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Modified Mindfulness-Based Cognitive Therapy for Depressive Symptoms in Parkinson's Disease: a Pilot Trial

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Background: Mindfulness-based cognitive therapy (MBCT) has evidence of efficacy in a range of populations, but few studies to date have reported on MBCT for treatment of anxious and depressive symptoms in Parkinson's disease (PD). **Aims:** The aim of this study was to examine the efficacy of modified MBCT in reducing symptoms of anxiety and depression and improving quality of life in PD. **Method:** Thirty-six individuals with PD were randomly assigned to either modified MBCT or a waitlist control. Changes in symptoms of anxiety, depression and quality of life were compared at group level using generalized linear mixed models and at individual level using reliable change analysis. **Results:** At post-treatment, there was a significant reduction in depressive symptoms for people undertaking modified MBCT at both group and individual levels compared with controls. There was no significant effect on anxiety or quality of life at the group level, although significantly more people had reliable improvement in anxiety after modified MBCT than after waitlist. Significantly more waitlist participants had reliable deterioration in symptoms of anxiety and depression than those completing modified MBCT. Most participants stayed engaged in modified MBCT, with only three drop-outs. **Discussion:** This proof-of-concept study demonstrates the potential efficacy of modified MBCT as a treatment for depressive symptoms in Parkinson's disease and suggests further research is warranted.

Keywords: anxiety, depression, mindfulness-based cognitive therapy, Parkinson's

Introduction

Depression is highly prevalent in Parkinson's disease (PD) with estimates ranging between 50 (Reijnders et al., 2008) and 75% (Menza et al., 2009). Depression in PD is associated with faster motor and cognitive decline (Starkstein et al. 1992) and higher mortality (Hughes et al., 2004). In addition to higher rates of depression, the prevalence of anxiety disorders in PD has been estimated to range from 25 to 45% (Leentjens et al., 2008) and the comorbidity of anxiety and depression in PD is very high (Simuni and Fernandez, 2013).

Despite the high prevalence of depression in PD, only 10–20% of sufferers receive treatment, which is typically anti-depressant treatment and may have limited efficacy for PD patients (Dyduch and Załuska, 2015; Frisina et al., 2008). In a meta-analysis that included randomized placebo controlled treatments for depression and anxiety in PD, we found a non-significant moderate effect size for anti-depressants ($d = .71$) and a significant large effect size ($d = 1.57$) for cognitive behaviour therapy (CBT) (Troeung et al., 2013). Only two randomized controlled trials (RCTs) of CBT for depression in PD have been conducted to date (Dobkin et al., 2011; Troeung et al., 2014), which have showed significant decreases in anxiety and depression. However, recruitment for one of these trials was difficult, which is a common issue in PD populations and suggests potential barriers to seeking psychological treatment in the community (Troeung et al., 2014). One difficulty experienced in our CBT group trial (Troeung et al., 2014) was the reading and writing involved, which can be difficult for participants due to the motor symptoms of PD such as tremor, muscle stiffness, and slow movement.

Another behavioural treatment for PD which involves less written strategies than previous CBT protocols for PD (Troeung et al., 2014) is mindfulness-based cognitive therapy (MBCT). This intervention consists of eight weekly group sessions plus daily homework practice aimed at developing mindfulness, and present-focused, non-judgemental awareness of experience (Segal et al., 2012). MBCT includes guided body scan meditations where participants focus on sensations in different parts of their bodies, walking and seated breathing meditations,

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gentle stretching, and guidance in cognitive decentring as a means of reducing rumination and worry.

Mindfulness-based interventions, including MBCT and its parent intervention mindfulness-based stress reduction (MBSR), have demonstrated efficacy in reducing symptoms of anxiety and depression in general and clinical populations (Gotink et al., 2015; Hofmann et al., 2010). MBCT was designed to treat recurrent depression and its efficacy in preventing depressive relapse (Piet and Hougaard, 2011; Teasdale et al., 2000) has led to it being included in the NICE guidelines for treating recurrent depression (Pilling et al., 2009). MBCT aims to reduce unhelpful perseverative cognition (e.g. rumination, worry) by training attention, and research aiming to dismantle components of mindfulness shows that rumination and mindfulness are mediators of clinical outcomes after MBCT (Alsubaie et al., 2017; Gu et al., 2015). Thus, it is proposed that MBCT has the potential for people with PD to reduce depression associated with rumination (e.g. dwelling on memories of good motor functioning) and anxiety associated with worry (e.g. worrying about motor limitations and concerns over increasing impairment). This rationale is strengthened by extensive evidence that mindfulness-based interventions have efficacy in treating psychological distress associated with chronic health conditions (Bohlmeijer et al., 2010) including multiple sclerosis, another movement disorder (Grossman et al., 2010).

