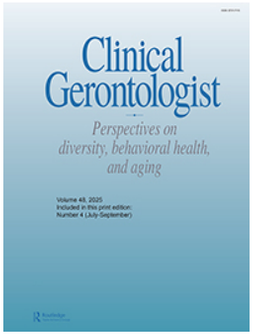

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A Systematic Review of Third-Wave Therapies to Reduce Distress and Improve Wellbeing and Quality of Life in People with Parkinson's Disease

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ABSTRACT

Objectives: This systematic review assessed use of third-wave psychotherapies in reducing psychological distress and improving psychological well-being and quality of life in people with Parkinson's disease and critically evaluated intervention adaptations.

Methods: A literature search, conducted across five databases identified randomized controlled trials (RCTs) evaluating third-wave psychotherapies for individuals with Parkinson's disease.

Results: Ten RCTs were identified of which nine evaluated mindfulness-based interventions, and one acceptance and commitment therapy. Methodological quality ranged from moderate to high, but sample sizes were small, and only one study was adequately powered. Five reported on Parkinson's specific adaptations. The trial with the largest sample size reported a significant effect of Mindfulness Yoga on depression and anxiety, psychological well-being and quality of life. Other findings were mixed across all outcomes.

Conclusions: There was evidence of an effect of Mindfulness Yoga on our pre-defined outcomes. Pilot and feasibility trials showed that mindfulness-based interventions were well received and provided feedback on adaptations. There was a lack of data to draw conclusions regarding non-mindfulness-based therapies.

Clinical implications: Larger trials of mindfulness-based interventions are required to establish the clinical meaningfulness of treatment effects. Further research is needed to adapt and explore on non-mindfulness-based interventions such as acceptance and commitment therapy.

KEYWORDS

Parkinson's disease; psychological distress; psychological well-being quality of life; systematic review; third-wave psychotherapies

Introduction

Parkinson's disease (PD) is the second most prevalent neurodegenerative disorder (De Lau & Breteler, 2006) and is characterized by motor symptoms, such as bradykinesia, resting tremor and gait rigidity. There is, however, an increasing awareness of the importance of non-motor symptoms, including depression, anxiety, sleep disruption, constipation, pain and urinary problems, which occur in over 90% of people across the disease course. Growing evidence highlights the substantial burden of non-motor symptoms, which have a negative impact on psychological wellbeing and quality of life (Broen et al., 2018; Chaudhuri et al., 2006; Schrag & Taddei, 2017), and can exacerbate disability and reduce treatment adherence (Aarsland et al., 2021; Lawson et al., 2020). Contemporary approaches to the management of PD aims to holistically address non-motor as well as motor symptoms (Pfeiffer, 2016) through pharmacological and, increasingly, psychological interventions (Church, 2021).

Behavioral and cognitive psychotherapies have evolved in three stages (Hayes, 2004). The "first wave" of therapies, such as behavioral therapy, focuses on immediate behavioral change. The "second wave," which includes conventional cognitive behavioral therapy (CBT), is concerned with changing the content or frequency of one's internal experiences (e.g., thoughts, emotions, bodily sensations). The "third wave," such as mindfulness-based cognitive therapy (MBCT) and acceptance and commitment therapy (ACT), places emphasis on modifying how one relates to

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these internal states instead of seeking to alter them (Hayes, 2004).

Third-wave psychotherapies have demonstrated their effectiveness in various mental and physical health conditions, including anxiety, depression, and chronic pain (McCracken et al., 2022; Schefft et al., 2023). For example, MBCT is a group intervention recommended by the National Institute for Health and Care Excellence (2022) to prevent relapse in recurrent depression and combines elements of mindfulness practice with techniques from cognitive therapy (Segal et al., 2002). Mindfulness-based stress reduction (MBSR) was originally developed for individuals with chronic physical health conditions who are experiencing psychological distress, depressive symptoms, and anxiety (Kabat-Zinn, 2003). ACT aims to support people in developing psychological flexibility, which entails the capacity to fully engage with the present moment, and to adapt or persist in behavior when it aligns with their goals and values (Hayes et al., 2006). Through the examination of 20 meta-analyses, which include 133 studies and 12,477 participants, ACT has been shown to be effective, yielding positive results across a wide range of targeted conditions (Gloster et al., 2020), most recently motor neurone disease (Gould et al., 2024).

Interest in the use of third-wave psychotherapies in people with PD is on the rise, as there is no cure for the condition and interventions, such as ACT and MBCT, which specifically target psychological processes that influence well-being, could be enormously beneficial. These approaches emphasize cognitive flexibility, emotional regulation, and acceptance; mechanisms which may help people with PD to manage distressing experiences related to motor and non-motor symptoms, improve quality of life, and reduce psychological distress (Feliu-Soler et al., 2018; McCracken & Gutiérrez-Martínez, 2011).

Published systematic reviews have examined a variety of outcomes in people with PD, but have not focused on specific third-wave psychotherapies. McLean et al. (2017), for example, examined the efficacy of Mindfulness-Based Stress Reduction (MBSR) and found substantial improvements in varied outcomes, including depression and quality of life. However, only one of the two interventions investigated was of acceptable quality, and neither intervention appropriately accounted for possible confounding variables. Similarly, Lin et al. (2023) explored the effects of mindfulness and meditation therapies and discovered significant changes in PD outcomes. Yet, there were no significant differences between mindfulness intervention and control groups in terms of depression, anxiety, pain, or difficulty sleeping. They concluded that mindfulness and meditation therapies might be useful as complementary therapies for individuals with PD.

