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Title: Is Irish set dancing feasible for people with Parkinson's disease in Ireland?

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Abstract

Objective: To investigate if community-based Irish set dancing is feasible in Irish adults with Parkinson's disease.

Methods: Over an eight week period, ten participants attended one set dancing class per week and completed a home programme in parallel. Feasibility was assessed by monitoring adverse effects, participants' verbal feedback, compliance rates and feedback from an exit questionnaire. Participants were assessed using the Berg balance scale, 6-min walk test, UPDRS-3 and PDQ-39, before and after the intervention.

Results: No adverse effects were detected. Attendance at classes was 86%. Compliance with the home programme was 67%. Findings from the exit questionnaire showed participants enjoyed participating and reported improvements in aspects of health including balance. Quality of life improved with the dance programme and there was a trend toward improvement on the UPDRS-3.

Conclusion: These findings suggest community-based Irish set dancing is a feasible form of exercise that can positively influence quality of life.

Keyword: Parkinson's disease; Dance; Physical activity; Community rehabilitation.

Introduction

Parkinson's disease (PD) is a movement disorder characterized by bradykinesia, tremor and rigidity [1]. As the disease progresses, postural instability and mobility difficulties can have a compromising effect on physical functioning [2,3], quality of life [4,5], and social engagement [6]. Physical activity is advocated in the management of PD [7] but it is estimated more than 50% do not meet the recommended activity levels [8] of 30 min per day [9]. It is argued that an optimum exercise intervention for those with PD integrates cueing strategies, balance training, focuses attention and improves physical capacity [8]. Irish set dancing appears to be one effective form of physical activity for some people with PD [10] as it incorporates dynamic balance activities with gait and skilled movements. Movement generation may also be enhanced through musical cues [11]. Set dancing could enhance long-term compliance with physical activity as it incorporates exercise, socialisation and spousal participation, which are desirable elements required to motivate adherence to physical activity for people with PD [12]. A recent study identified six months of set dancing improved balance and mobility to a greater extent than traditional exercise in a sample of Venetians with PD [10]. Whilst this study showed the feasibility and benefit of set dancing for some people with PD, the intervention was delivered in a rehabilitation setting and may not reflect the realities of everyday practice [13]. As the number diagnosed with PD is expected to double by 2030 in several European countries [14], healthcare professionals need intervention studies to investigate the feasibility and acceptability of translating evidence into practice. Therefore, there is a need to investigate if set dancing is feasible in community settings. Additionally, set dancing originates in Ireland and has a traditional and fundamental social and cultural identity role in Irish communities [15,16]. Given the past experiences, cultural values and familiarity associated with this dance genre in Ireland [15,16], it is impossible to identify if the findings of Volpe et al. [10] are applicable to an Irish population

with PD. With this in mind, the overall aim of this study is to examine the feasibility and benefit of set dancing for people with PD in Ireland. This study was conducted as a prerequisite to a randomized control trial to identify:

- The suitability of outcome measures to quantify change after the intervention
- If participants are willing to participate in a set dancing intervention
- Aspects of the intervention participants are satisfied with and areas needing adaption

As this was a feasibility study of short duration, it was hypothesised participants would be able to partake fully in the intervention without reporting adverse effects. It was also hypothesised gains in functional exercise tolerance, balance, motor performance and quality of life would be evident after the eight weeks of set dancing classes.

Methods

This study was approved by the Mid-Western Regional Hospital Scientific Research Ethics Committee.

Ten participants (7 males, 3 females) were recruited through public talks where verbal and written information about the study was provided. Written consent was obtained from all participants prior to taking part along with approval from their general practitioner. In accordance with inclusion and exclusion criteria, all participants had a diagnosis of idiopathic PD, stages 1-2.5 on the modified Hoehn and Yahr scale [17]. They were able to walk 3 m unaided and had a DVD player to enable participation in the home dance programme. No participant had a serious cardiovascular/pulmonary condition, neurological deficit other than PD, evidence of a musculoskeletal problem, issues contraindicating participation in exercise, or a cognitive or hearing problem which affected their ability to follow instructions or hear

music. Participants had not taken part in regular dance classes in the six months prior to the trial [18].

Assessment

Assessments took place the week before the dance classes began and the week after classes finished [19]. Assessments were carried out by two qualified healthcare professionals, blinded to the hypothesis of the study. A standardised script was used for assessments. Participants were assessed at the same time of day in all assessments to avoid fluctuations in performance [20]. They were instructed not to change their exercise habits or usual care unless advised by their practitioner. Participants were instructed to inform the researcher if changes were made to any aspect of their usual care or exercise habits. Participant's data was eliminated if any changes were made [21].

