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Mood changes following social dance sessions in people with Parkinson's disease

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Abstract

Dance interventions have physical benefits for the elderly, especially those with Parkinson's disease. This study assessed the psychological benefits of dance. A total of 37 participants, with either Parkinson's disease (n = 22) or age-matched controls (n = 15) completed mood questionnaires before and after a 10-week dance intervention. An overall reduction in total mood disturbance and a specific reduction in anger were observed. In addition, less fatigue was found for those initially scoring higher in depression. This suggests that dance can provide psychological benefits for both people with Parkinson's disease and the elderly, with findings suggesting that this is an avenue to be explored further.

Keywords

Brunel University Mood Scale, dance, exercise, mood, Parkinson's disease, Profile of Mood States

Introduction

Parkinson's disease (PD), a neurodegenerative disease, typically developing in people above the age of 50 years, is associated with the motor signs of tremor, bradykinesia, rigidity and postural instability. Although PD is predominantly identified by these motor symptoms, non-motor features are also shown to be associated with the condition, including sleep disturbances (Menza et al., 2010), deficits in tasks of executive functioning (Rodriguez-Ferreiro et al., 2010) and altered mood (Brown et al., 2011). Although clarity is needed concerning which non-motor symptoms are linked directly to the pathology, it is important not to neglect these factors affecting those living with PD.

It has been said that 'depression is the most common neuropsychiatric disturbance in Parkinson's Disease' (Papapetropoulos et al., 2006: 465). Research has consistently shown that there is a high prevalence of depression in people with PD, such that up to 60 per cent of scores in relation to quality of life can be explained by depression (Global Parkinson's Disease Survey (GPDS) Steering Committee, 2002) and perhaps even more than the severity of the motor symptoms of the disease (Suzukamo et al., 2006). Furthermore, Starkstein et al. (1992) found that depression in PD was strongly

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associated with a greater decline in cognition and severity of disease. It is thought that early intervention in the treatment of depression in PD could be essential in aiding cognitive function (Kuzis et al., 1997; Starkstein et al., 1990). Despite this and the consistent identification of an association between depression and PD (Brown et al., 2011; Schindler et al., 1993; Tandberg et al., 1996), the implications of mood disturbance are often neglected both by patients and by neurologists failing to identify depression in up to potentially 75 per cent of people with PD (Schindler et al., 1993; Schulman et al., 2002).

It is well known that exercise can have positive benefits on mood in adults who do not have PD (McDonald and Hodgdon, 1991; Smith, 2013), including those with other chronic illnesses (Graham et al., 2008). Conversely, mood can regulate the quality of the exercise performance (Lane et al., 2012). In a review by Yeung (1996) of 23 exercise studies, 18 showed significant benefits of mood with the remaining 5 being inconclusive. Dance has also been shown to regulate mood such that positive mood is increased and negative mood is decreased following dance exercise interventions over short-term, progressive periods of up to 50 minutes (Hansen et al., 2001; Kennedy and Newton, 1997) and over a longer period of 7 weeks (Steinberg et al., 1998). Furthermore, improvements in mood, including those measured by the Profile of Mood States (POMS) have been observed after just 10 minutes of exercise, including dance, resulting in higher vigour and less confusion (Lane et al., 2003; Maroulakis and Zervas, 1993; Rokka et al., 2010) and an improvement in total mood score, vigour and fatigue (Abrantes et al., 2012; Hansen et al., 2001).

Exercise is proposed to be particularly beneficial for anxiety and depression (Steinberg et al., 1998), the two most common psychological disorders in PD and the elderly (Carod-Artal et al., 2008). In a qualitative study interviewing elderly dancers, the main themes to emerge were feelings of psychological well-being, as well as a sense of belonging (Paulson, 2011). In addition to this, Lima and Vieira (2007) followed dance classes over the period of 1 year in the elderly, where participants reported 'being transported to a world of happiness' and being able to 'forget their problems' (Lima and Vieira, 2007: 136). This led the authors to conclude that dance classes could potentially be beneficial for well-being and social relationships. It should, however, be noted that although dance increases mood in all individuals, it is suggested there is a greater benefit for those with initially low depression scores (Lane and Lovejoy, 1999).