Roper et al. (2022) evaluated a broad range of psychotherapies for reducing anxiety in people with PD, including both controlled and uncontrolled studies. These ranged from traditional (Dissanayaka et al., 2017) and telephone based (Dobkin et al., 2011) CBT to mindfulness-based psychotherapies (Cash et al., 2016) and ACT (Ghielen et al., 2017). Eight of the 36 included studies, including five randomized controlled trials (RCTs), explored the efficacy of third-wave psychotherapies on anxiety in people with PD, with mixed findings. Since Roper et al. (2022) only focused on anxiety outcomes, the potential effectiveness of third-wave psychotherapies on other forms of psychological distress, psychological wellbeing, and quality of life in people with PD is unclear and needs to be further explored. Additionally, as the review did not assess the quality of PD-specific adaptations to psychotherapies in the included studies, it offered limited insight into their potential fit to the context in which practitioners will use the interventions (Kirk et al., 2021).

This review aimed to address these gaps in the evidence base and answer the following research questions:

(1) How effective are third-wave psychotherapies in reducing psychological distress (e.g., depression, anxiety) in individuals with Parkinson's disease?
(2) Do these interventions improve psychological well-being and quality of life?
(3) What adaptations have been made to third-wave psychotherapies for individuals with Parkinson's disease?

Methods

Protocol and registration

The review protocol was registered in PROSPERO (CRD42023414090; https://www.crd.york.ac.uk/prospero/display_record.php?RecordID=414090) and reported using PRISMA guidelines (Page et al., 2021). The PICOS (Population, Intervention, Comparator, Outcome, Study design) framework (Amir-Behghadami & Janati, 2020) was used as guidance to construct the review question and eligibility criteria.

Eligibility criteria

Population

Studies were included if participants were 1) aged 18 years or above, 2) with a formal diagnosis of PD based on Movement Disorders Society (Postuma et al., 2015) and/or UK Brain Bank Criteria (Reichmann, 2010), 3) with or without comorbid conditions (e.g. depression and/or anxiety). Studies involving participants who self-reported diagnoses were excluded.

Intervention

The following third-wave psychotherapies were eligible: MBCT, MBSR, compassion focused therapy (CFT), compassionate mind training (CMT), "extended" (i.e., including third wave therapy components) behavioral activation (BA), dialectical behavioral therapy (DBT), cognitive behavioral analysis system of psychotherapy (CBASP), functional analytic psychotherapy (FAP), integrative behavioral couple therapy (IBCT), and ACT. Interventions were eligible for inclusion if they were delivered to individuals or groups in any format (e.g. in person, online). Studies in which any of the included interventions did not constitute the majority of the intervention (i.e. more than 50% of the total intervention) were excluded.

Comparator(s)

Studies that included one or more comparator conditions were eligible, such as non-active controls (e.g., treatment as usual, standard care, or waiting lists), active controls (e.g., support groups or psychoeducation), or other psychological or pharmacological treatments. Studies without a comparison group were excluded.

Outcomes

Studies were eligible if they included one or more of the following outcomes: (1) psychological distress (e.g. symptoms of stress, anxiety, depression, disease-related distress); (2) psychological wellbeing (e.g. self-acceptance, sense of autonomy, a feeling of purpose and meaning in life); (3) quality of life in people with PD; and (4) attrition rate from intervention.

Study design

Only RCTs, pilot RCTs or non-randomized controlled trials (non-randomized CTs) were included in this review. Uncontrolled studies, trial protocols, observational studies, case-control studies, case reports, systematic reviews, meta-analyses, qualitative studies and conference reports or meeting abstracts were excluded.

Context and language

Studies from any setting were included, provided they were published in English.

Search strategy

PsycINFO (all years), PubMed (all years), CINAHL (all years), Embase (all years), and Web of Science (all years) were searched from date of inception to 14/03/2023 using both MeSH subject headings and keywords (see below). In addition, reference lists of relevant studies and literature reviews were manually searched for potentially relevant studies. Gray literature was not included due to the lack of peer-review of unpublished papers.

The following sets of search terms were combined using AND operators and adapted to the abovementioned databases where necessary:

(1) mindfulness-based OR acceptance-based OR third wave OR third-wave OR MBCT OR MBSR OR compassion-focused therapy OR compassion focused therapy OR CFT OR compassionate mind training OR behavior activation OR behavioral activation OR behavior activation OR behavioral activation OR dialectical behavior therapy OR dialectical behavioral therapy OR dialectical behavior

therapy OR dialectical behavioral therapy OR DBT OR cognitive behavioral analysis system of psychotherapy OR cognitive behavioral analysis system of psychotherapy OR CBASP OR functional analytic psychotherapy OR FAP OR integrative behavioral couple therapy OR integrative behavioral couple therapy OR IBCT OR "acceptance and commitment therapy" OR acceptance commitment therapy OR "acceptance and commitment training" OR acceptance commitment training

(1) Parkinson*
(2) random* OR RCT OR non-random*

Study selection

After duplicates were removed, titles and abstracts were screened, and full text articles were retrieved and assessed for eligibility by three independent, blinded reviewers (DC, JS and NC). Any discrepancies were resolved through discussion with a fourth reviewer (RG).

Data extraction

The following data were extracted from included studies; demographic characteristics (age, sex, country of study, education), clinical characteristics (number and duration of therapy sessions, mode of therapy), study characteristics (first author/year, referral setting, study design, experimental and control conditions, outcomes), and key findings from each study using a standardized, pre-piloted form. In the event of missing data or ambiguous information, the authors of the relevant study were contacted.

Risk of bias and quality assessment

Risk of bias in individual studies was assessed using the Effective Public Health Practice Project quality assessment tool for quantitative research (Armijo-Olivo et al., 2012; Thomas et al., 2004). EPHPP assigns ratings to studies based on six methodological domains: selection bias, research design, confounders, blinding, data collection, and withdrawals and drop-outs. Studies receive a global rating of "weak" if they have two or more weak methodological domains, "moderate" if they have a single weak methodological domain, and "strong" if they have no weak methodological domains.

Additional critical appraisal included an examination of: 1) overall attrition rate (calculated as the number of participants who withdrew or were lost to follow-up/number of participants randomly assigned at baseline); and 2) the potential impact of various confounding factors, including participants' prior experience with or ongoing practice of meditation or mindfulness, as well as the use of pharmacotherapy for mood disorders, on treatment effectiveness.