Despite this rationale for using mindfulness interventions, and MBCT in particular, to treat depressive symptoms in PD, there have been few studies to date examining their efficacy for psychological and motor symptoms associated with PD (Advocat et al., 2016; Cash et al., 2016; Dissanayaka et al., 2016; Pickut et al., 2015). Pickut et al. (2015) randomly assigned 27 people with PD either to an 8-week MBSR group intervention ($n = 14$), or usual care ($n = 13$). There was a significant decrease of 20% found from pre- to post-treatment on motor symptoms in the intervention group whilst the control group did not demonstrate significant changes. The study did not report on depressive symptoms or psychological disorders, so it is difficult to assess whether there were any participants in the trial with clinical levels of depression or diagnosed psychopathology. Furthermore, the intervention studied (MBSR) has not been designed explicitly to treat depressive symptoms like MBCT has, which actively targets depressive rumination (Segal et al., 2012). In another trial (Dissanayaka et al., 2016), 14 participants with PD received a 6-session modified MBCT over 8 weeks. At post-treatment, there was a significant reduction in anxiety, depression and some common symptoms of PD including stiffness, physical discomfort, tremors, postural instability, and gait dysfunction. Cash et al. (2016) conducted an uncontrolled trial of MBSR in 29 participants with PD and found significant reductions in depression and improvements in cognitive functioning; however, similar to the Dissanayaka et al. (2016) study given the lack of control group it is difficult to draw conclusions about efficacy. Advocat and colleagues (2016) conducted a randomized controlled trial examining a 6-week MBSR with 57 adults with PD. There were no significant improvements between the MBSR and waitlist groups post-treatment; however, at 6-month follow-up in the mindfulness group there were significant improvements in activities of daily living, mindfulness, health behaviours and stress, potentially indicating a delayed effect of treatment. Despite some of the promise of these initial studies, there is a need for further research to determine the efficacy of mindfulness in PD due to inconclusiveness in the effects of mindfulness-based therapies in PD. Furthermore, while one study has indicated the potential benefits of MBCT in PD (Dissanayaka et al., 2016) it was uncontrolled and although another qualitative study reported participants' perceived benefits of MBCT (Fitzpatrick et al., 2010),

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to date there have been no controlled trials examining MBCT in PD. A recent systematic review echoes this call for further research into mindfulness-based therapies for PD (McLean et al., 2017).

The primary aim of this study was therefore to provide proof-of-concept for a modified MBCT as a treatment for symptoms of anxiety and depression in PD, indicated by significantly greater reductions in anxious and depressive symptoms in the modified MBCT group at post-treatment compared with the waitlist control group. The secondary aim was to examine changes in quality of life. It was hypothesized that, after treatment, participants receiving modified MBCT would have significantly lower anxiety and depression and significantly higher quality of life than waitlist participants.

Method

Trial design

The study was an 8-week, non-blinded, controlled efficacy study for anxiety, depression and quality of life in PD. The research was a registered with the Australian New Zealand Clinical Trials Registry (ACTRN12614000287639) and followed CONSORT guidelines (Schulz et al., 2010). Participants were randomized to modified MBCT or a waitlist. Modified MBCT consisted of six group sessions across 8 weeks, with each session lasting for 2 h. Participants randomized to the waitlist received telephone calls every month to assess for depression and suicidality. An *a priori* power analysis was conducted using G*Power 3.1.8 (Faul et al., 2007). At an alpha of .05, 18 participants per group (a total of 36 participants) were required in order to ensure an 80% chance of detecting a 'moderate' ($f = .20$) interaction between group and time (see Supplementary Material for details).

Participants

Individuals with idiopathic PD were recruited through advertising in Perth, Western Australia, via Parkinson's Western Australia and a local radio station. Inclusion criteria were: (1) meeting the Queen Square Brain bank criteria for idiopathic PD, which is Parkinson's with no identifiable cause (Hughes et al., 1992), (2) age 18–90 years, (3) providing written informed consent, and (4) being able to access transport to attend the treatment. Exclusion criteria were: (1) receiving psychotherapy, (2) cognitive impairment, indicated by scoring below 24 on the Mini-Mental State Examination (MMSE; Folstein et al., 1975), or (3) having active suicidality using the NHMRC risk assessment guidelines (National Health and Medical Research Council, 2014). Thirty-six eligible participants were randomized to the intervention and waitlist control groups over a 2-month period using computerized block randomization.

Measures

Data were gathered by structured interviews and scales administered by a clinical psychology trainee (S.R.), trained by experienced clinical psychologists (S.E. and R.A.). Pre-randomization screening included the following instruments: (1) Mini-Mental State Examination (Folstein et al., 1975), to screen for cognitive impairment, (2) Structured Clinical Interview for the DSM-IV (SCID-IV; First *et al*., 2002), to assess the presence of affective and anxiety disorders,

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to screen for substance use and other complex psychiatric disorders (i.e. psychosis), and to assess suicidality, and (3) Movement Disorders Society-Unified Parkinson's Disease Rating Scale (MDS-UPDRS; Martinez-Martin et al., 2013) to determine diagnosis of PD, which was administered by a neurologist (S.S.) with extensive experience in PD assessment.

Primary efficacy outcomes

To measure the primary outcome of depression, the Geriatric Depression Scale-15 (GDS-15; Sheikh and Yesavage, 1986) was used, which is a 15-item self-report measure with high internal consistency (Ertan et al., 2005) that was designed to screen for depressive symptoms in older adults and has also been used with PD patients (Weintraub and Stern, 2007). Internal consistency in this study was $\alpha = .77$. To measure the primary outcome of anxiety, the Geriatric Anxiety Inventory (GAI; Pachana and Byrne, 2012) was administered, which is a 20-item self-report scale assessing the severity of anxiety disorders (generalized anxiety disorder, simple phobias and panic disorder). This measure has been validated for use in PD (Pachana and Byrne, 2012). The internal consistency in this study was $\alpha = .87$.

Secondary efficacy outcomes

Secondary outcome measures were administered at baseline and post-treatment by a clinical psychology trainee (S.R.). To provide an additional measure of depression, anxiety and stress, the Depression, Anxiety Stress Scale-21 (DASS-21; Lovibond and Lovibond, 1995) was administered weekly by a clinical psychology trainee (S.R.) during the 8-week treatment. The DASS-21 had an internal consistency of .76 and demonstrates sound construct validity with the DASS-42 for use in PD (Johnson et al., 2016). The internal consistency for the total score in this study was high ($\alpha = .90$). The Parkinson's Disease Questionnaire-39 (PDQ-39; Peto et al., 1995) is a 39-item self-report scale that was used to examine health-related quality of life (QOL), with lower scores indicating higher quality of life. The scale has good reliability and validity for use in PD (Tan et al., 2004). The internal consistency in this study was $\alpha = .94$.

