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# Dance classes improve self-esteem and quality of life in persons with Parkinson's disease

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## Abstract

**Introduction** Dance can reduce motor symptoms in persons with Parkinson's disease (PD). However, the effect on psychosocial wellbeing, including self-esteem and quality of life is less clear.

**Methods** Forty-nine persons with PD (Hoehn and Yahr stage 1–4) participated in weekly dance classes for a consecutive period of 22 weeks, 36 participants completed the classes. Two baseline measurements (T1a and T1b) were performed during a 2-week control period prior to the dance classes. Post-measurements (T2) were performed immediately after 22 weeks of dance classes. Primary outcome was self-esteem as measured with the Rosenberg Self-Esteem Score.

**Results** Self-esteem scores were stable across the two baseline measurements and improved significantly after the dance classes (1.5 points improvement between T1b and T2, 95% CI 0.3, 2.7;  $p=0.012$ ). Additionally, quality of life as measured with the Parkinson's Disease Questionnaire 39 improved significantly (3.4 points reduction between T1b and T2, 95% CI – 5.7, – 1.2;  $p=0.003$ ) as did motor symptoms as measured with the Movement Disorders Society-Unified Parkinson's Disease Rating Scale—part III (6.2 points reduction between T1b and T2, 95% CI – 10.1, – 2.4;  $p=0.002$ ). Balance confidence as measured with the Activities-Specific Balance Confidence Scale did not change.

**Discussion and conclusions** Dance classes seem to improve self-esteem, quality of life and motor symptoms in persons with PD. These effects should be investigated further in a randomized clinical trial.

**Clinical message** Dance classes may be a valuable complementary treatment option in people with PD to improve not only motor symptoms, but also self-esteem and quality of life.

**Keywords** Parkinson's disease · Dance · Self-esteem · Quality of life

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## Introduction

Pharmacological and surgical therapies do not always resolve disabling (non-) motor symptoms and associated reduction in quality of life and general social functioning in persons with Parkinson's disease (PD) [1–3]. Complementary non-pharmacological interventions are therefore needed. Exercise is a promising intervention in PD [4]. However, people with PD may experience various barriers to exercise [5] and tend to become physically inactive [6].

The challenge is to develop interventions that address motor as well as non-motor symptoms in a format that is enjoyable and engaging [7]. Dance may be an intervention meeting these criteria. First, dance may address all key elements of an exercise program for those with PD [8]. It naturally combines training of physical variables (balance, flexibility, strength and cardiorespiration) and cognitive

skills (multitasking, memory). Second, dance is perceived as enjoyable by many people with PD [7]. Social interaction, the possibility of spousal participation and focus on the enjoyment of moving to music, instead of focusing on PD-related limitations, may contribute to this [9].

Dance interventions can improve balance, gait, functional mobility and severity of motor symptoms as measured by the Movement Disorders Society-Unified Parkinson's Disease Rating Scale—part III [10, 11]. Additionally, studies have reported that dance may improve mood, cognition and quality of life [2, 12]. The effects on self-esteem, however, have not been investigated. In daily clinical practice, people with PD do regularly mention the beneficial effects of dance classes on their self-esteem.

Therefore, our primary goal was to investigate the effect of dance on self-esteem in people with PD. Second, we analyzed the effects on quality of life, balance confidence and the severity of motor symptoms.

## Methods

### Study design and participants

An exploratory longitudinal cohort study was conducted, with two baseline measurements separated by two weeks (T1a, T1b) that served as a control period. A third measurement (T2) was carried out immediately after 22 consecutive weeks of weekly dance classes.

Inclusion criteria were a diagnosis of PD and the ability to follow instructions. Exclusion criteria were the presence of comorbidities such as orthopedic surgery (<3 months ago) or other neurological conditions which significantly influence mobility. All people with PD who were enrolled in the dance classes (see “[Intervention](#)” section) were asked to participate in this study ( $n = 108$ ).

### Intervention

The dance classes were given once a week for 22 weeks by PD-skilled dance teachers at seven different locations in the north of the Netherlands. The classes involved aspects of ballet, modern dance and jazz, and lasted 60 min. Classes started with a warming up (usually on and behind a chair or at the barre), followed by dance routines with aspects of partnering, improvisation and memorized choreographed dance sequences, closed by a cooling down. The classes focused on enjoyment and success, rather than the limitations of the participants. There was an opportunity to socialize before and after the dance classes. Usual care (including visits to neurologists and allied health professionals) continued during the study period.