Intervention adaptations for people with PD were critically appraised based on the widely adopted UK Medical Research Council (MRC) guidelines for developing and evaluating complex interventions (Campbell et al., 2000). This includes the degree of piloting and feasibility work, sample size determination, degree of user input prior to and during the adaptation of the intervention, use of a mixed methods design, and the authors' confidence that the intervention was delivered as intended. Three reviewers (DC, NC and JS) evaluated the risk of bias and additional critical appraisal and rated the quality of intervention adaptations. Any discrepancies were discussed and resolved with a fourth reviewer (SR).

Data synthesis

Findings were summarized within a narrative synthesis, with studies being grouped according to type of third-wave intervention and outcome.

Results

The PRISMA flow diagram is shown in Figure 1 (Page et al., 2021). The search identified 2098 records: 10 studies were included in the review after screening for eligibility criteria. No potentially eligible studies reported in non-English languages were found.

Study characteristics

Study characteristics are presented in Table 1. All studies were RCTs published in the last 8 years (six

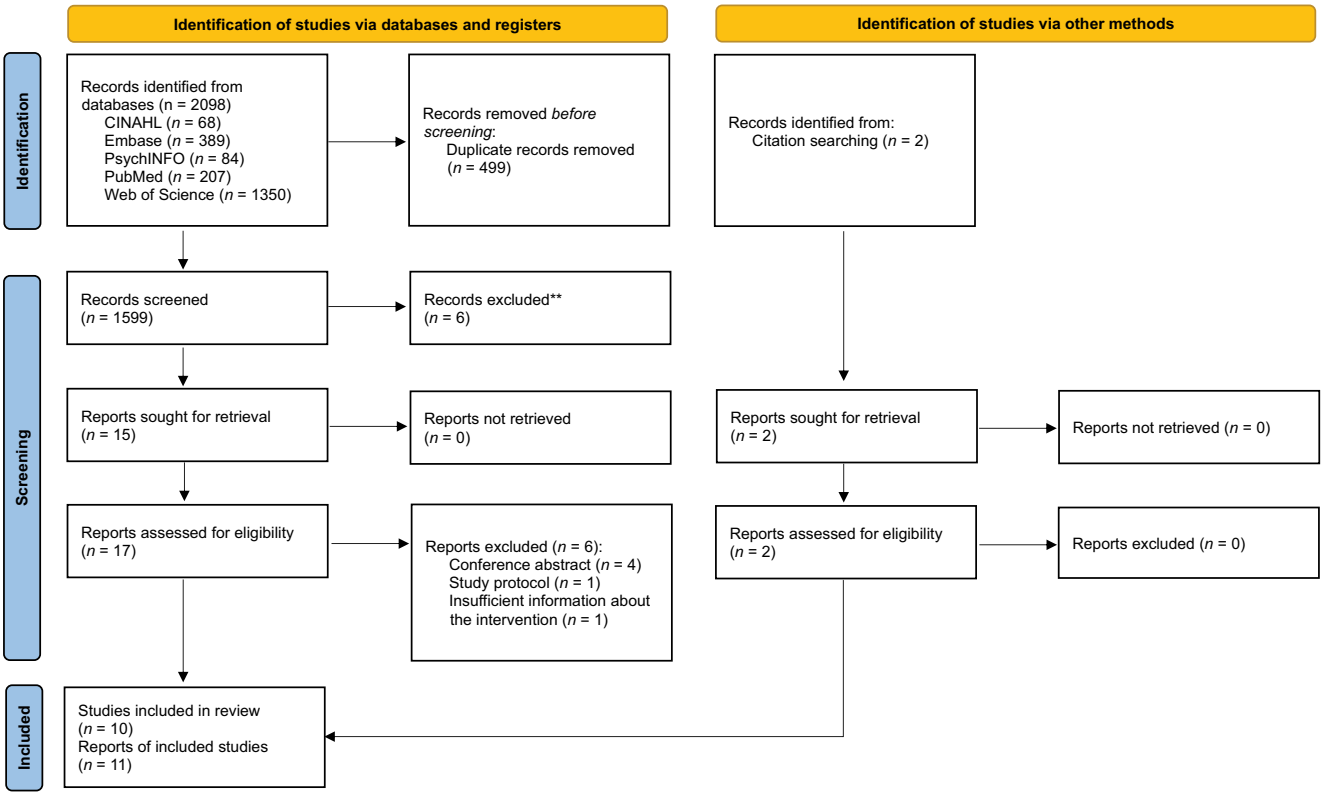

Figure 1. Preferred reporting items for systematic reviews (PRISMA) flow chart of identification and selection of studies.

after 2019). Four trials were effectiveness trials (Advocat et al., 2016; Kwok et al., 2019; Pickut et al., 2015; Son & Choi, 2018), five pilot trials (Ayromlou et al., 2020; Buchwitz et al., 2021; Ghielen et al., 2017; Rodgers et al., 2019; Siwik et al., 2022) and one feasibility trial (Bogosian et al., 2021). Studies were conducted in nine different countries, seven of which were Western countries. Sample sizes varied from 30 (Pickut et al., 2015) to 138 (Kwok et al., 2019) participants. All participants were referred by neurologists, geriatricians or other specialists' clinics, apart from one study which recruited participants through adverts on Parkinson's UK and Michael J. Fox Foundation websites and sent e-mails to the Parkinson's UK Research Network (Bogosian et al., 2021).

Eight studies included a non-active and two an active control group. Non-active control groups included "waiting list" (Advocat et al., 2016; Bogosian et al., 2021; Rodgers et al., 2019) and "treatment-as-usual" (Buchwitz et al., 2021; Ghielen et al., 2017; Pickut et al., 2015; Siwik et al., 2022; Son & Choi, 2018). Active control groups included psychoeducation about PD (medications, symptoms, mood and sleep, connecting with resources) (Ayromlou et al., 2020) and stretching and resistance training exercise (SRTE) (Kwok et al., 2019). Nine studies focused on mindfulness-based interventions, and one (Ghielen et al., 2017) on ACT. Mindfulness-based interventions included MBSR (Ayromlou et al., 2020; Siwik et al., 2022), MCBT (Bogosian et al., 2021; Rodgers et al., 2019), a mindfulness-based lifestyle program (Advocat et al., 2016), mindfulness yoga (Kwok et al., 2019) and a mindfulness meditation-based complex exercise program (MMBCEP; Son & Choi, 2018). No other third-wave intervention studies were identified.