Statistical methods

A series of generalized linear mixed models (GLMMs) were tested in order to determine whether the intervention group changed on the outcome measures relative to the control group. The GLMMs were implemented through SPSS (version 22) GENLINMIXED procedure and there was one nominal random effect (participant), one nominal fixed effect (group: intervention *versus* control), one ordinal fixed effect (time: pre-test *versus* post-test), and Group × Time interaction. The GLMM 'robust statistics' option was examined to assess for violations of normality and homogeneity of variance. Violations of sphericity were addressed by changing the covariance matrix from the default of compound symmetry to autoregressive. To optimize the possibility of convergence, a separate GLMM analysis was conducted for each outcome. A significant Group × Time interaction was predicted for all outcomes and Bonferroni adjusted alpha-levels were used.

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Description of intervention

MBCT is an 8-week intervention designed to treat recurrent depression, but also has efficacy in reducing anxiety and stress associated with chronic illness (Segal et al., 2012). The protocol used in this trial was developed and initially evaluated by Dissanayaka et al. (2016), and consisted of a modified MBCT protocol consisting of six group sessions of 2 h duration each, across 8 weeks. Dissanayka et al. (2016) adapted a brief 3-week MBCT program (Harnett et al., 2010) which was a condensed version of regular 8-week MBCT (Segal et al., 2002). The protocol used in this study targeted skills such as cultivating present-focused non-judgemental awareness of thoughts, emotions and bodily sensations through guided meditation practice and informal mindfulness exercises that involve bringing mindfulness awareness to everyday activities. The program also included instruction on how thinking patterns maintain depression and anxiety, and how to avoid rumination and worry by non-judgementally observing moment-by-moment experience. The intervention protocol (Dissanayaka et al., 2016) was 'tailor-made' for people with PD by taking into consideration aspects of the illness that may impact participation and outcomes (e.g. motor symptoms, increasing memory problems). For example, walking meditation was omitted to accommodate motor difficulties, the language and pace of instructions was adapted to accommodate cognitive difficulties, while the metaphors and examples used in didactic exercises were tailored to symptoms and cognitions common in PD (for further details of the protocol, see Dissanayaka et al., 2016). A set of CDs (Williams, 2011) which guide MBCT practice were given to participants to engage in regular mindfulness exercises.

A workbook containing the weekly handouts was provided to each participant. This contained material covered in the weekly session for personal practice at home. Weekly homework tasks were set for participants, which required them to engage in formal meditation based on breathing exercises, and informal meditation based on focusing attention on routine daily tasks. Completion of homework was reviewed in subsequent sessions to assess adherence and guide group discussion around overcoming obstacles.

The modified MBCT intervention was conducted by two clinical psychology trainees (S.R. and independent co-facilitator) who first participated in an MBCT course and were trained in the delivery of the modified MBCT program by experienced clinical psychologists (S.E. and R.A.). The therapists were new to the delivery of MBCT and were supervised weekly by a clinical psychologist (R.A.) with extensive training and experience in delivery and supervision of MBCT. The waitlist control group received a monthly telephone call or email to ensure they remained part of the study, and to check for suicidality using the Australia National Health and Medical Research Council (National Health and Medical Research Council, 2014) risk assessment guidelines.

Results

Participant flow

Of the 38 participants screened for inclusion, two were referred for individual therapy due to the severity of their depression and resulting risk of suicidality. The remaining 36 participants were randomized to the intervention and waitlist control groups. Three participants dropped out of treatment (all three were unable to participate due to other commitments) and six dropped

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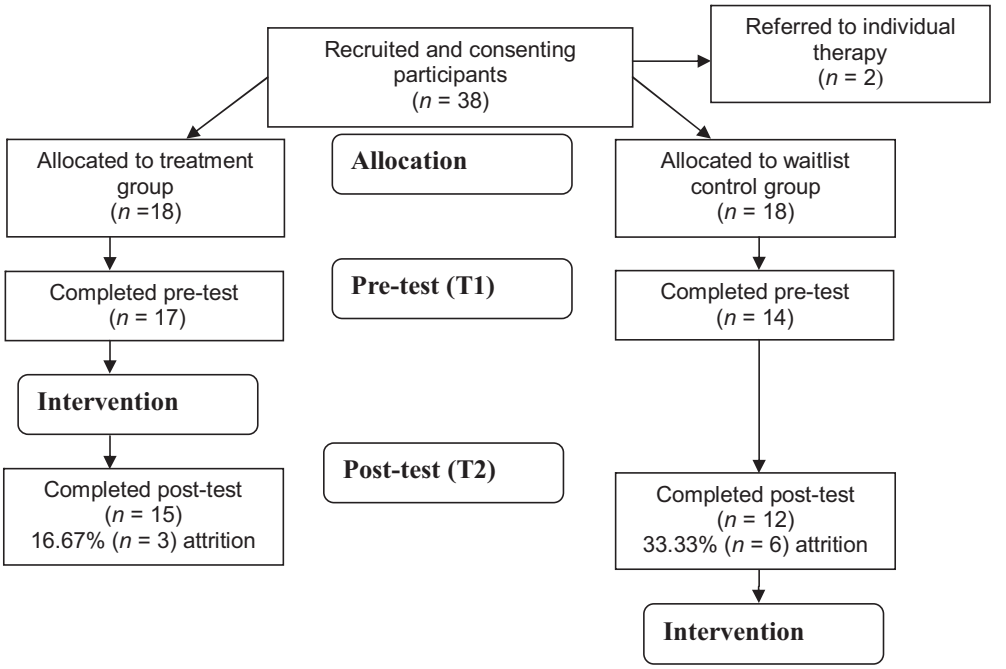


Figure 1. CONSORT (Schulz et al., 2010) diagram of participants' movement during stages of the randomized control trial indicating attrition rates at each stage.

out of the waitlist control (25% dropout), leaving a sample of 27 participants (15 treatment, 12 control; see Fig. 1).