Recent evidence has suggested that exercise, especially dance, can help the motor symptoms of PD (Hackney and Earhart, 2009; Hackney et al., 2007). In a meta-analysis carried out by Goodwin et al. (2008), it was concluded that exercise resulted in improvements to physical functioning, balance, strength and health-related quality of life. Physical benefits in flexibility, balance and coordination were also reported by Alpert et al. (2009) following 15 weeks of jazz dance classes.

However, not all studies have shown improvements in mood following dance classes in the elderly (Alpert et al., 2009; Eyigor et al., 2009; McInman and Berger, 1993; Maroulakis and Zervas, 1993), and moreover, research focusing on the benefits of dance for PD often fails to assess the potential mood benefits that dance could provide. This is particularly surprising given that mood has been shown to relate to both cognition and physical health (Berger and Motl, 2000; Cohen and Rodriguez, 1995). Goodwin et al. (2008) concluded that there was insufficient evidence of the impact of exercise on depression in PD. In addition, no research has been identified to date that investigates whether dance classes can improve mood in PD over both a short and a longer time period.

The objective of this study was, therefore, to examine the moderating effect of dance on mood in the elderly and more specifically in a group of people with PD across a long cycle of 12 weeks and a short cycle of 1 hour.

Method

Participants

A total of 37 participants, aged between 50–80 years (M = 65.5 years), took part in the study. Of these, 22 participants (12 males, 10 females) had been diagnosed with PD and were all rated as having mild to moderate PD (Hoehn and Yahr I–III) by trained physiotherapists. The remaining 15 participants (7 males, 8 females) acted as age-matched controls.

Participants were recruited though local advertisements and through contact with local PD support groups. Eight of the controls were partners of those in the PD group. This study was ethically approved at an institution in the United Kingdom.

Design

This study formed part of a larger study investigating dance as an intervention for PD. A mixed design was used with two independent variables. IV1: Group, with two levels (PD vs Control); IV2: Long Cycle Time, with two levels (week 1 vs week 12), or Short Cycle Time, with two levels (before class vs after class). The dependent variables (DVs) were participant's mood scores.

Materials

POMS. The POMS (McNair et al., 1971) was used to measure mood changes across Long Cycle Time. The POMS is a 64-item mood scale and is scored on six subcategories: Tension–Anxiety, Vigour–Activity, Depression–Dejection, Fatigue–Inertia, Anger–Hostility and Confusion–Bewilderment. The POMS also produces a Total Mood Disturbance (TMD) score, calculated by adding all responses and subtracting Vigour from the rest of the subscales. Responses to mood are indicated on a 5-point Likert scale (0 = Not at all to 4 = Extremely). Lower scores indicate a more positive mood state in all subscales other than Vigour, where a higher score suggests higher energy and elevated mood.

Originally developed for a clinical setting, this measure was chosen as it has since been developed to show good reliability for the elderly (Nyenhuis et al., 1999) along with its excellent levels of internal consistency.

Brunel University Mood Scale. The Brunel University Mood Scale (BRUMS; Terry et al., 1999) was used to measure mood changes across Short Cycle Time. The BRUMS is a short-form version of the POMS, verified by Terry et al. (1999) to be suitable for adults in a normal population. The BRUMS is scored according to the same dimensions as the POMS but on a 24-item scale.

