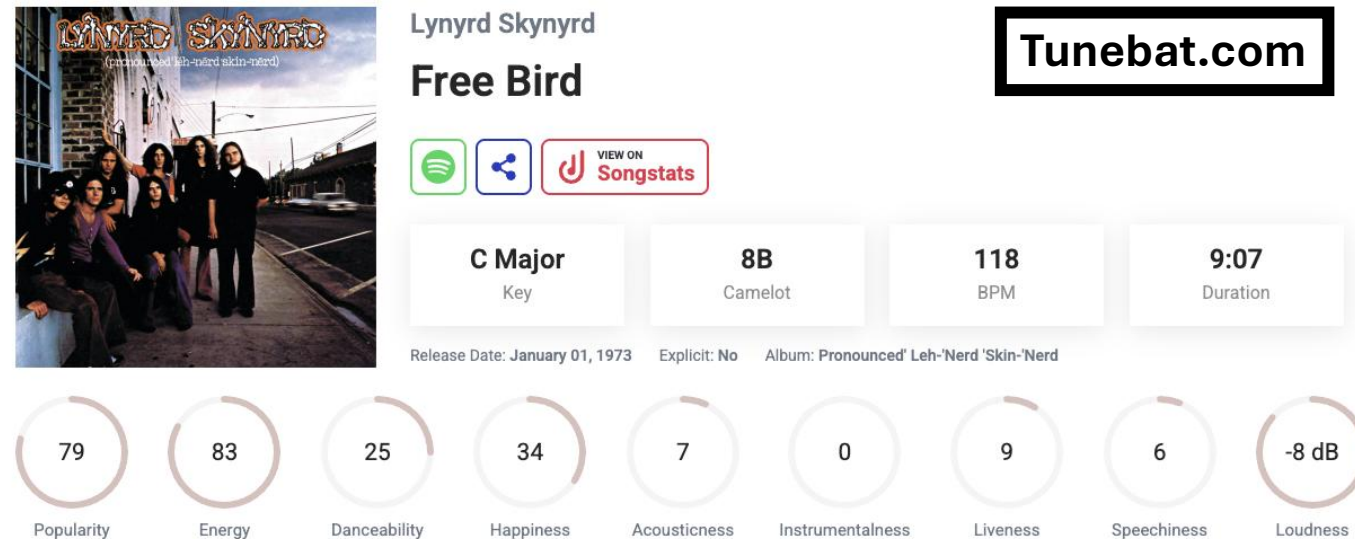
# Practical Applications and Conclusions

- **SSM allows for increased walking capacity and higher intensities.**
  - May lead to greater adaptation over time.
  - Improved perceptive and psychological responses may have implications for adherence.
- **SSM results in enhanced motivation and psychological outcomes.**
  - May aid in overcoming PD-associated losses in motivation and emotional dysregulation.
  - Possibly aid in initiation of exercise or daily tasks.



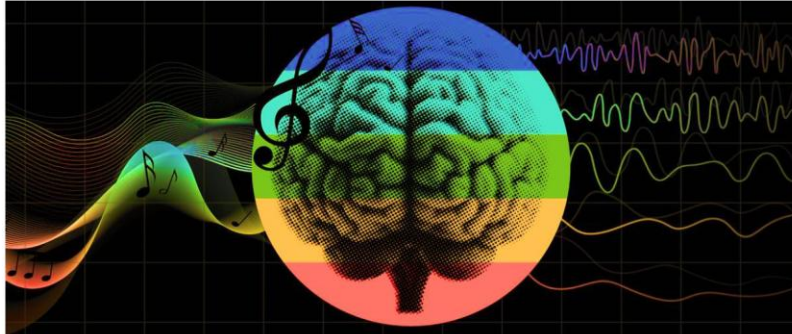
# Practical Application- What Can You Do?

- **How to apply this information:**
  - **Music characteristics matter**
    - Ex. Faster tempo= more stimulative
  - **Curate playlists for quick and easy implementation to combat symptoms (AI can help).**
    - Ex. Relaxing music if feeling anxious
- **Task specific implementation**
  - Ex. Sleep versus exercise
- **Sing or “drum” to the beat**



**ChatGPT**

# Ongoing Research



## PARKINSON'S DISEASE, MUSIC, AND THE BRAIN

**UAB** The University of  
Alabama at Birmingham.

School of Education and Human Sciences

**UAB RESEARCHERS ARE CURRENTLY CONDUCTING A MUSIC,  
BRAIN ACTIVITY, AND PARKINSON'S DISEASE STUDY**

**1150 10th Ave South | Birmingham, AL 35233**

➤ **INCLUSION CRITERIA:**

- FORMAL DIAGNOSIS OF PARKINSON'S DISEASE
  - AGE 50 OR OLDER
  - HAVE A STABLE MEDICATION REGIMEN FOR FOUR WEEKS PRIOR TO ENROLLMENT OF THE STUDY
  - MUST BE ABLE/WILLING TO UNDERGO MAGNETIC RESONANCE IMAGING
- People who enter the study will listen to music and complete a hand grip task while their brain activity is measured in an MRI scanner.
- Requires 1 study visits lasting ~1.5 hours. **Participants will be compensated \$60 at the end of their visit.**



**ROOTED**  
MUSIC THERAPY

# Why Parkinson's Disease?

JHR

NARRATIVE REFLECTION

## Rock n' Roll Canine

By Christopher Ballmann, PhD

I was diagnosed with bipolar disorder when I was young. Although often stigmatized to present as a “Jekyll and Hyde” complex,<sup>1</sup> bipolar disorder does not influence an individual’s sense of right and wrong nor does it relate to personality changes.<sup>2</sup> Rather, it mainly affects mood, energy levels, sleep patterns, physical activity, and impulsivity.<sup>3</sup> I have gone to great lengths to hide it most of my life due to stigma—although it is hard to disguise going without sleep for 10+ days to those around you. Despite my successes as a researcher and professor, my life has been erratic and often unpredictable. The highs and lows of my life have wavered to the extremes like a swinging pendulum. Difficult in every sense of the word. Cycling through psychiatric medications always felt like a chess match, and I was constantly losing. But through it all, I found treatment in areas that coalesced into the biggest win toward managing my mental health and psychiatric disabilities.



### Let There Be Rock

When I was 12 years old, my Dad bought me my first electric guitar. To say I immediately connected with it would be an understatement. It became an extension

- 482% increased risk for developing PD (Huang, 2019, Neurology).
- 235% increased risk for developing PD (Faustino, 2020, JAMA).



# Acknowledgments

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# Thank you!