Participant characteristics

Demographic and clinical characteristics of participants are also shown in Table 1. The age profile of participants was similar across studies, with mean age ranging from 60.86 years (6.80) to 67.95 years (10.40). Most studies ($n = 8$) included similar proportions of males and females, with the overall female percentage ranging from 32.50 to 57.90.

Table 1. Study and demographic characteristics of included studies.

Authors (Year)	Study type	Country/ Setting	Inclusion criteria	Exclusion criteria	Mean, SD range	Demographics Female (%), Ethnicity (%)	Education	Mean age at onset (mean years since diagnosis)	Intervention and comparator	*n* randomized (completers)
Advocat et al. (2016)	RCT (Randomised waitlist control)	Australia Neurology clinic, primary care, Parkinson's registry.	(1) Aged 18–75; fluent in English; (2) H&Y stage 2; (3) community dwelling.	N/S	Mean = 63.30, SD = 8.10 (39–75)	57.90%, N/S	Above secondary school: (77 %)	55.7 (N/S)	Intervention: MB lifestyle program Comparator: Waiting list	Intervention: 35 (N/S) Comparator: 37 (N/S)
Ayromlou et al. (2020)	Pilot RCT	Iran Neurology clinic	(1) Idiopathic PD (UK Brain Bank criteria); (2) H&Y stages 1–3); (3) stable PD medications last six months; (4) MMSE score: 17–30; (5) commitment to participate.	(1) Focal neurologic deficit on imaging; (2) other medical conditions impacting on quality of life; (3) use of antiepileptic drugs; (4) symptoms of psychosis.	Mean = 67.95, SD = 6.80 (56–80)	32.5%, N/S	N/S	N/S (4.25)	Intervention: MBSR Comparator: Active control - psychoeducation about PD	Intervention: 20 (N/S) Comparator: 20 (N/S)
Bogosian et al. (2021)	Feasibility RCT	UK Parkinson's UK and Michael J. Fox Foundation	(1) Self-reported diagnosis of PD by a neurologist or geriatrician; (2) home computer and internet access (3) fluent in English; (4) stabilized PD, antidepressant or anxiolytic medication, minimum of 1 month.	(1) Severe cognitive impairment (TICS-M < 20); (2) severe psychiatric conditions (3) severe hearing impairment; (4) participating in other psychological therapies (3) prior formal training in MB methods or current meditation practice.	Mean = 60.86 SD = 10.04 (N/S)	50%, White British: 96.70%	N/S	N/S (5.22)	Intervention: MBCT Comparator: Waiting list	Intervention: 30 (19) Comparator: 30 (29)
Buchwitz et al. (2021)	Pilot RCT	Germany Neurology clinic	(1) Idiopathic PD (Movement Disorder Society criteria); (2) 45–85 years of age.	(1) Moderate depression (BDI-II > 19); (2) dementia (PANDA <15); (3) additional severe neurological or psychiatric disorders; (4) H&Y stage 5; (5) prior regular experience in meditation or yoga; (6) changes in PD medication within 2 weeks	Median = 64.50 (46–80)	50%, N/S	Mean years of education: 15.50	N/S (N/S)	Intervention: IPSUM Comparator: TAU	Intervention: 22 (14) Comparator: 21 (16)
Ghielen et al. (2017)	Pilot RCT	Netherlands Neurology clinic	(1) Idiopathic PD (UK Brain Bank criteria); (2) one or more wearing-off symptoms or response fluctuations (WOQ-19); (3) anxiety (BAI >26).	(1) Other neurological, orthopedic, or cardiopulmonary conditions; (2) cognitive impairment (MMSE <24); (3) insufficient motivation for participation.	Mean = 63.10 SD = 9.5 (34–80)	40%, N/S	N/S	N/S (11.40)	Intervention: BEWARE – ACT with physical therapy Comparator: TAU (physical therapy)	Intervention: 23 (19) Comparator: 23 (19)
Kwok et al. (2019)	RCT	Hong Kong Neurology clinic	(1) H&Y Stage 1 PD; (2) >18 years; (3) stand unaided and walk with or without an assistive device; (4) ability to give written informed consent.	(1) Receiving pharmacologic or surgical treatments for psychiatric disorders; (2) participating in any other trial or instructor-led exercise program; (3) cognitive impairment (AMTS <6); (3) other debilitating conditions	Mean = 63.60 SD = 8.7 (38–85)	52.90%, N/S	Primary (18.1%), Secondary (56.5%), Tertiary (25.4%)	N/S	Intervention: Mindfulness yoga Comparator: Active control-SRTE	Intervention: 71 (57) Comparator: 67 (55)

(*Continued*)

Table 1. (Continued).