Procedure

Following informed consent, participants were asked to fill out a demographics questionnaire and the POMS according to how they felt in the past month. As well as this, all participants were administered the Mini Mental State Examination (MMSE) at baseline, in a meeting prior to the first dance class (week 1). Participants then attended a weekly dance class, run by a qualified dance instructor, for a period of 10 weeks (weeks 2–11). Dance classes lasted for 50 minutes and consisted of a 10-minute warm-up, 30 minutes of dancing and ended with a 5-minute cool-down. A 5-minute break was given midway. Each class was based on rhythmic dancing to a strong beat, designed to be appropriate for the age, mobility and constraints of people with mild to moderate PD. Participants were taught in two separate, yet identical, dance classes. They completed the classes standing, with the option to sit down if desired. The style of dancing changed every 2 weeks and consisted of Bollywood, Tango, Cheerleading, Old Time Music Hall and Party dancing based on the Charleston and Saturday Night Fever. In the ninth week, participants were asked to complete the BRUMS, according to how they felt 'right now', before and after the dance class (short cycle). Following completion of the dance classes, participants were asked to complete the POMS for a second time a few days later in week 12 (long cycle).

Table 1. Comparison of baseline means (*SD*) between PD and control groups, and POMS geriatric statistical norms.

	PD (n = 18), mean (*SD*)	Control (n = 10), mean (*SD*)	POMS norms, mean (*SD*)
Age	65.94 (9.33)	64.5 (9.86)	68
MMSE	28.44 (2.01)	29.00 (1.25)	–
POMS: Tension–Anxiety	9.33 (5.92)	8.30 (4.52)	5.9 (5.2)[a]
POMS: Depression–Dejection	7.44 (9.31)	7.10 (9.32)	5.8 (6.7)
POMS: Anger–Hostility	5.50 (5.79)	8.90 (7.36)	4.4 (4.7)
POMS: Vigour–Activity	15.78 (7.0)	17.20 (6.39)	21.3 (6.0)[a]
POMS: Fatigue–Inertia	9.33 (7.26)	7.70 (4.92)	6.1 (5.4)
POMS: Confusion–Bewilderment	6.72 (4.0)	4.00 (3.97)	4.5 (3.5)[a]
POMS: Total Mood Disturbance	22.56 (33.3)	18.8 (29.59)	5.3 (25.9)[a]

SD: standard deviation; PD: Parkinson's disease; POMS: Profile of Mood States; MMSE: Mini Mental State Examination.
[a]POMS norms significantly different to Parkinson's at $p < .05$.

Results

Two participants (Parkinson's = 1, Control = 1) dropped out of the study during the intervention due to an unrelated medical issue and because they did not wish to continue, respectively. Five participants (Parkinson's = 3, Control = 2) were unable to attend the final testing session due to either a holiday ($n = 2$), other commitments ($n = 2$) or illness ($n = 1$) and therefore failed to submit final POMS questionnaires. One further person from the control group was excluded due to scoring below the cut-off point on the MMSE.

Demographic and normative data comparisons

Initial comparisons using independent samples *t*-tests between mean scores of the PD and control groups revealed no significant differences between the two groups for age, MMSE scores or baseline mood scores ($p > .05$ in all cases) (Table 1).

One sample *t*-tests were carried out comparing normative to baseline POMS scores for PD and control participants. Tension, Vigour, Confusion and TMD were found to be significantly different from the norms in the PD group, in all cases showing a higher mood disturbance to the norms. No significant differences ($p > .05$) from the norms were found for the control group.

Correlations between baseline POMS subscales revealed variables that were highly correlated with one another. However, most correlations were .7 or below and therefore acceptable for multivariate analysis (Maxwell, 2001).

Long cycle time

TMD data for long cycle time was subjected to a 2 × 2 mixed analysis of variance (ANOVA): Factor 1 – Group (PD vs Control); Factor 2 – Time (pre- and post-intervention).

TMD scores showed a significant main effect of time, $F(1, 26) = 5.75$, $p = .024$, partial $\eta^2 = .18$, such that total disturbance in mood was lower post intervention. There was no significant main effect of group and no interaction between time and group ($p > .05$).

In order to determine whether the change in overall mood was due to a particular subscale, a 2 × 2 multivariate analysis of variance (MANOVA) was conducted, where each subscale served as a DV. Data of one participant were automatically excluded from the MANOVA, due to two incomplete subscales.

A mixed MANOVA showed no significant differences between group or time on the combined DVs ($p > .05$). The interaction between time and group, however, reached borderline significance, $F(6, 21) = 2.57$, $p = .05$; Wilks' Lambda = .58.