### Data collection

The primary outcome was self-esteem as measured with the Rosenberg Self-Esteem Scale (RSE) [13]. Secondary outcomes were quality of life as measured with the Parkinson's Disease Questionnaire (PDQ-39) [14], balance confidence as measured with the Activities-Specific Balance Confidence Scale (ABC) [15] and severity of motor symptoms as measured with the Movement Disorders Society-Unified Parkinson's Disease Rating Scale—part III (MDS-UPDRS part III) [16].

MDS-UPDRS part III was performed by three trained observers. Observer 1 and 2 performed the first two measurements (T1a and T1b), observer 2 and 3 performed the last measurement (T2). The questionnaires were distributed electronically and personally by the observers. They were collected by the observers at the time of the MDS-UPDRS measurements.

### Statistical analysis

In a linear mixed model analysis (maximum likelihood method, autoregressive first order covariance structure), the effects of time (categorical variable (T1a, T1b and T2)) were explored, where T1b was the moment of reference. This type of analysis is a flexible technique for longitudinal data analysis and allows for missing data, while taking into account all available data. RSE, PDQ-39, ABC and MDS-UPDRS III scores were dependent variables with gender, age and Hoehn and Yahr stage as independent variables. For clinical interpretation, age was centered at the mean of the group (68 years). Independent variables were entered stepwise manually in the model and remained in the model if the model fit increased significantly ( $-2 \text{ Log Likelihood criterion}$ ) or regression coefficients were significant ( $p \text{ values} \leq 0.05$ ). Effect sizes (Cohen's  $d$ ) for the changes between T1b and T2 were calculated. All analyses were performed in IBM SPSS statistics version 23.

## Results

Of the 108 people with PD who were asked to participate, 50 agreed to do so. One person (woman, 78 years old, Hoehn and Yahr stage 1) was excluded after the first measurement, because of inability to follow the instructions of the test battery, hence 49 persons participated (Table 1). Thirteen participants withdrew from the study because of physical complaints other than PD ( $n = 5$ ), inability to reach the participant at T2 ( $n = 3$ ), the classes being

**Table 1** Characteristics of persons following dance classes and persons completing dance classes

Characteristics of persons	Following dance classes ( <i>n</i> = 49)	Completing dance classes ( <i>n</i> = 36)
Gender (woman)	31 (63%)	21 (58%)
Age, mean (SD)	68 (8.4)	68 (7.4)
Hoehn and Yahr stage		
1	22 (45%)	16 (44%)
2	18 (37%)	14 (39%)
3	5 (10%)	5 (14%)
4	4 (8%)	1 (3%)

too confrontational (*n* = 1), new job (*n* = 1) and unknown (*n* = 2). Data from these dropouts that had been collected until the moment of dropout were included in the analysis.

For all dependent variables, the change between T1a and T1b was not significant, indicating stable baseline values. After the dance classes, scores of the Rosenberg Self Esteem Scale, the Parkinson's Disease Questionnaire 39 and the Movement Disorders Society-Unified Parkinson's Disease Rating Scale—part III had improved significantly

(Table 2). Activities-Specific Balance Confidence scores did not change after the dance classes. Age was significantly associated with the MDS-UPDRS part III sum score but did not influence the effect of the dance classes, because interaction between age and time was not significant. Gender and Hoehn and Yahr stage did not contribute to the statistical prediction of the dependent variables. The two baseline measurements of the MDS-UPDRS part III were not systematically influenced by differences between the observers (linear mixed model analysis).

## Discussion

Our primary goal in this exploratory longitudinal cohort study was to investigate the effect of dance on self-esteem in people with PD. We also analyzed the effect of dance on quality of life, balance confidence and motor symptoms. The results showed that after 22 weeks of weekly dance classes, the self-esteem, quality of life and motor symptoms of people with PD had improved.

This is the first study to investigate the effect of dance on self-esteem in PD. Our study showed a significant

**Table 2** Outcomes of linear mixed model analyses

	Estimate	Std. error	Sig.	95% confidence interval		Effect size (Cohen's <i>d</i> )
				Lower bound	Upper bound	
Rosenberg Self Esteem Scores						
T1b	20.8	0.6	<0.001 <sup>*a</sup>	19.5	22.1	
T1a	0.2	0.6	0.737	− 1.0	1.3	
T2	1.5	0.6	0.012 <sup>*b</sup>	0.3	2.7	0.465
PDQ-39 Summary Index						
T1b	29.1	1.8	<0.001 <sup>*a</sup>	25.5	32.7	
T1a	1.1	1.1	0.296	− 1.0	3.3	
T2	− 3.4	1.1	0.003 <sup>*b</sup>	− 5.7	− 1.2	0.464
ABC Scores						
T1b	70.4	3.2	<0.001 <sup>*a</sup>	64.0	76.8	
T1a	0.2	2.5	0.942	− 4.9	5.2	
T2	0.6	2.6	0.802	− 4.5	5.8	0.139
MDS-UPDRS part III Sum Scores						
T1b	37.6	2.1	<0.001 <sup>*a</sup>	33.5	41.8	
T1a	− 3.4	1.7	0.055	− 6.9	0.1	
T2	− 6.2	2.0	0.002 <sup>*b</sup>	− 10.1	− 2.4	0.441
Age centered (68)	0.5	0.2	0.029 <sup>*c</sup>	0.1	0.9	