Authors (Year)	Study type	Country/ Setting	Inclusion criteria	Exclusion criteria	Mean, SD range	Demographics Female (%), Ethnicity (%)	Education	Mean age at onset (mean years since diagnosis)	Intervention and comparator	*n* randomized (completers)
Pickut et al. (2015)	RCT (longitudinal)	Belgium Neurology clinic	(1) PD diagnosis (UK Brain Bank Criteria); (2) H&Y stages 1–3, (3) no features suggesting atypical parkinsonism; (4) No use of neuroleptics or other drugs that induce parkinsonism within 60 days (5) optimal and stable PD medication (6) stable dose of all medications for 30 days; (7) Not cognitively impaired (MOCA ≥26); (8) no other unstable or life threatening disease; (9) no previous mindfulness training; (10) commitment to attend MBI classes and daily homework.	N/S.	Mean = 61.80, SD = 9.10 (N/S)	50%, N/S	N/S	N/S	Intervention: MBI Comparator: TAU	Intervention: 15 (14) Comparator: 15 (13)
Rodgers et al. (2019)	Pilot RCT	Australia Neurology clinic	(1) PD diagnosis (UK Brain Bank Criteria); (2) aged 18–90 years; (3) provided written informed consent; (4) able to access transport to attend the treatment.	(1) Receiving psychotherapy; (2) cognitive impairment (MMSE <24); (3) active suicidality (NHMRC risk assessment guidelines).	Mean = 63.70, SD = 8.76 (40–77)	45%, N/S	N/S	N/S	Intervention: Modified MBCT Comparator: Waiting list	Intervention: 18 (15) Comparator: 18 (12)
Siwik et al. (2022)	Pilot RCT	USA Specialist in brain and nervous system	(1) Idiopathic PD diagnosed within 3 years (UK PD Brain Bank criteria); (2) H&Y stage 2 or 3; (3) Not significant cognitifve impairment, MMSE ≥ 25; (4) ≥ 40 years of age; (5) proficiency in written and spoken English.	(1) Serious medical or psychological illness; (2) use of systemic hydrocortisone based steroids that could interfere with accurate salivary cortisol assessment.	Mean = 63.70, SD = 7.0 (40-N/S)	44.40%, White: 100%	High school (22.2%), Degree or above: (77.8%)	N/S	Intervention: MBSR Comparator: TAU	Intervention: 18 (N/S) Comparator: 18 (N/S)
Son and Choi (2018)	RCT	Korea Neurology clinic	(1) PD diagnosis; (2) H&Y stages 1–3; (3) clinically stable condition; (4) ability to communicate in a social setting; (5) ability to walk independently; (6) no experience of alternative therapies.	N/S.	N/S (N/S)	63.8%, N/S	Middle school (44.3%), High school (49.7%), Graduate or above (6.1%)	N/S	Intervention: MMBCEP Comparator: TAU (routine outpatient therapeutic programs)	Intervention: 33 (33) Comparator: 33 (30)

ACT = Acceptance and Commitment Therapy; AMTS = Abbreviated Mental Test score; BEWARE = body awareness training; IPSUM = Insight into PD Symptoms by using Mindfulness; MB = Mindfulness Based; MBI = Mindfulness Based Intervention; MBCT = Mindfulness-Based Cognitive Therapy; MBSR = Mindfulness-Based Stress Reduction; MMBCEP = Mindfulness Meditation-based Complex Exercise Program; MOCA = Montreal Cognitive Assessment; PD = Parkinson's disease; RCT = randomized controlled trial; SD = standard deviation; SRTE = stretching and resistance training exercise; TAU=treatment as usual.

Two studies (Ayromlou et al., 2020; Siwik et al., 2022) reported the ethnicity of participants, which was predominantly (>90%) White. Five studies reported on educational level (Advocat et al., 2016; Buchwitz et al., 2021; Kwok et al., 2019; Siwik et al., 2022) and mean years of education (Buchwitz et al., 2021), with >90% having completed secondary school education.

Inclusion and exclusion criteria for the included studies are shown in Table 1. The criteria used to diagnose PD varied between studies (UK Brain Bank clinical diagnostic criteria, Movement Disorder Society criteria). Six studies used the Hoehn and Yahr staging for assessing disease severity (Clarke et al., 2016), which varied from stage 1 to 3. Individuals with severe PD (Hoehn and Yahr stage 5), major cognitive impairment, or dementia were excluded from five studies.

Most studies ($n = 7$) did not select participants on the basis of psychological distress or depression. Only one trial (Ghielen et al., 2017) included individuals who reported considerable anxiety (Beck Anxiety Inventory; BAI > 26), while another (Buchwitz et al., 2021) excluded those who reported moderate depression (Beck's Depression Inventory-II; BDI-II > 19). Participants with psychological comorbidities such as anxiety, stress, and depression were included in two studies (Advocat et al., 2016; Rodgers et al., 2019).

Intervention characteristics

Regarding the mode of therapy (see Table 2), all interventions were delivered in groups. Nine studies were manualised, and one did not specify.

Outcome assessment

As shown in Table 2, all studies used self-report measures to assess primary and secondary outcomes, and outcome assessments were conducted at pre- and immediately post-intervention. Six studies also included longer term follow-up assessments, with follow-ups ranging from 1 week to 6 months post-intervention (Advocat et al., 2016; Bogosian et al., 2021; Buchwitz et al., 2021; Ghielen et al., 2017; Kwok et al., 2019; Siwik et al., 2022).

Psychological distress

Depression and/or anxiety was a primary outcome in six studies. The largest effectiveness trial found a significant reduction in Hospital Anxiety and Depression Scale (HADS) following Mindfulness Yoga ($n = 71$) compared to an active control ($n = 67$) (Kwok et al., 2019); an effectiveness trial with a smaller sample size ($n = 33$ in each arm) reported a greater reduction in the Geriatric Depression Scale (GDS), following a Mindfulness Meditation-based Complex Exercise Programme (MMBCEP) compared with treatment-as-usual (Son & Choi, 2018); and a pilot study ($n = 18$ in each arm) reported a greater reduction in The Depression, Anxiety and Stress Scale (DASS-21) following MBCT compared to a waiting list (Rodgers et al., 2019), but no effect specifically on the anxiety subscale of the DASS-21 or the Geriatric Anxiety Inventory (GAI); and one pilot study of IPSUM vs TAU (Buchwitz et al., 2021) found a significant reduction in the State-Trait Anxiety Inventory (STAI), but not depression, measured by the Becks Depression Inventory (BDI)-II. Other studies had negative findings: A feasibility pilot of MBCT delivered via video conference there was a small but not significant difference in HADS scores compared to a waiting list control (Bogosian et al., 2021); and a small effectiveness trial (15 in each arm) of MBI versus TAU found no differences in BDI-II (Pickut et al., 2015).