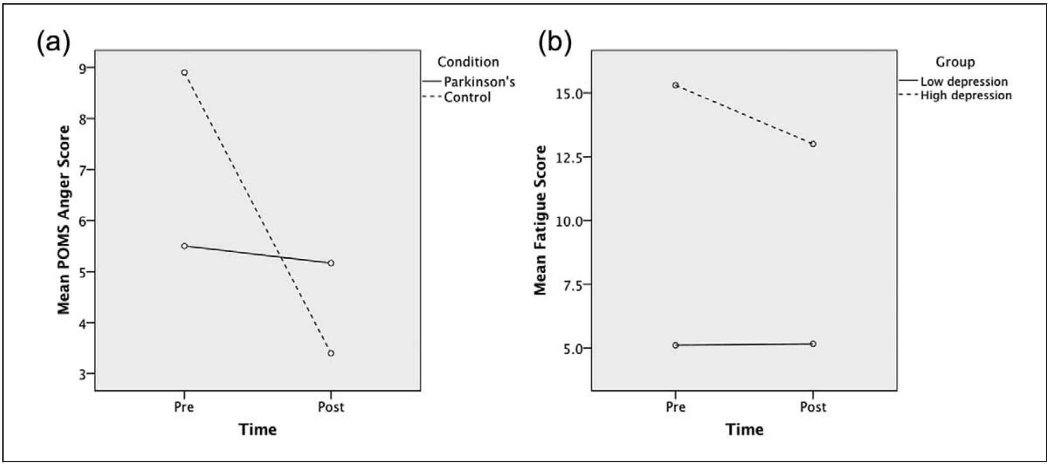

Figure 1. (a) The interaction between time and group for POMS Anger scores and (b) interaction between time and time depression for POMS Fatigue scores.
POMS: Profile of Mood States.

When the results for the DVs were considered separately, a significant difference for time was found in Tension, $F(1, 26) = 4.76$, $p = .038$, partial $\eta^2 = .16$; Anger, $F(1, 26) = 9.6$, $p = .005$, partial $\eta^2 = .27$; and Vigour approached significance, $F(1, 26) = 3.56$, $p = .072$, such that all participants reported less tension and anger and greater vigour. Bonferroni post hoc corrections were carried out in order to allow for the chance of a type I error occurring due to multiple testing and correlated DVs. Using a Bonferroni-adjusted *p*-value of .008, Anger was the only subscale to remain significant.

There were no significant differences for group ($p > .05$ in all cases). The only subscale to show a significant interaction between time and group was Anger, $F(1, 26) = 7.53$, $p = .011$, partial $\eta^2 = .23$.

Figure 1(a) displays the interaction in POMS Anger scores such that those in the control group had reduced scores in anger ($M = 3.40$) compared to those with PD ($M = 5.17$). Pre-anger scores were higher for POMS in the control group ($M = 8.90$) than the PD group ($M = 5.50$). However, an independent samples *t*-test confirmed that these scores were not significantly different from pre-scores in the PD group ($p > .05$).

Further analyses comparing improvements in mood to initial POMS depression scores were carried out. Scores of POMS depression from both PD and controls were collapsed into two groups – low and high depression scores – with a cut-off point of 7 (Wilkins et al., 1995) used to determine low depression scores.

A 2 × 2 mixed MANOVA – Factor 1: Depression group (low vs high); Factor 2 – Time (pre- and post-intervention) – revealed a significant main effect of group, $F(6, 21) = 17.92$, $p < .001$, but no significant main effect of time and no interaction ($p > .05$ in all cases) on the combined DVs. When the analysis for DVs was carried out separately, main effects of time were found for Tension, $F(1, 26) = 7.14$, $p = .013$, partial $\eta^2 = .22$, and Anger $F(1, 26) = 5.1$, $p = .033$, partial $\eta^2 = .18$, such that lower feelings of tension and anger were present post-intervention. Fatigue also showed a significant effect of time, $F(1, 26) = 5.55$, $p = .026$, partial $\eta^2 = .16$, such that lower levels of fatigue were reported post intervention. Using a Bonferroni-adjusted *p*-value of .01 Tension reached borderline significance. However, Anger and Fatigue were no longer significant. There were significant main effects of depression for all POMS subscales ($p < .01$ in all cases) such that higher levels of mood disturbance were present in the depressed group. Fatigue was the only subscale to show a significant interaction between time and group, $F(1, 26) = 5.62$, $p = .025$, partial $\eta^2 = .18$.