Based on the SCID (Spitzer et al., 1992), at intake 22% of the sample met diagnostic criteria for an affective disorder (18% major depressive disorder, 4% dysthymic disorder) and 19% of the total sample met diagnostic criteria for an anxiety disorder (11% social phobia, 4% post-traumatic stress disorder, 4% generalised anxiety disorder). In the total sample, 4% met diagnostic criteria for both major depressive disorder and social phobia.

Baseline data

Participants were between 40 and 77 years of age (mean = 63.70, SD = 8.76), and 55% were male. In the treatment group there were 67% males, and 60% of the treatment group were married. In the control group there were 58% females, and 91% of the control group were married. All participants in the control and treatment group had a disease severity of greater than 1 on the Hoehn and Yahr, MDS-UPDRS (Martinez-Martin et al., 2013), meaning that all participants had at least bilateral or midline disease involvement. There were no significant baseline differences between the intervention and waitlist control group in female/male ratio [χ^2 (1, N = 27) = 1.69, p = .194], disease severity [χ^2 (1, N = 26) = .872, p = .647], marital status, or any of the outcome measures [χ^2 (1, N = 27) = 4.25, p = .235] (see Tables 1 and 2).

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Table 1. Statistical group comparison of baseline means

Variable	Contrast (*t*-statistic) Treatment and Control group means at pre-test
GAI	$t\,(25) = 0.783$, $p = .441$
GDS-15	$t\,(25) = -0.842$, $p = .408$
PDQ-39	$t\,(25) = -1.080$, $p = .291$
DASS-21 Depression	$t\,(25) = -0.034$, $p = .973$
DASS-21 Anxiety	$t\,(25) = -0.385$, $p = .703$

No significant differences between baseline treatment and control group means were found on any of the outcome measures using *t*-tests. GAI, Geriatric Anxiety Inventory; GDS-15, Geriatric Depression Scale-15; PDQ-39, Parkinson's Disease Questionnaire-39; DASS-21 Depression, Depression Anxiety Stress-Scales-21 (DASS-21) depression subscale; DASS-Anxiety, Depression Anxiety Stress-Scales-21 (DASS-21) anxiety subscale.

Intervention effects

As shown in Table 3, there was a significant Group × Time interaction for DASS-21-Depression ($F\,[1,50] = 23.20$, $p < .001$, partial $\eta^2 = .0.32$). Least significant difference (LSD) tests showed a significant pre–post reduction in DASS-21 Depression for the treatment group ($t\,(50) = 7.071$, $p < .001$, Cohen's $d = 0.96$), but no significant change for the control group ($t\,(50) = 1.86$, $p = 0.071$, Cohen's $d = 0.06$). There were no significant Group × Time interactions for the GAI ($F\,[1,50] = 3.53$, $p = .066$, partial $\eta^2 = 0.07$), the GDS-15 ($F\,[1,50] = 2.65$, $p = .110$, partial $\eta^2 = 0.05$), the PDQ-39 ($F\,[1,48] = 0.50$, $p = .482$, partial $\eta^2 = 0.01$), or the DASS-21Anxiety ($F\,[1,50] = 0.69$, $p = .411$, partial $\eta^2 = 0.01$).

Reliable change

Reliable change analysis (Jacobson and Truax, 1991) was conducted to determine whether the proportions of people improving, deteriorating, or remaining stable on the DASS-21 depression subscale and GAI differed between the two groups. The proportions are reported in Table 4. For DASS-21 depression, the proportion of participants who improved was significantly higher in the intervention group, and the proportion of participants who deteriorated was significantly higher in the control group (chi-square $[1] = 5.49$, $p = .019$). Similarly, for GAI, the proportion of participants who improved was significantly higher in the intervention group, and the proportion of participants who deteriorated was significantly higher in the control group (chi-square $[1] = 8.56$, $p = .003$).

Discussion

This proof-of-concept trial aimed to test the efficacy of modified MBCT for reducing psychological distress in people with PD. Our hypothesis that it would decrease symptoms of depression was partially supported. The modified MBCT program, adapted for PD, produced significant reductions in DASS-21 depression scores at both the group level (as demonstrated by the GLMM analysis) and at the individual level (as demonstrated by the reliable change analysis) compared with the control group. Although this was a mixed sample with relatively low levels of baseline depression, we observed a large effect size for modified MBCT in

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Table 2. Descriptive data (adjusted means, *SD* and *n* values) comparing treatment and control conditions at all measurement points on each outcome

	Treatment group						Control group					
	Pre-test			Post-test			Pre-test			Post-test		
Measure	Mean	*SD*	*n*	Mean	*SD*	*n*	Mean	*SD*	*n*	Mean	*SD*	*n*
DASS_Dep	3.11 (normal)	0.51	15	2.31 (normal)	0.62	15	3.13 (normal)	1.11	12	3.55 (normal)	0.89	12
DASS_Anx	4.27 (mild)	0.34	15	3.60 (normal)	0.53	15	4.83 (mild)	0.26	12	3.58 (normal)	0.93	12
GAI	4.27	0.151	15	2.70	0.10	15	2.92	0.05	12	4.133	1.41	12
GDS-15	2.78	0.35	15	1.87	0.11	15	3.59	1.29	12	3.88	0.73	12
PDQ-39	17.28	1.94	14	15.51	3.21	14	23.64	2.75	11	20.69	1.63	11

By convention, item scores were summed within participants; these sums were than averaged across participants to produce a mean outcome score. DASS_Dep, Depression Anxiety Stress-Scales-21 (DASS-21) depression subscale; DASS_Anx, Depression Anxiety Stress-Scales-21 (DASS-21) anxiety subscale; GAI, Geriatric Anxiety Inventory; GDS-15, Geriatric Depression Scale-15; PDQ-39, Parkinson's Disease Questionnaire-39.

