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Improvements in balance and gait speed after a 12 week dance intervention for Parkinson's disease

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ABSTRACT

Preliminary research suggests dance is beneficial for people with Parkinson's Disease and can serve to complement conventional medical treatments. There are many types of dance classes however, the Dance for Parkinson's Disease model has shown rapid growth in participant attendance and interest over time. Unlike other studies where the description of the dance program has been rather vague, this model has clear principles and a specific structure which has led to more research in this model over others. Whilst prelimary research has demonstrated that this intervention is potentially quite effective, what remains unknown is the specific length of dance intervention required, measured in weeks and hours, until improvements are seen in motor impairments and quality of life in Parkinson's Disease.

Methods: We aimed to replicate and extend previous findings where enhancements were shown on short-term motor (1-day) and quality of life in Parkinson's Disease. We conducted a 12-week pilot study using the Dance for Parkinson's Disease model.

This study was a quasi-experimental, non-controlled study of nine (9) participants, who completed 2 motor (Berg Balance Scale and Timed up and Go) and quality of life questionnaires (Quality of Life Scale and questionnaire of wellbeing) before and after the second and twelfth class.

Results: Balance and gait improvements in short-term (1-day) and long-term (12-weeks) in the Berg Balance Scale. No improvements in quality of life were observed. Enhancements were observed in one-third (34%) less dance intervention duration (15 hours), than previous studies.

Conclusions: Participation in dance classes, improved motor symptoms in both short (1-day) and long-term (12-week) durations. Overall, quality of life did not change.

What is already known about this topic?

Existing research has already shown short-term motor and quality of life improvements in PD in 8-months[3] & 17-month[2] trials.

What this paper adds

An extension to the existing literature on the *required* length of time necessary to see these beneficial impacts within this population. What remains unknown in the literature on this topic, is the *specific length* of dance intervention that is needed, measured in weeks and hours, until initial improvements are seen in both motor and quality of life in PD.

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1. Introduction

Parkinson's Disease (PD) is described is a common hypokinetic movement disorder of the central nervous system primarily associated with dysfunction of the basal ganglia (BG). This subcortical structure plays a prominent role in motor learning, particularly in the late stage of learning where movement sequence retrieval is more implicit and habitual. Difficulty in executing habitual movement is a distinct feature of PD.

Levodopa, the primary pharmacological medicine for PD, has multiple limitations in its intervention. Only a few motor symptoms of PD are temporarily treated, there is a decreased efficacy of drug treatment as PD progresses, symptoms become progressively resistant to levodopa [1], non-motor symptoms of PD are ignored, and finally adverse side-effects such as depression, anxiety, hallucinations and dyskinesia arise as a result of levodopa use. Due to these various limitations, research within this field has shifted its attention to other forms of interventions, such as dance therapy, intended to improve daily functioning and quality of life by teaching and training PD patients compensatory movement strategies while providing a positive social atmosphere. Various dance classes have shown to alleviate motor symptoms of people with PD [2–7]. We studied dance classes using the Dance for PD® (DfPD®) model first conceived by Westheimer [2]; this model, a collaboration of the Mark Morris Dance Group (MMDG) and the Brooklyn Parkinson Group (BPG), posits an artistic model in its aims and conception for those with PD (and their caregivers) that has been implemented worldwide. DfPD® classes target PD specific symptoms related to balance, cognition, motor skill, depression and physical confidence. Our study intended to examine the shortest dance session (12-weeks; 15 h) in novel PD-dancers compared to studies of 8-months[3] and 17-months[2]. Westheimer [1] employed a similar dance program, over 17-months, and reported long-term QoL benefits. Heiberger et al. [3] employed an 8-month dance program to examine short-term effects on motor control after one dance class and studied long-term effects of QoL.