Figure 1(b) displays the mean scores and explains the interaction effect of POMS Fatigue scores. Participants in the higher depression group reported less fatigue after the dance intervention ($M = 13.00$) in comparison to before ($M = 15.3$), while people with lower depression remained equal in levels of fatigue ($M = 5.1$). Initial levels of fatigue, however, were higher in those reporting higher levels of depression, confirmed by an independent samples *t*-test, $t(17.74) = -5.94$, $p < .001$.

Short cycle time

Due to varying sample sizes across POMS subscales, short cycle time was subjected to mixed ANOVAs – Factor 1: Group (PD vs Control); Factor 2: Time (at pre and post intervention).

TMD scores showed a significant effect of time, $F(1, 19) = 5.26$, $p = .033$, partial $\eta^2 = .22$, such that TMD scores improved over time. There was no significant effect of group and no interaction between time and group ($p > .05$).

Mixed ANOVAs on BRUMS short cycle scores showed a significant main effect of time for Tension, $F(1, 24) = 4.47$, $p = .045$, partial $\eta^2 = .16$, and Vigour, $F(1, 22) = 6.75$, $p = .016$, partial $\eta^2 = .24$. Depression scores of time approached significance, $F(1, 24) = 3.9$, $p = .06$, partial $\eta^2 = .14$. In all cases, there was no significant main effect of group and no interaction between time and group ($p > .05$). All participants showed positive improvements in feelings of tension, vigour and depression. However, when a Bonferroni adjustment with a *p*-value of .008 was used, no significant effects remained, suggesting that there were no improvements in the short cycle time.

Further analyses taking depression levels into account revealed no further significant effects.

Discussion

The aim of this study was to investigate whether a dance intervention could improve mood in the elderly and more specifically in those with PD. The results showed that specific mood changes occurred in elderly people with and without PD over short and long cycle time. Participants' overall mood disturbance was significantly reduced, as measured by the POMS. Further analysis revealed that anger in particular was significantly reduced over a period of 12 weeks. Further analysis on POMS scores revealed that people with higher depression reported less fatigue following the dance classes. A reduction in TMD was also observed over a short cycle time, pre and post one dance class, as measured by BRUMS.

Previous research (Brown et al., 2011; Schindler et al., 1993; Tandberg et al., 1996) suggests that people with PD tend to have higher depression, fatigue and anxiety than people without PD. No such differences were observed in this study. There were no differences between the PD and Control participants in baseline scores of either Long Cycle Time or Short Cycle Time on the POMS and BRUMS subscales. However, those people with higher depression scores may be less likely to volunteer due to the self-selecting sample employed. Differences were observed, however, between baseline POMS scores of PD and geriatric normative data for the POMS in the subscales Tension, Vigour, Confusion and TMD such that those with PD showed a higher mood disturbance score throughout. It should be noted here that many participants in the control group were carers for the people taking part with PD. It may be possible that mean scores were not different in baseline scores of those with PD due to carer burden, where levels of depression are higher (Schrag et al., 2006). Moreover, with partners in consistent close proximity, it is possible that mood differences experienced by one person could impact the mood of the other, as opposed to the dance intervention improving the mood of both groups (Joiner and Katz, 2006).