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Table 3. Results of the omnibus maximum likelihood mixed effects linear regressions for each outcome

Outcome	Source	Numerator df	Denomenator df	*F*- value	Significance	Cohen's *d*	Partial η^2
GDS-15	Group	1	50	1.925	.171	0.26	
	Time	1	50	0.705	.405	0.16	
	Group × Time	1	50	2.646	.110		0.05
GAI	Group	1	50	0.003	.954	0.01	
	Time	1	50	0.055	.816	0.04	
	Group × Time	1	50	3.531	.066		0.07
PDQ-39	Group	1	48	2.922	.094	0.32	
	Time	1	48	7.780	.008***	0.53	
	Group × Time	1	48	0.502	.482		0.01
DASS-21	Group	1	50	0.300	.586	0.10	
Dep	Time	1	50	2.302	.135	0.29	
	Group × Time	1	50	23.20	.000**		0.32
DASS-21	Group	1	50	0.140	.710	0.07	
Anx	Time	1	50	7.425	.009*	0.51	
	Group × Time	1	50	0.688	.411		0.01

*$p <$ Bonferroni correct alpha-level of .025 (anxiety outcomes), **$p <$ Bonferroni correct alpha-level of .025 (depression outcomes), ***$p < .01$; GDS-15, Geriatric Depression Scale-15; GAI, Geriatric Anxiety Inventory; PDQ-39, Parkinson's Disease Questionnaire-39; DASS-21 Dep, Depression Anxiety Stress-Scales-21 (DASS-21) depression subscale; DASS-Anx, Depression Anxiety Stress-Scales-21 (DASS-21) anxiety subscale.

Table 4. Reliable change at post-intervention for participants in the intervention and waitlist-control groups

	n	I	D	NC
DASS-21 Dep				
Intervention	15	9 (60%)	4 (27%)	2 (13%)
Control	12	2 (16.5%)	8 (67%)	2 (16.5%)
GAI				
Intervention	15	7 (47%)	5 (33%)	3 (20%)
Control	12	0 (0%)	10 (83%)	2 (17%)

I, improved; D, deteriorated; NC, no change; DASS-21 Dep, Depression Anxiety Stress-Scales-21 (DASS-21) depression subscale; GAI, Geriatric Anxiety Inventory.

reducing depressive symptoms on the DASS-21. These results should be interpreted cautiously as the same effect was not observed on the other measure of depression, the GDS-15. However, as the GDS-15 is predominantly a screening tool, it is possible that it was more prone to floor effects in this less distressed sample. Providing further support for our primary hypothesis, clinical significance testing showed that participants' depressive symptoms were more likely to improve if they received modified MBCT and more likely to deteriorate if they received no treatment. Overall, these findings provide preliminary evidence that mindfulness-based therapies may be a useful intervention for depressive symptoms in PD, in line with previous research (Dissanayaka et al., 2016; Pickut et al., 2015).

The predictions that there would be a decrease in anxiety and increase in quality of life with modified MBCT were largely unsupported, and in contrast to previous studies which have found significant reductions in anxiety (Dissanayaka et al., 2016). At the group level, there was no significant decrease in anxiety symptoms in the treatment group compared with the control group. This finding may be related to the low level of anxiety at baseline for both groups and that despite some efficacy in reducing anxiety in other populations, MBCT was primarily developed to target cognitive and behavioural processes underlying depressive symptomology (Segal et al., 2012). Indeed, evidence suggests that MBSR, as opposed to MBCT, may better target anxiety and quality of life in people with chronic health conditions (Bohlmeijer et al., 2010; Hofmann et al., 2010; Vøllestad et al., 2011). Despite this null finding at the group level, clinical significance testing showed that participants' anxiety was more likely to improve if they did modified MBCT and more likely to deteriorate if they received no treatment. These inconsistent findings probably highlight not only the floor effects mentioned above but also low power for group statistics in this pilot study due to the small sample. A further reason for the lack of effects on anxiety may also be due to the treatment being modified MBCT, where treatment was shorter, being 6 weeks rather than 8 weeks as in the regular MBCT protocol (Segal et al., 2002, 2012), with no day retreat, resulting in a lower dose of mindfulness than in regular MBCT.

Despite the potential to dilute group effects, we decided to include participants with PD regardless of the presence of clinical diagnoses of depression or anxiety to explore whether modified MBCT could have an effect for participants who did not have a clinical diagnosis but had symptoms of depression and anxiety. Therefore, our sample consisted of participants with a wide range of depression and anxiety scores, with 37% of the total sample having

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clinical anxiety, and 33% clinical depression at baseline according to the DASS-21. Although we are unable to determine whether modified MBCT had a prevention effect on anxiety and depression as this would require a long follow-up period and a larger number of participants, it is of interest that for the total sample those who did not receive the intervention showed higher scores on depression and anxiety at post-treatment compared with the modified MBCT group. It would be useful for future research to examine if MBCT can prevent the onset of clinical diagnoses of depression, and potentially anxiety, in individuals with PD. This would be consistent with the original rationale behind MBCT, which is to prevent new episodes of depression by targeting rumination, a core cognitive process that maintains depression (Segal et al., 2012).

