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The BASES Expert Statement on the Use of Music for Movement among People with Parkinson's

Produced on behalf of the British Association of Sport and Exercise Sciences by

Prof Costas I. Karageorghis FBASES, Dr Dawn Rose, Dr Lucy E. Annett, Dr Judith Bek, Dr Lindsay Bottoms, Dr Peter J. Lovatt, Dr Ellen Poliakoff, Dr Benjamin G. Schultz, Dr Caroline P. Whyatt, Dr William R. Young and Prof Yvonne N. Delevoeye-Turrell.

"Music makes me feel free; it makes me feel normal, like I was a puppet with my strings messed-up, and suddenly they've all been untangled."

Anon. person with Parkinson's

Introduction

Music is an artistic auditory stimulus that unfolds over time. It can prime specific actions and prompt engagement in physical activity as well as heighten motivation during motor tasks (Karageorghis, 2020). Contrastingly, it can be used to downregulate arousal to facilitate the transition from an active to a sedentary state or to ameliorate anxiety. In therapeutic applications, musical features such as rhythm, melody and harmony have been shown to elicit psychological and physiological changes (Thaut & Hoemberg, 2014).

Parkinson's is a degenerative neurological condition in which the loss of dopamine neurons results in impaired initiation and control of movement, with common symptoms including tremor, postural instability and gait disturbance. There are also non-motor effects that include apathy, anxiety and depression. Medication does not alleviate all manifestations of the condition and there is presently no known cure (Obeso *et al.*, 2017). It is notable that people with Parkinson's are estimated to be 30% less active than age-matched peers (Ramaswamy *et al.*, 2018). Nonetheless, evidence is emerging that a range of exercise-based and social activities that involve musical engagement can serve to address the common symptoms and enhance quality of life (Thaut & Hoemberg, 2014).

This statement brings together an international interdisciplinary team to outline what is known about music-related applications for people with Parkinson's, and to provide recommendations for exercise and health practitioners.

Background and evidence

Auditory and motor areas in the brain are closely linked. Notably, rhythm and tempo provide "temporal scaffolding" to help guide when, how far and how fast to move (Dalla Bella *et al.*, 2015, p.78). The sustained interest in how the rhythmic components of music can help to regulate movement in Parkinson's has led to a therapeutic strategy known as *rhythmic auditory stimulation*. Findings from related work indicate that rhythmic auditory stimulation training has a regulatory effect on walking (Dalla Bella *et al.*, 2015). This "entrainment effect" can

also direct several of the body's pulses, such as breathing rate, heart rate and brain waves. Nonetheless, if people find it difficult to extract a beat or need to adapt their walking pattern to certain situations (e.g. rough ground), rhythmic auditory stimulation training can have limited applicability.

Researchers in Parkinson's have suggested that musical stimuli provide more effective auditory cueing than simple metronomic (*tick-tock*) stimuli. A recent study illustrated that the capacity to synchronise accurately depends not only on the speed (tempo) and type of auditory cue (metronome, music), but also on the type of movement being coordinated (Rose *et al.*, 2019; see Figure 1). Moreover, music can facilitate action production, leading to greater automaticity and fluency in sequential motor tasks (Karageorghis, 2020). Accordingly, people with Parkinson's have a means by which to engage in purposeful motor behaviours with less cognitive effort. Music has "groove", lyrics and affective qualities that come to the fore in social situations such as dancing. Thus, music has the potential to facilitate expressive and communicative actions as well as functional ones. Nonetheless, care must be taken when using music with lyrical content that requires semantic processing, as dual-tasking can be challenging for people with Parkinson's.

The effects of music are nuanced and multifaceted. Music triggers memories that can transport individuals back in time and