Two studies which included depression and anxiety scores as secondary outcomes showed no differences between intervention and comparator arms (Advocat et al., 2016; Ghielen et al., 2017).

Subjective disease-specific distress was the primary outcome of one pilot study, which reported no differences in the Impact of Event Scale (IES) following MBSR compared to TAU (Siwik et al., 2022).

Psychological wellbeing and quality of life

All studies evaluated psychological wellbeing and/or quality of life (three as a primary and seven as a secondary outcome), as shown in Table 2. One effectiveness trial showed significant improvement in secondary outcomes measures including the Holistic Well-being Scale (HWS) and Health-Related Quality of Life (HRQOL) following Mindfulness Yoga compared to an active control (Kwok et al., 2019). One pilot trial investigated

Table 2. Intervention characteristic, outcome measures and findings of included studies.

Authors (Year)	Type of third-wave psychotherapy	Mode of therapy	Length of intervention (weeks)	No. of therapy sessions	Session duration (min)	Manualized therapy	Assessment periods	Criteria for completion of intervention	Primary/Secondary outcome measures	Key study findings
Advocat et al. (2016)	MB lifestyle program	Group	6	6	120	Yes	Pre/post intervention (week 7) & follow-up (after 6 months)	Those who completed 4/6 sessions were considered completers.	Primary: Function and Wellbeing (PDQ-39) Secondary: Depression anxiety and stress scales (DASS-21)	No significant change on the anxiety and depression subscales of DASS-21 at 7-weeks, or 6 months post intervention. Small, but not significant improvement in function and wellbeing (PDQ39 SI) immediately after the program ($t = -0.59$, $p = 0.56$) and at 6 month post intervention ($t = -1.42$, $p = .16$) in the intervention group, compared to the waitlist control.
Ayromlou et al. (2020)	MBSR	Group	8	8	120 (with a 15 minute break in between)	Yes	Pre/post intervention	N/S	Primary: Quality of life (PDQ-39)	Lower mean score in all PDQ-39 items in the experiment group compared to control group; however, the difference was only significant for social support (34.13 ± 9.7 vs 26.19 ± 7.7 for control and experiment group, respectively, $p = .007$).
Bogosian et al. (2021)	MBI Delivered via Videoconferencing	Group	8	8	60	Yes	Pre/post intervention (week 8) & follow-up (after 3 months-week 20)	N/S	Primary: Anxiety (HADS), Depression (HADS) Secondary: Health-related quality of life (HRQOL)	Small, but not significant differences in anxiety and depression scores for the mindfulness group compared with the control group (Anxiety: Cohen's $d = 0.25$ at baseline; Cohen's $d = 0.33$ at post-intervention). Significant main effect of time for both depression and anxiety scores was revealed ($p < .001$), but no significant main effect of group ($p = .325$) and no significant interaction between group and time was found ($p = .809$). There was a significant increase in the quality of life measure (HRQOL).
Buchwitz et al. (2021)	IPSUM	Group	8	8	120	Yes	Pre/post intervention (week 8) & follow-up (week 16)	Those who completed the intervention and post assessment.	Primary: Depression (BDI-II), Stress (PSQ-20), Anxiety (STAI), Quality of life (PDQ39) Secondary: N/A	Trait anxiety was significantly reduced in the training group, but not the control group, over the course of the study [$\chi 2\ (2) = 8.591$, $p = .014$]. Anxiety scores continuously reduced over time, but only the change from baseline to follow-up assessment turned out to be significant ($z = 0.964$, $p = .011$, $r = 0.26$). State anxiety did not change within groups at any point. Neither depression scores, nor perceived stress total or subscale scores did change significantly in any group. There was no significant change of dysexecutive functioning or quality of life total or subscale scores at any point in time.
Ghielen et al. (2017)	BEWARE- ACT with physical therapy	Group	6	12 (2 sessions/ week)	60	Unclear	Pre/post intervention (week 6) & follow-up (week 18)	Those who completed 12 sessions for 6 weeks.	Primary: Self-Efficacy Scale (GSES), Secondary: Anxiety (BAI), Depression (BDI), Quality of life (PDQ-39)	No significant improvement in self-efficacy (GSES) in the BEWARE treatment condition when compared to treatment-as-usual ($p = .71$). No significant difference on anxiety or depression (BAI, $p = .022$; BDI, $p = .095$) post-intervention between the BEWARE and control groups. There was a significant improvement in emotional wellbeing, as measured with the PDQ-39, in the BEWARE condition compared with the TAU condition, both at post-treatment and at follow-up.

(*Continued*)

Table 2. (Continued).

Authors (Year)	Type of third-wave psychotherapy	Mode of therapy	Length of intervention (weeks)	No. of therapy sessions	Session duration (min)	Manualized therapy	Assessment periods	Criteria for completion of intervention	Primary/Secondary outcome measures	Key study findings
Kwok et al. (2019)	Mindfulness yoga	Group	8	8	90	Yes	Pre/post intervention (week 8) & follow-up (after 3 months – week 20)	N/S	Primary: Anxiety (HADS), Depression (HADS) Secondary: Spiritual well-being (HWS), Health-related quality of life (HRQOL)	Significant improvement on HADS (anxiety and depressive symptoms) at the T1 ($p = .001$) and T2 ($p < .001$) end points when compared to the control group. Significant improvement on HWS in terms of perceived hardship and perceived equanimity, and HRQOL at T1 ($p < .001$) and T2 ($p < .001$) when compared to the control group.
Pickut et al. (2015)	MBI	Group	8	8	150	Yes	Pre/post intervention	Those who completed 8 sessions for 8 weeks.	Beck Depression Inventory II (BDI-II), Quality of life (PDQ-39),	No significant differences between experimental and control groups on the total BDI-II scores and PDQ-39.
Rodgers et al. (2019)	MBCT	Group	8	6	120	Yes	Pre/post intervention	N/S	Primary: Depression, Anxiety (GAI, DASS-21) Secondary: Quality of life (PDQ-39)	A significant reduction in depressive symptoms for experimental group at both group and individual levels compared with controls. There was no significant effect on anxiety (GAI or anxiety subscale of DASS-21) or quality of life (PDQ-39) 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.
Siwik et al. (2022)*	MBSR	Group	8	8	120	Yes	Pre/post intervention (week 8) & follow-up (week 9)	N/S	Primary: Disease-Specific Distress (IES)	No significant differences in disease-specific distress (IES) between participants randomized to experimental group (MBSR) compared to control group (TAU) at study entry. Among patients, there was a significant interaction between intervention and disease-specific distress, $F(1, 15) = 5.61$, $p < .05$, partial $\eta 2 = 0.27$.
Son and Choi (2018)	MMBCEP	Group	8	6	120	Yes	Pre/post intervention	N/S	Primary: Geriatric Depression Scale (GDS – Korean version), The State-Trait Anxiety Inventory (STAI), Activities of Daily Living (ADL), and the Quality of Life of Patients with Parkinson's Disease (PDQL)	There was a significant reduction in depressive symptoms for participants who completed modified MBCT at both group and individual levels when compared to controls at post-treatment. 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.