Several limitations of the study should be pointed out. First, due to drop-out the study was under-powered. Second, the inclusion criteria were broad and did not limit co-morbidities that could potentially influence outcomes (e.g. co-morbid acquired brain injury). Less than half the sample had an anxiety or mood disorder and average symptom severity was low, which limits the generalizability of these results to clinical populations. Furthermore, we only assessed outcome at post-treatment and follow-up assessment at 6 or 12 months post-treatment is required to assess the efficacy of the intervention. Future research should examine the effects of the intervention on measures of mindfulness, as in the present study it was unclear whether the intervention successfully increased mindfulness, the most common mediator of MBCT outcomes (Alsubaie et al., 2017). Finally, it is important to note that the study had a small sample size and future research should be conducted with a larger sample. However, it is encouraging that the modified MBCT intervention was still associated with a decrease in depressive symptoms despite this.

Limitations notwithstanding, the results are promising as a pilot, proof-of-concept study, and provide impetus for further research, as indicated by the significant reduction in depressive symptoms in the intervention group. Future research using qualitative methods would be useful to further explore participant experiences and inform treatment refinement. Future quantitative research should examine the efficacy of modified MBCT in a larger sample of individuals with PD who are a 'pure' clinical sample where all participants have diagnoses of depression and/or anxiety. It would also be useful to examine if a regular MBCT (Segal et al., 2012) confers increased efficacy compared with the shorter, modified version used in this study. MBCT should also be compared with an active treatment such as CBT. Finally, mediation studies should be conducted to test putative MBCT mechanisms such as increasing mindfulness and decreasing rumination and worry (Alsubaie et al., 2017).

In summary, our findings suggest that modified MBCT holds promise as a potential intervention for depressive symptoms in PD, whilst it is uncertain whether it impacts anxiety and quality of life for people with PD. This treatment appears to be an acceptable intervention for people with PD and may help them to better manage the psychological impact of this challenging disease.

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Conflicts of interest: The authors have no conflicts of interest with respect to this publication.

Ethical statements: The authors abided by the Ethical Principles of Psychologists and Code of Conduct as set out by the APA (http://www.apa.org/ethics/code/). Ethics approval for the study was granted by the Curtin University Human Research Ethics Committee, approval number HR 32/2014.

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Supplementary material

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References

Advocat, J., Enticott, J., Vandenberg, B., Hassed, C., Hester, J. and Grant, R. (2016). The effects of a mindfulness-based lifestyle program for adults with Parkinsons disease: a mixed methods, wait list controlled randomised control study. *BMC Neurology*, *16*, 166–177. https://doi.org/10.1186/s12883-016-0685-1

Alsubaie, M., Abbott, R., Dunn, B., Dickens, C., Keil, T. F., Henley, W. and Kuyken, W. (2017). Mechanisms of action in mindfulness-based cognitive therapy (MBCT) and mindfulness-based stress reduction (MBSR) in people with physical and/or psychological conditions: a systematic review. *Clinical Psychology Review*, *55*, 74–91. https://doi.org/10.1016/j.cpr.2017.04.008

Bohlmeijer, E. T., Prenger, R., Taal, E. and Cuijpers, P. (2010). The effects of mindfulness-based stress reduction therapy on mental health of adults with a chronic medical disease: a meta-analysis. *Journal of Psychosomatic Research*, *68*, 539–44. https://doi.org/10.1016/j.jpsychores.2009.10.005

Cash, T. V., Ekouevi, V. S., Kilbourn, C. and Lageman, S. K. (2016). Pilot study of a mindfulness-based group intervention for individuals with Parkinson's disease and their caregivers. *Mindfulness*, *7*, 361–371. https://doi.org/10.1007/s12671-015-0452-1

Dissanayaka, N. N. W., Idu Jion, F., Pachana, N. A., O'Sullivan, J. D., Marsh, R., Byrne, G. J. and Harnett, P. (2016). Mindfulness for motor and nonmotor dysfunctions in Parkinson's disease. *Parkinson's Disease*, *2016*. https://doi.org/10.1155/2016/7109052

Dobkin, R. D., Menza, M., Allen, L. A., Gara, M. A., Mark, M. H., Tiu, J. et al. (2011). Cognitive-behavioral therapy for depression in Parkinson's disease: a randomized, controlled trial. *American Journal of Psychiatry*, *168*, 1066–1074. https://doi.org/10.1176/appi.ajp.2011.10111669

Dyduch, A. and Załuska, M. (2015). Depression in Parkinson's disease: the effectiveness and risk of pharmacotherapy. Clinical review. *Psychogeriatrics*, *15*, 147–153. https://doi.org/10.1111/psyg.12078

Ertan, F. S., Ertan, T., Kızıltan, G. and Uyguçgil, H. (2005). Reliability and validity of the Geriatric Depression Scale in depression in Parkinson's disease. *Journal of Neurology, Neurosurgery, and Psychiatry*, *76*, 1445–1447. https://doi.org/10.1136/jnnp.2004.057984

Faul, F., Erdfelder, E., Lang, A.-G. and Buchner, A. (2007). G*Power 3: a flexible statistical power analysis program for the social, behavioral, and biomedical sciences. *Behavior Research Methods*, *39*, 175–191. https://doi.org/10.3758/BF03193146