This study aimed to replicate short-term (1-day) motor improvements [3] and extend research to examine long-term motor (12-week) and QoL measurements (at weeks 2 and 12) following participation in weekly DfPD® classes. Unlike previous DfPD® studies [2,3] that reported findings after 8-months[3] and 17-months[2], the present study looked at the effects of a dance program that is on average 34% shorter in dance intervention duration. We hypothesized, short-term (1-day) and long-term (12-week, 15 h) motor improvements and increases in QoL scores from baseline (week 2) to week 12.

2. Methods

2.1. Participants

Fourteen individuals initially volunteered for the study; five did not complete the entire protocol, before and after class testing during weeks 2–12, due to personal reasons and absences. Thus, a total of nine PD participants volunteered from a new Dancing with Parkinson's Program at Canada's National Ballet School (NBS); H&Y range = asymptomatic to severe (0–4), $M_{H\&Y} = 0.8$ ($M_{age} = 67.78 \pm 6.14$ yr; $n_{Males} = 5$; average length of disease diagnosis = 5.56 years; range = 0–17 years). Written informed consent was obtained using an approved protocol from York University's Ethics Board (2013-211).

2.2. Measures

The Berg Balance Scale (BBS) [8,9] (n = 5) and the Timed Up and Go (TUG) (n = 5) test were employed for this study as a measure of motor performance. The BBS is comprised of 14 tasks, measuring different functions of balance and posture that are common to daily living. Each task is judged on an ordinal scale ranging from 0 to 4 (La Porta et al.), and evaluated as either a factor of time to complete, or quality of execution. With this measure, a total score of 56 reflects perfect balance. TUG is a timed measurement (in seconds) of movement sequencing, gait, and balance control.

Table 1
Sample exercises featured in the dance class at NBS.

Exercise	Description	Purpose
Danced name introduction	Stating your name with a corresponding dance movement. The rest of the class first watches before repeating the participants name and movement. Standing or seated.	Feeling welcomed and welcoming everyone in the class. Practicing skills of choreographing on the spot.
Tendus	Pressing the feet along the floor until the leg is fully extended. Arms follow a similar extension motion. Seated.	Warming up the feet and lower leg, while working on strengthening the core.
Shuffle dance	A series of shuffles, stamps, and ankle inversions. Seated.	Facilitating flexibility and mobility in the ankles and knees.
Magic dance	Dancing with an imaginary ball and scarf, while exploring a range of motion. Seated.	An opportunity for vivid imagery and creative interpretation.
Rainfall cannon	Simulating the sounds of an approaching rainstorm using various body parts as percussion instruments. Seated.	Practicing movement initiation by waiting to execute a movement in proper sequence.
Winning the poker game	Rising slowing from a chair while moving in a celebratory manner.	Practicing rising from a seated position in a safe manner.
Painter and Sculptor mirrored pairs	A paired improvisation dance, done face to face. One partner would lead while the other mirrored their painting motion. This dance finished with a series of intertwined sculpture-like poses. Seated and standing aspects.	Mirroring a partner in a detailed fashion, and practicing creative movement initiation by improvising and developing unique poses.
Pliés in parallel and second position	Holding on to the back of a chair, pliés (bending of the knees) and rises were done in parallel (feet together) and apart. Standing.	Developing strength and balance while standing and increasing range of motion in the legs.
Lunging side to side	While holding onto the back of the chair, transferring weight from side to side with legs in a wide pronated position and "brandishing a fist" at a neighbouring participant. Standing.	Finding a core centre for balance by lunging off balance and returning to a central position.
Waltz	Waltz step performed first on the spot and the travelling. Standing.	Safely dancing through space, and physically embodying the triplet rhythm of a waltz.
Shy to confident shuffle dance	A standing variation of the seated shuffle dance, where the movements are done first in a demur and small manner, but gradually increase in confidence until they are gregariously expressed.	A fun way of practicing moving with confidence and with clear intention.
The "Showdown Hoedown" dance	Approximately a 2 min choreography done facing a partner, first dancing as advisories in the "showdown" and then together as companions in the "hoedown." Standing.	Challenging participants to recall a lengthy piece of choreography with multiple sections and changes of direction