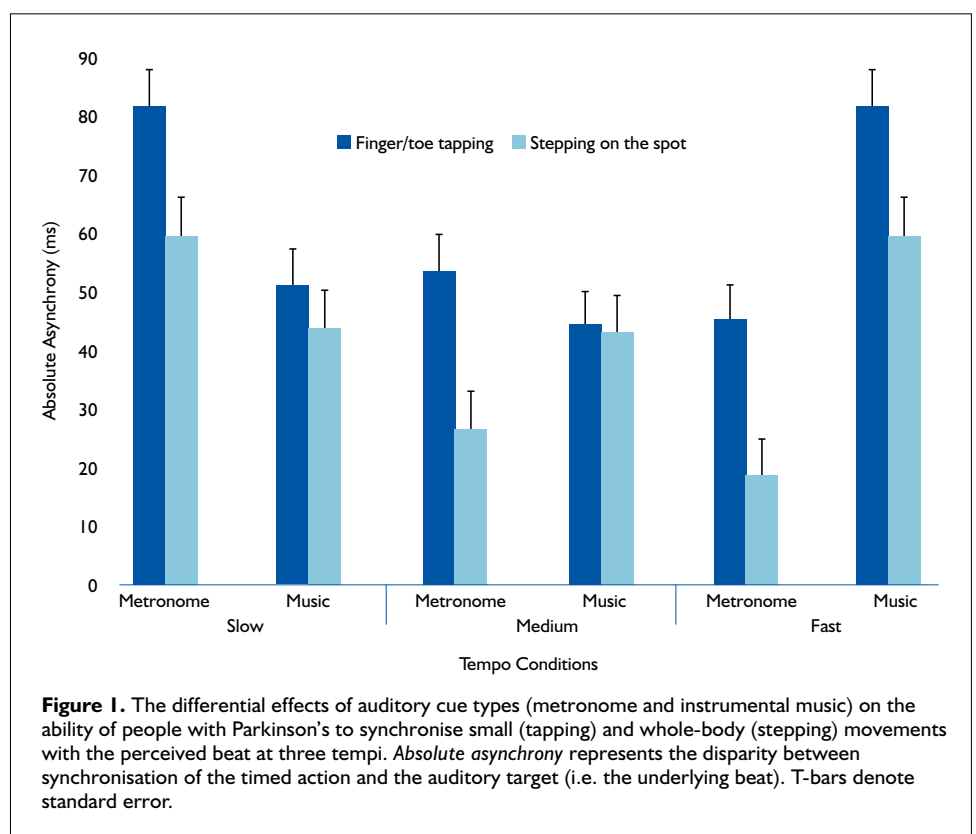


Figure 1. The differential effects of auditory cue types (metronome and instrumental music) on the ability of people with Parkinson's to synchronise small (tapping) and whole-body (stepping) movements with the perceived beat at three tempi. *Absolute asynchrony* represents the disparity between synchronisation of the timed action and the auditory target (i.e. the underlying beat). T-bars denote standard error.

connect them with significant others in a meaningful way. The familiarity of personally meaningful music may assist in the internal generation (i.e. imagination) of cues to motivate, initiate and regulate movement. Research has shown that auditory and motor imagery (“internal rehearsal”) can facilitate movement production and fluency, in motor tasks such as gait (Young *et al.*, 2016) and hand movements (Bek *et al.*, 2019). As well as using pre-recorded music, the ability to deploy an “inner jukebox” could be promoted as a therapeutic strategy for Parkinson’s (Rose *et al.*, 2019).

Recommendations

- Select music tracks that have a clearly extractible metre (strong beat) and avoid altering the tempi of tracks.
- Incorporate music making as well as music listening into therapeutic programmes.
- Music is a socialising force that can be used to encourage people to move together in time and space, with concomitant benefits for quality of life.
- Within group settings, consider participants’ age and preferences in the formation of music programmes in order to accommodate individual needs (e.g. varying levels of movement complexity).
- Employ modern digital technologies, such as those that generate motion sensor-mediated music programmes, to facilitate the autonomous selection of music based on movement rate (i.e. *passive synchronisation*).

Future directions

- The use of digital technologies to identify and codify individuals’ spontaneous motor tempo should be explored in order that this can be incorporated into therapeutic music applications.
- There is a need to examine how music can help people with Parkinson’s to divert attention (i.e. facilitate dissociation) from overwhelming sensory inputs that are both external (e.g. noise, social chattering) and internal (e.g. tremor, muscle pain).
- The use of music to evoke motor imagery that facilitates movement should be explored.
- The influence of group dynamics on responsiveness to music warrants further investigation.
- Going beyond measuring single-limb body movements (e.g. finger tapping) would serve to elucidate the therapeutic benefits of music-related interventions.

Conclusions

Music for movement can be used in Parkinson’s to facilitate the guidance of voluntary actions, improve engagement in physical activity, elevate motivation and enhance affective states. We hope that the detail provided herein will encourage practitioners to optimise the way in which music is integrated into their therapeutic approaches and to create a soundscape that will enable people with Parkinson’s to “untangle the puppet strings.” ■



Prof Costas I. Karageorghis FBASES

Costas is a Professor in Sport and Exercise Psychology at Brunel University London and a BASES accredited sport and exercise scientist.



Dr Dawn Rose

Dawn is a Senior Research Associate in Music Psychology at Lucerne University of Applied Sciences and Arts, Switzerland.



Dr Lucy E. Annett

Lucy is a Principal Lecturer in Biological Psychology at the University of Hertfordshire.



Dr Judith Bek

Jude is a Research Associate in Neuroscience and Experimental Psychology at the University of Manchester.



Dr Lindsay Bottoms

Lindsay is a Principal Lecturer in Exercise Physiology at the University of Hertfordshire. Moreover, she is a BASES accredited sport and exercise scientist and Deputy Chair of the BASES Division of Physical Activity for Health.



Dr Peter J. Lovatt

Peter is a Dance Psychologist and Director of Movement in Practice.



Dr Ellen Poliakoff

Ellen is a Senior Lecturer in Neuroscience and Experimental Psychology at the University of Manchester.



Dr Benjamin G. Schultz

Benjamin is a Research Fellow in Cognitive Psychology at the University of Melbourne, Australia.



Dr Caroline P. Whyatt

Caroline is a Lecturer in Psychology at the University of Hertfordshire.



Dr William R. Young

William is a Senior Lecturer in Sport and Health Sciences at the University of Exeter.



Prof Yvonne N. Delevoeye-Turrell

Yvonne is a Professor in Cognitive Psychology at the University of Lille, France.

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