As the results show, people who score higher in depression can benefit more from these dance interventions (Lane and Lovejoy, 1999), suggesting that the benefits observed here could be underestimated in real terms. Larger samples should therefore be used in future in order to increase statistical power and post hoc tests should be interpreted with caution. Although Bonferroni post hoc comparisons were necessary to control for type I error, there is a risk of the test being highly conservative and missing significant effects, due to both the number of tests and highly correlated variables. Highly correlated variables (above .7) could also have implications for the robustness of the MANOVA tests applied due to the loss of degrees of freedom. However, a MANOVA was deemed suitable for this analysis due to subscales being investigated (Foster et al., 2006). Furthermore, a series of mixed ANOVAs were carried out as an alternative method to MANOVA and showed no significant changes to results.

The positive increase in POMS mood scores supports previous research looking at dance and exercise in relation to mood (Rokka et al., 2010; Steinberg et al., 1998). The decrease in TMD scores and the trend to increased vigour resemble the pattern of results found by Maroulakis and Zervas (1993) and Lane et al. (2003) who, in a sample of non-PD participants, found an increase in scores of vigour straight after dance classes. Furthermore, Hansen et al. (2001) showed that exercise, including dance aerobics, improved scores of vigour, TMD and fatigue. Scores of fatigue were only found to improve over a long cycle time when participants were grouped according to their depression scores, supporting Lane and Lovejoy (1999) that greater benefits in mood can result when mood is depressed pre-exercise. Fatigue itself is a symptom well known to be associated with depression. Exercise has been found to improve both fatigue and depression with a recent Cochrane review confirming this overall effect (Rimer et al., 2012). Although a number of different explanations have been put forward, the improvement in fatigue as well as mood is thought to be due to exercise releasing endorphins or the hormone cortisol (Chen, 2013), subsequently altering the brain chemistry.

These results suggest that taking part in weekly dance classes can subsequently improve mood in the elderly, with and without PD. Exactly why positive affect is observed following exercise remains unclear with a number of variables and/or mechanisms likely to influence the magnitude of the effect (Berger and Motl, 2000). What remains to be seen is whether this is a result of the dance exercise or whether the social aspect of the dance classes resulted in the mood changes (Harvey et al., 2010). Benefits of psychological well-being have recently been found in other forms of moderate exercise (Kassavou et al., 2013), where a ‘healing balm’ effect has been proposed, suggesting that mood changes occur as a result of the combination of exercise with other conditions such as a safe and social environment (Priest, 2007). Furthermore, the control group in this study consisted of people who did not present with symptoms of PD. Further studies including a no-dance PD control group are required to investigate whether time per se or taking part in social events contribute to these changes in mood.

A number of additional elements that moderate the positive effects of mood on exercise have also been identified, which should be taken into account in future studies. As well as a social control, the role of the music should be explored in more depth, including a no-music exercise condition. The dual-mode model of exercise and affect (Ekkekakis et al., 2011) suggests that intensity of exercise is key to positive affect both when taking part in exercise and after. Mixed findings between low- and high-intensity exercise have been found in relation to what type of exercise promotes a greater increase in mood. A meta-analysis by Ekkekakis et al. (2011) concludes that the intensity of the exercise needs to be self-selected in order for it to promote greater positive affect.

It is thought that dance may be particularly beneficial psychologically, due to the mental challenges that dance steps and timing can provide, such as memory, learning and spatial awareness (Lima and Vieira, 2007). In addition, dance is a sociable form of exercise. Lack of sociability is linked to depression in elderly (Anderson, 2001), thus potentially explaining positive benefits of mood from dance. Future research therefore needs to address intensity, fitness and sociability as well as depression levels in both the elderly and those with PD using an appropriate depression inventory. While mood scores can indicate depression, they are not designed to identify clinical depression. In addition to this, the longitudinal impact of mood, as well as tailoring dance interventions towards the specific needs of PD (Abrantes et al., 2012), should be investigated further due to the prevalence of depression in this neurodegenerative disease.

In conclusion, these findings suggest that dance can provide positive benefits over both a long and a short cycle time for the elderly, including those with PD. However, further investigation is warranted in order to improve the design, including a longitudinal study, a no-exercise social control and control participants who are not related to those with PD. In addition, the role of music and other potential mediating variables need to be explored in order to try and pinpoint the underlying mechanisms involved.

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