(1) ACT = Acceptance and Commitment Therapy; BEWARE = body awareness training; IPSUM = Insight into PD Symptoms by using Mindfulness; MB=Mindfulness-Based; MBI=Mindfulness-Based Intervention; MBCT = Mindfulness-Based Cognitive Therapy; MBSR = Mindfulness-Based Stress Reduction; MMBCEP = Mindfulness Meditation-based Complex Exercise Program; NHMRC = National Health and Medical Research Council; PD = Parkinson's disease; RCT = randomized controlled trial; SD = standard deviation; SRTE = stretching and resistance training exercise. (2) *This study included both patients and carers; however, only the outcomes of patients are presented in this review.

group MBSR and revealed that the intervention had a positive impact on all items of the Parkinson's Disease Questionnaire (PDQ-39) in the experimental compared to control group. However, the change was only significant for social support (Ayromlou et al., 2020).

In one pilot trial evaluating the BEAWARE intervention (ACT intervention), the experimental group outperformed the control group in terms of emotional wellbeing as assessed by the PDQ-39 at both post-treatment and follow-up (Ghielen et al., 2017). Six trials, including three effectiveness trials (Advocat et al., 2016; Pickut et al., 2015; Son & Choi, 2018), two pilot trials (Buchwitz et al., 2021; Rodgers et al., 2019) and one feasibility trial (Bogosian et al., 2021), found no significant

Table 3. Potential sources of bias in studies included in the systematic review as assessed by Effective Public Health Practice Project (EPHPP).

Author (Year)	Selection bias	Study design	Confounders	Blinding	Data collection methods	Withdrawals and dropouts	Intervention integrity	Analyses	Global rating
Advocat et al. (2016)	Strong	Strong	Strong	Moderate	Strong	Moderate	(Q1) 80–100% (Q2) Yes (Q3) No	(Q1) Individual (Q2) Individual (Q3) Yes (Q4) No	Strong
Ayromlou et al. (2020)	Moderate	Strong	Strong	Moderate	Strong	Strong	(Q1) 80–100% (Q2) Yes (Q3) No	(Q1) Individual (Q2) Individual (Q3) Yes (Q4) No	Strong
Bogosian et al. (2021)	Strong	Strong	Strong	Moderate	Strong	Moderate	(Q1) 80–100% (Q2) Yes (Q3) No	(Q1) Individual (Q2) Individual (Q3) Yes (Q4) No	Strong
Buchwitz et al. (2021)	Strong	Strong	Strong	Strong	Strong	Moderate	(Q1) 80–100% (Q2) Yes (Q3) No	(Q1) Individual (Q2) Individual (Q3) Yes (Q4) No	Strong
Ghielen et al. (2017)	Weak	Strong	Strong	Moderate	Strong	Strong	(Q1) 80–100% (Q2) Yes (Q3) No	(Q1) Individual (Q2) Individual (Q3) Yes (Q4) Unclear	Moderate
Kwok et al. (2019)	Moderate	Strong	Strong	Moderate	Strong	Strong	(Q1) 80–100% (Q2) Yes (Q3) No	(Q1) Individual (Q2) Individual (Q3) Yes (Q4) Yes	Strong
Pickut et al. (2015)	Moderate	Strong	Strong	Moderate	Strong	Strong	(Q1) 80–100% (Q2) Yes (Q3) No	(Q1) Individual (Q2) Individual and Group (Q3) Yes (Q4) No	Strong
Rodgers et al. (2019)	Strong	Strong	Strong	Weak	Strong	Strong	(Q1) 80–100% (Q2) Yes (Q3) No	(Q1) Individual (Q2) Individual (Q3) Yes (Q4) No	Moderate
Siwik et al. (2022)	Weak	Strong	Strong	Moderate	Strong	Strong	(Q1) N/A (Q2) Unclear (Q3) No	(Q1) Individual (Q2) Individual (Q3) Yes (Q4) Yes	Moderate
Son and Choi (2018)	Moderate	Strong	Strong	Moderate	Strong	Strong	(Q1) 80–100% (Q2) Yes (Q3) No	(Q1) Individual (Q2) Individual (Q3) Yes (Q4) No	Strong

Questions under Intervention Integrity: (Q1) What percentage of participants received the allocated intervention? (Q2) Was consistency of intervention measured? (Q3) Is it likely that subjects received an unintended intervention that may influence the results? Questions under Analyses: (Q1) Indicate unit of allocation. (Q2) Indicate unit of analysis. (Q3) Are the statistical methods appropriate for the study design? (Q4) Is the analysis performed by intervention allocation status (i.e., intention to treat) rather than actual intervention received?

differences in wellbeing and quality of life outcomes before and after therapy, as well as in follow-up assessments where applicable.