First, M. B., Spitzer, R. L., Gibbon, M. and Williams, J. B. W. (2002). *Structured Clinical Interview for DSM-IV-TR Axis I Disorders, Research Version, Patient Edition. (SCID-I/P).* New York.

https://doi.org/10.1017/S135246581800070X Published online by Cambridge University Press

Fitzpatrick, L., Simpson, J. and Smith, A. (2010). A qualitative analysis of mindfulness-based cognitive therapy (MBCT) in Parkinson's disease. *Psychology and Psychotherapy: Theory, Research and Practice*, *83*, 179–192. https://doi.org/10.1348/147608309X471514

Folstein, M. F., Folstein, S. E. and McHugh, P. R. (1975). 'Mini-mental state': a practical method for grading the cognitive state of patients for the clinician. *Journal of Psychiatric Research*, *12*, 189–198. https://doi.org/10.1016/0022-3956(75)90026-6

Frisina, P. G., Borod, J. C., Foldi, N. S. and Tenenbaum, H. R. (2008). Depression in Parkinson's disease: health risks, etiology, and treatment options. *Neuropsychiatric Disease and Treatment*, *4*, 81–91. https://doi.org/10.2147/NDT.S1453

Gotink, R. A., Chu, P., Busschbach, J. J. V., Benson, H., Fricchione, G. L. and Hunink, M. G. M. (2015). Standardised mindfulness-based interventions in healthcare: an overview of systematic reviews and meta-analyses of RCTs. *PLoS ONE*, *10*, 1–17. https://doi.org/10.1371/journal.pone.0124344

Grossman, P., Kappos, L., Gensicke, H., D'Souza, M., Mohr, D. C., Penner, I. K. and Steiner, C. (2010). MS quality of life, depression, and fatigue improve after mindfulness training: a randomized trial. *Neurology*, *75*, 1141–1149. https://doi.org/10.1212/WNL.0b013e3181f4d80d

Gu, J., Strauss, C., Bond, R. and Cavanagh, K. (2015). How do mindfulness-based cognitive therapy and mindfulness-based stress reduction improve mental health and wellbeing? A systematic review and meta-analysis of mediation studies. *Clinical Psychology Review*, *37*, 1–12. https://doi.org/10.1016/j.cpr.2015.01.006

Harnett, P.H., Whittingham, K., Puhakka, E., Hodges, J., Spry, C. and Dob, R. (2010). The short-term impact of a brief group-based mindfulness therapy program on depression and life satisfaction. *Mindfulness*, *1*, 183–188. doi: 10.1007/s12671-010-0024-3

Hofmann, S. G., Sawyer, A. T., Witt, A. A. and Oh, D. (2010). The effect of mindfulness-based therapy on anxiety and depression: a meta-analytic review. *Journal of Consulting and Clinical Psychology*, *78*, 169–183. https://doi.org/10.1037/a0018555

Hughes, A. J., Daniel, S. E., Kilford, L. and Lees, A. J. (1992). Accuracy of clinical diagnosis of idiopathic Parkinson's disease: a clinico-pathological study of 100 cases. *Journal of Neurology, Neurosurgery, and Psychiatry*, *55*, 181–184. https://doi.org/10.1136/jnnp.55.3.181

Hughes, T. A., Ross, H. F., Mindham, R. H. S. and Spokes, E. G. S. (2004). Mortality in Parkinson's disease and its association with dementia and depression. *Acta Neurologica Scandinavica*, *110*, 118–123. https://doi.org/10.1111/j.1600-0404.2004.00292.x

Jacobson, N. S. and Truax, P. (1991). Clinical significance: a statistical approach to defining meaningful change in psychotherapy research. *Journal of Consulting and Clinical Psychology*, *59*, 12–19. https://doi.org/10.1037/0022-006X.59.1.12

Johnson, A. R., Lawrence, B., Corti, E., Booth, L., Gasson, N., Thomas, M. G. et al. (2016). Suitability of the Depression, Anxiety, and Stress Scale in Parkinson's disease. *Journal of Parkinson's Disease*, *6*, 609–616. https://doi.org/10.3233/JPD-160842

Leentjens, A. F. G., Dujardin, K., Marsh, L., Martinez-Martin, P., Richard, I. H., Starkstein, S. E. et al. (2008). Anxiety rating scales in Parkinson's disease: critique and recommendations. *Movement Disorders*, *23*, 2015–2025. https://doi.org/10.1002/mds.22233

Lovibond, S. H. and Lovibond, P. F. (1995). *Manual for the Depression Anxiety Stress Scales*. Sydney: Psychology Foundation.

Martinez-Martin, P., Rodriguez-Blazquez, C., Alvarez-Sanchez, M., Arakaki, T., Bergareche-Yarza, A., Chade, A. et al. (2013). Expanded and independent validation of the Movement Disorder Society–Unified Parkinson's Disease Rating Scale (MDS-UPDRS). *Journal of Neurology*, *260*, 228–236. https://doi.org/10.1007/s00415-012-6624-1

McLean, G., Lawrence, M., Simpson, R. and Mercer, S. W. (2017). Mindfulness-based stress reduction in Parkinson's disease: a systematic review. *BMC Neurology*, *17*, 1–7. https://doi.org/10.1186/s12883-017-0876-4

https://doi.org/10.1017/S135246581800070X Published online by Cambridge University Press

Menza, M., Dobkin, R. D., Marin, H., Mark, M. H., Gara, M., Buyske, S. et al. (2009). The impact of treatment of depression on quality of life, disability, and relapse in patients with Parkinson's disease. *Movement Disorders*, *24*, 1325–1332. https://doi.org/10.1002/mds.22586