Outcome measures

The Unified Parkinson's disease rating scale-motor subscale 3 (UPDRS-3) was used to assess the severity of motor impairments associated with PD [22,23]. Quality of life was assessed using the Parkinson's disease questionnaire-39 (PDQ-39) [24]. This questionnaire assesses the impact of PD in eight different areas including mobility and communication. The summary index provides an overall score of the impact of PD on quality of life. The 6-min walk test was used to assess functional exercise tolerance [25,26]. Balance was assessed using the Berg balance scale [27]. All of these measures have been found valid and reliable in those with PD and have been used in previous studies investigating the benefit of dance for individuals with PD [19,21,28-31]. A screening questionnaire designed to investigate participants past dance experiences was filled in before classes commenced. An exit questionnaire developed by Hackney et al. [20] was used to evaluate the intervention. The questionnaire asked

participants if they noticed improvements in different aspects of health on a Likert scale from 1 to 5. Feasibility was assessed by monitoring for adverse effects (falls, muscle soreness, excessive fatigue), participants' verbal feedback, attendance at classes, compliance with the home dance programme and feedback from the exit questionnaire. Demographic information was collected via interview.

Intervention

Participants attended one set dancing class per week [22] for eight weeks. A day and time for class was chosen in collaboration with participants. Each class lasted 1.5 h and took place in a community hall. Classes were led by a set dancing teacher who was also a chartered physiotherapist. Participants were encouraged to take rests and inform the instructor if they felt unwell and express opinions on class structure. Each participant with PD was partnered with a spouse, caregiver or family member during the class [22,32].

The dance class started with a warm up consisting of range of motion, aerobic and postural exercises [22,33]. During the main part of the class participants learned various set dancing steps including the polka and reel steps [15]. These steps were then combined with patterns of movement in a group formation to create a set. Sets including the Corofin Plain Set and the Plain Set were taught [34]. These sets use stepping strategies similar to gait and contain turning movements that allow a partner to be used as visual cues. They also provide repetitive practice initiating and terminating movement and adjusting centre of gravity in different directions. The class ended with each couple practicing gait patterns to the music [35] and gentle flexibility exercises [36]. Exercises and dance material were progressed from sitting to supported standing using the back of a chair and finally to unsupported standing in line with participants abilities.

To complement classes, a set dancing-based exercise programme was performed at home for 20 min, twice per week. Exercises involved seated active practice of class material and mental rehearsal to facilitate learning [37,38] and optimise safety. A standardised interactive DVD, developed by the dance instructor was given to aid learning [39]. Compliance with the home exercise programme was monitored using a home exercise diary.

Statistical analysis

Data was analysed using Predictive Analytics Software (“PASW”) version 20. Frequency analysis was done to give a descriptive account of participants and to analyse questionnaire data. As data was non-parametric, the Wilcoxon Signed Ranks Test was used to compare pre and post intervention data. A significance level of <0.05 was set for all statistical tests.

Results

All participants completed the study. Data from one participant was excluded from all analysis due to medication changes. The demographic profile of the remaining nine participants is presented in Table 1.

Table 2 displays the results. Quality of life (PDQ-39 scores) improved significantly. A trend toward significance was observed in motor impairment (reduced UPDRS-3 scores).

Table 1 Demographic Characteristics of Participants

Demographic Characteristic (n=9)	Values
Age (years)	66.66±5.87
Hoeln and Yahr	1.5±0.5 (1, 2.5)
Gender (male/female)	7:2
Duration of disease (years)	7.3±5.96
Previous set dance experience (yes/no)	43%

Values for age and duration of disease are mean± standard deviation. Values for Hoeln and Yahr are median± interquartile range (minimum, maximum)

Table 2 Results

Outcome measure	Baseline (n=9)	Post intervention (n=9)	^aP value
UPRRS-3 (points)	11±7.5 (6, 25)	9±8 (4, 18)	0.05
PDQ-39 (points)	23.30±17.46 (4.59, 36.82)	19.27±15.93 (2.08, 31.41)	0.01*
6MWT (meters)	388.43±100.24 (288.19, 513.73)	388.43±93.98 (288.19, 476.14)	0.24
Berg (pts)	55±2.50 (52, 56)	56±2.50 (53, 56)	0.1

^aWilcoxon Signed Ranks Test, *= Significant finding, Results are median±interquartile range (minimum, maximum), UPDRS-3=Unified Parkinson's Disease Rating Scale –Motor subscale, 6MWT= 6Minute-Walk Test, Berg= Berg Balance scale, An increase 6MWT, Berg=Improvement, A reduction in UPDRS-3, PDQ-39=Improvement

No adverse effects were reported during or following the study. Attendance rate at classes was 86%. Compliance with the home programme was 67%. One participant only attended 50% of classes due to work commitments and complied least with the home programme (25%). Other reasons for absence included illness unrelated to participants PD and family events.