T1b is moment of reference

ABC Activities-Specific Balance Confidence, PDQ-39 Parkinson's Disease Questionnaire-39, MDS-UPDRS Movement Disorders Society-Unified Parkinson Disease Rating Scale

<sup>\*a</sup>Differs significantly from 0

<sup>\*b</sup>Differs significantly from T1b

<sup>\*c</sup>For each year above (below) the age of 68, the participant scores on the MDS-UPDRS part III increase (decrease) with 0.5 points

improvement in self-esteem after the dance classes. We found a medium effect size (Cohen's  $d$  0.465). It remains to be determined whether this improvement is caused by the specific effects of the dance classes itself, or whether this reflects in a specific effect conveyed by the social interaction with other people with PD. We hypothesize that both factors may have contributed. People with PD reported that because of the dance classes they felt more like a person instead of a patient and it provided them with positive feedback instead of a focus on limitations. Importantly, we did not find evidence for a causal relation between the dance classes and improved self-esteem. Another possibility is that dance improved motor aspects of the disease and that this reverted on self-esteem.

Self-esteem has the potential to influence quality of life in people with PD [17]. We found that quality of life, as measured by the Parkinson's Disease Questionnaire 39, did improve significantly after the dance classes. This is in line with other studies evaluating the effects of dance on quality of life in PD [2, 12]. We again found a medium effect size (Cohen's  $d$  0.464). The effect size in the study of Lee and colleagues was larger (Cohen's  $d$  0.654). This may have arisen because the latter study concerned a 'between-subjects' comparison and our study concerned a 'within-subjects' comparison. On average, the improvement on the PDQ-39 ( $-3.4$ ) did not exceed the minimal clinical important difference (MCID,  $-4.7$ ) [18], although the improvements were larger than the MCID in 41% of the participants.

Balance confidence, as measured with the Activities-Specific Balance Confidence Scale, did not change after the dance classes. Interestingly, two recent studies involving balance training with virtual reality [19] and a highly challenging balance training [20] in people with PD both reported improvement in balance performance, without improved balance confidence, as measured with the ABC Scale. These findings suggest that physical balance training alone may not be enough to improve balance confidence and that more factors, such as overall confidence, may play a role. Of note, the absence of improvement on the ABC scale suggests that the improvement on the three other outcome measures was not based on a specific placebo effect of the intervention, but more likely reflected an actual improvement due to the specific effects of the dance classes.

Motor symptoms, as measured with the Movement Disorders Society-Unified Parkinson Disease Rating Scale—part III, also improved significantly by  $-6.2$  points, again with a medium effect size (Cohen's  $d$  0.441). This effect can be interpreted as of moderate clinical importance since the MCID of the UPDRS motor score is  $-2.5$  points [21]. The significant improvement in motor symptoms after the dance classes is in line with meta-analyses [10, 11].

This exploratory study is not without limitations. Due to feasibility issues, the MDS-UPDRS was performed by

three observers, although our analyses showed no effect of differences between the raters. Additionally, years of disease or years since diagnosis were not recorded. Also medication use was not assessed. Participants were typically seen during a regular on state. Moreover, we did not evaluate whether dopaminergic medication changed over the study period. Additionally, we did not include balance as an outcome measure, therefore, we do not know if this changed after the dance classes and whether this affected the outcome on balance confidence. When participants withdrew somewhere during the time of the actual dance classes, no measurement was performed. In future research, it would be interesting to add further measurements during the dance classes (e.g. half way). Despite these limitations, this exploratory study provides a solid basis for further research on which elements of dance classes improve self-esteem in PD.

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**Author contributions** WF and BB conceived and designed the study. TR, HR and WF collected the data. WF, JN, HR, PD and BB contributed to the interpretation of the data. PD performed the statistical analyses. WF and TR wrote the first draft of the article. All other authors revised the article critically. All authors gave final approval of the version to be submitted.

## Declarations

**Conflicts of interest** Wya Feenstra was involved in developing the dance classes, but has no financial interests. The other authors have no relevant financial or non-financial interests to disclose.

**Ethical approval** The study was performed in accordance with the guidelines of the 1964 Declaration of Helsinki and was approved by the Medical Ethics Review Board of the University Medical Centre Groningen. All participants signed an informed consent prior to the study.

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