National Health and Medical Research Council (2014). Suicide risk assessment guidelines. See: www.nhmrc.gov.au

Pachana, N. and Byrne, G. (2012). The Geriatric Anxiety Inventory: international use and future directions. *Australian Psychologist*, *47*, 33–38. https://doi.org/10.1111/j.1742-9544.2011.00052.x

Peto, V., Jenkinson, C., Fitzpatrick, R. and Greenhall, R. (1995). The development and validation of a short measure of functioning and well being for individuals with Parkinson's disease. *Quality of Life Research*, *4*, 241–248. https://doi.org/10.1007/BF02260863

Pickut, B., Vanneste, S., Hirsch, M. A., Van Hecke, W., Kerckhofs, E., Mariën, P. et al. (2015). Mindfulness training among individuals with Parkinson's disease: neurobehavioral effects. *Parkinson's Disease*, *2015*. https://doi.org/10.1155/2015/816404

Piet, J. and Hougaard, E. (2011). The effect of mindfulness-based cognitive therapy for prevention of relapse in recurrent major depressive disorder: a systematic review and meta-analysis. *Clinical Psychology Review*, *31*, 1032–1040. https://doi.org/10.1016/j.cpr.2011.05.002

Pilling, S., Anderson, I., Goldberg, D., Meader, N., Taylor, C. on behalf of the two guideline development groups (2009). Depression in adults, including those with a chronic physical health problem: summary of NICE guidance. *BMJ*, *339*, b4108. https://doi.org/10.1136/bmj.b4108

Reijnders, J. S. A. M., Ehrt, U., Weber, W. E. J., Aarsland, D. and Leentjens, A. F. G. (2008). A systematic review of prevalence studies of depression in Parkinson's disease. *Movement Disorders*, *23*, 183–189. https://doi.org/10.1002/mds.21803

Schulz, K. F., Altman, D. G. and Moher, D. (2010). CONSORT 2010 statement: updated guidelines for reporting parallel group randomised trials. *Journal of Clinical Epidemiology*, *63*, 834–840. https://doi.org/10.1016/j.jclinepi.2010.02.005

Segal, Z. V, Williams, J. M. G. and Teasdale, J. D. (2002). *Mindfulness-Based Cognitive Therapy for Depression: A New Approach to Preventing Relapse*. New York, NY: Guilford Publications.

Segal, Z. V, Williams, J. M. G. and Teasdale, J. D. (2012). *Mindfulness-Based Cognitive Therapy for Depression: A New Approach to Preventing Relapse* (2nd edn). New York, NY: Guilford Publications.

Sheikh, J. I. and Yesavage, J. A. (1986). Geriatric Depression Scale (GDS) recent evidence and development of a shorter version. In T. L. Brink (ed), *Clinical Gerontology: A Guide to Assessment and Intervention*. New York, NY: The Haworth Press. https://doi.org/10.1300/J018v05n01_09

Simuni, T. and Fernandez, H. U. (2013). Anxiety in Parkinson's disease. In R. F. Pfeiffer and I. Bodis-Wollner (eds), *Parkinson's Disease and Nonmotor Dysfunction* (pp. 17–29). New York, NY: Springer. https://doi.org/10.1007/978-1-60761-429-6

Starkstein, S. E., Mayberg, H. S., Preziosi, T. J., Andrezejewski, P., Leiguarda, R. and Robinson, R. G. (1992). Reliability, validity and clinical correlates of apathy in Parkinson's disease. *Journal of Neuropsychiatry and Clinical Neurosciences*, *4*, 134–139. doi: 10.1176/jnp.4.2.134

Tan, L. C. S., Luo, N., Nazri, M., Li, S. C. and Thumboo, J. (2004). Validity and reliability of the PDQ-39 and the PDQ-8 in English-speaking Parkinson's disease patients in Singapore. *Parkinsonism and Related Disorders*, *10*, 493–499. https://doi.org/10.1016/j.parkreldis.2004.05.007

Teasdale, J. D., Segal, Z. V. and Ridgeway, V. A. (2000). Prevention of relapse/recurrence in major depression by Mindfulness-Based Cognitive Therapy. *Journal of Consulting and Clinical Psychology*, *68*, 615–623.

Troeung, L., Egan, S. and Gasson, N. (2013). A meta-analysis of randomised placebo-controlled treatment trials for depression and anxiety in Parkinson's disease. *PLoS One*, *8*, e79510. https://doi.org/10.1371/journal.pone.0079510

Troeung, L., Egan, S. J. and Gasson, N. (2014). A waitlist-controlled trial of group cognitive behavioural therapy for depression and anxiety in Parkinson's disease. *BMC Psychiatry*, *14*, 19. https://doi.org/10.1186/1471-244X-14-19

https://doi.org/10.1017/S135246581800070X Published online by Cambridge University Press

Vøllestad, J., Sivertsen, B. and Nielsen, G. H. (2011). Mindfulness-based stress reduction for patients with anxiety disorders: evaluation in a randomized controlled trial. *Behaviour Research and Therapy*, *49*, 281–288. https://doi.org/10.1016/j.brat.2011.01.007

Weintraub, D. and Stern, M. B. (2007). Disorders of mood and affect in Parkinson's disease. In *Handbook of Clinical Neurology* (vol. *83*, pp. 421–433). Elsevier. https://doi.org/10.1016/S0072-9752(07)83019-3

Williams, M. (2011). *Mindfulness Meditation with Mark Williams: Guided Meditation for Mindfulness Based Cognitive Therapy*. Oxford, UK: Oxford Mindfulness Centre.

https://doi.org/10.1017/S135246581800070X Published online by Cambridge University Press