Results from the exit questionnaire showed participants enjoyed classes, noticed improvements in several aspects of health and would like to continue if more classes were offered (Table 3). In relation to verbal feedback, participants were happy with class structure and stated they “enjoyed all aspects of the class”. They felt material was thought in a way that suited their needs. Participants felt the home programme was “too simple” and would be more challenging if they could practice in standing. They liked listening to the music but felt mental rehearsal was unstimulating and “boring” and would have preferred to actively dance. Compliance with the home programme was affected by these issues and family events.

Table 3 Exit Questionnaire

Questionnaire item	Median (min, max) (n=9)
I enjoyed participating	1, (1,1)
My balance improved	2,(2,4)
My walking has improved	2 (1,3)
My mood improved	3, (1,3)
My coordination improved	2 (1,3)
My strength improved	2, (2,4)
My endurance improved	2 (1,3)
I would continue classes if offered	1 (1,3)
I use ideas/skill learned in classes in ADL'S	3(1,3)

Table illustrates median (minimum, maximum values for Likert scale from 1-5. (1=strongly agree, 2=somewhat agree, 3=neither agree nor disagree, 4=somewhat disagree, 5=strongly disagree).

Discussion

This study is novel as it is the first to examine the feasibility of community-based set dancing for those with PD in Ireland. The results of this study are promising and can be used to inform the methods of a larger randomized controlled trial.

Quality of life improved significantly following the set dancing programme. Volpe et al. [10] demonstrated six months of set dancing could improve quality of life. However, the benefit of a shorter duration intervention delivered in the community had not been established. It is important to note Volpe et al. [10] reported a greater magnitude of improvement on the PDQ-39, illustrating the positive impact long term participation in set dancing can have on quality of life. In an Irish context, set dancing may improve quality of life as it gives people the opportunity to laugh, relax and participate in an integral part of

social life [15]. Therefore, set dancing may be easily accepted as a form of physical activity and the rewarding, enriching environment created by the music, social interaction and motor skill learning, may help stimulate brain chemicals such as dopamine and serotonin [22,40,41]. These play a fundamental role in the pathology of motor and non-motor symptoms that can negatively impact quality of life in those with PD [1,42,43].

Set dancing involves multidirectional movements requiring continuous adaption to surroundings. Challenging environments have been hypothesised to improve aspects of balance through repetitive exposure and activation of one or more of the postural control systems [44]. However, no significant change in balance was detected post intervention. The small sample size in this study may account for this result. Additionally, participants had minimal balance impairment as indicated by balance results (Table 2). Previous literature [45,46], has identified that the Berg balance scale may not be sufficiently able to detect changes in individuals who have a higher level of balance performance, resulting in a ceiling effect. Future research may need to consider this and utilize other balance measures.

This was the first study to investigate the benefit of set dancing on functional endurance. While no improvements were observed, participants maintained their pre-assessment result over the trial. It is plausible that the intervention dosage was insufficient as participants only completed 130 min of dancing per week over eight weeks. This dosage is lower than previous studies used [19,20,47] and does not meet the recommendations for weekly physical activity [48]. It is also possible that a higher dosage is needed to significantly improve motor impairment (measured on the UPDRS-3) given that a trend toward improvement was observed in this study.

The results suggest set dancing is feasible for people with mild to moderate PD. All participants completed the study and no adverse effects were reported. The attendance rate of 86% is comparable with previous dance studies (78%-91%) [10,47]. Notably these studies

had longer durations (6-12months) making direct comparison difficult. Concurrent with the high attendance rate in this study, the exit questionnaire showed all participants “extremely” enjoyed classes and noticed improvements in several aspects of health particularly in gait and endurance (Table 3). This is similar to findings reported in previous dance and exercise studies [20,49], although a larger number of participants in this study expressed a desire to continue classes. Again, this may be due to the social, cultural context of set dancing in Irish society [15]. Furthermore, work related commitments were the greatest factor that interfered with attendance, accounting for 40% of all absences. Future studies may need to consider the scheduling of classes to ensure allocated class times suit the lifestyle of the target population.

The feasibility of a home dance programme in conjunction with dance classes has not been extensively investigated in this population. Participants complied with 67% of the programme, completing an average of 3.59 hour of dance exercise at home over eight weeks. In comparison to previous studies, this compliance rate is lower than formerly reported (79%) [50]. Lack of motivation and challenge appeared to interfere most with compliance. In light of this, a number of modifications will need to be made to the home programme before implementation in future studies.

Conclusions and implications

Set dancing is safe and feasible for some people with mild to moderate PD and may help to encourage participation in physical activity. Although, this study is limited by the small sample size and single group design, the findings raise hypothesis about the benefits of set dancing and identify issues regarding outcome measures and intervention dosage that will be addressed in a larger randomized controlled trial. This trial is registered on clinicaltrials.gov (registration number: NCT01939717).

Conflict of interest statement

The authors report no declarations of interest.

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