Risk of bias assessment and critical appraisal

As shown in Table 3, the global rating of all RCTs on the EPHPP was judged to be moderate to strong. Seven studies were rated as "strong" ($n = 7$; Advocat et al., 2016; Ayromlou et al., 2020; Bogosian et al., 2021; Buchwitz et al., 2021; Kwok et al., 2019; Pickut et al., 2015; Son & Choi, 2018), while the remaining three were rated as "moderate" ($n = 3$; Ghielen et al., 2017; Rodgers et al., 2019; Siwik et al., 2022). Some methodological issues, such as selection biases and blinding, were reported. In terms of selection bias, four trials ($n = 4$; Advocat et al., 2016; Bogosian et al., 2021; Buchwitz et al., 2021; Rodgers et al., 2019) were classified as "strong," four trials ($n = 4$; Ayromlou et al., 2020; Kwok et al., 2019; Pickut et al., 2015; Son & Choi, 2018) were classified as "moderate," while two studies were classified as "weak" ($n = 2$; Ghielen et al., 2017; Siwik et al., 2022). In the majority of the trials, blinding was judged "moderate" ($n = 8$), with only one "strong" (Buchwitz et al., 2021) and one "weak" (Rodgers et al., 2019) evaluation. Most of the studies had more than 80% initial participation ($n = 9$).

Further factors that may influence or confound the generalizability and interpretation of results are presented in the Supplementary Table S1. Overall, eight studies screened participants for cognitive impairment (Ayromlou et al., 2020; Bogosian et al., 2021; Buchwitz et al., 2021; Ghielen et al., 2017; Kwok et al., 2019; Pickut et al., 2015; Rodgers et al., 2019; Siwik et al., 2022), and five trials completed treatment adherence checks (Advocat et al., 2016; Bogosian et al., 2021; Buchwitz et al., 2021). Two trials imputed missing values for outcome measures (Bogosian et al., 2021; Buchwitz et al., 2021; Ghielen et al., 2017), one trial did not allow concurrent pharmacotherapy for mood disorders (Kwok et al., 2019), while others trials allowed participants to be prescribed medication for mood disorders (Bogosian et al., 2021; Ghielen et al., 2017). Four trials excluded people with previous experience or current practice of meditation/mindfulness (Bogosian et al., 2021; Buchwitz et al., 2021; Ghielen et al., 2017; Pickut et al., 2015). The remaining studies did not provide any related information.

Across trials, the total attrition rate ranged from 0% to 33.3%, with a median of 17.4% (see Table 3). One study did not provide adequate information (Ayromlou et al., 2020).

Quality of adaptations to interventions

The evaluation of intervention modifications for people with PD is shown in Table 4. Six studies used a mixed method design (Advocat et al., 2016; Ayromlou et al., 2020; Bogosian et al., 2021; Buchwitz et al., 2021; Ghielen et al., 2017; Siwik et al., 2022), two studies reported solely quantitative data (Pickut et al., 2015; Rodgers et al., 2019), and two studies did not give adequate details on this (Kwok et al., 2019; Son & Choi, 2018). All studies evaluated MBIs except for Ghielen et al. (2017), which evaluated BEWARE-ACT with physical therapy. There was insufficient information provided regarding whether intervention piloting was conducted across studies, with the exception of three studies whose primary aim was to pilot the intervention (Ayromlou et al., 2020; Rodgers et al., 2019; Siwik et al., 2022). Out of the three studies, two were MBSR (Ayromlou et al., 2020; Siwik et al., 2022) and one was MBCT (Rodgers et al., 2019). Three effectiveness trials, consisted of a Mindfulness based lifestyle program (Advocat et al., 2016), Mindfulness yoga (Kwok et al., 2019) and Mindfulness based complex exercise program, provided information on sample size considerations (Advocat et al., 2016; Kwok et al., 2019; Son & Choi, 2018) and one mindfulness-based intervention did not (Pickut et al., 2015). Six studies provided information on acceptability measures (Advocat et al., 2016; Bogosian et al., 2021; Buchwitz et al., 2021; Ghielen et al., 2017; Siwik et al., 2022; Son & Choi, 2018) and seven provided information on adherence measures (Advocat et al., 2016; Bogosian et al., 2021; Buchwitz et al., 2021; Kwok et al., 2019; Pickut et al., 2015; Rodgers et al., 2019; Siwik et al., 2022). Only two studies included information on prior work completed before developing the intervention (Advocat et al., 2016; Ghielen et al., 2017) or if user involvement was present in the development of the tailored intervention (Ghielen et al., 2017; Son & Choi, 2018).

Table 4. Assessment of quality of adaptations to interventions using the UK medical research council (MRC) guidelines.

Author (Year)	Was the intervention adapted for people with PD?	Was the intervention piloted?	How was the appropriate sample size calculated?	Acceptability measures	Adherence measures	Were there any focus group, interview or survey before developing the intervention?	What user involvement was there in the development of the adapted intervention?	Was a mixed method design used?	Have the authors done enough piloting and feasibility work to be confident that the intervention can be delivered as intended?
Advocat et al. (2016)	Unclear	Unclear	Sample size calculations were based on published data from participants with Hoehn and Yahr stage two PD.	Patients attitudes toward the intervention (based on qualitative data) e.g. better perception of control, acceptance of the disease and self-acceptance.	Participant attendance at the weekly intervention sessions was monitored; only those who completed 4/6 sessions were considered completers. Participant adherence was monitored using a modified medical outcomes study and by participants self-rating their practice of the program exercises in the week prior on a 5point Likert scale. Intervention participants were required to complete the adherence measure prior to leaving the fourth and final sessions. All participants were mailed the adherence measure along with the other study questionnaires at the 6-month post intervention point.	Yes, semistructured interviews were conducted with 16 participants (nine female) prior to participation in the mindfulness program.	N/S	Yes	Unclear, they did not mention anything about piloting and feasibility.
Ayromlou et al. (2020)	Unclear	This is a pilot study.	N/S	N/S	N/S	Unclear	N/S	Yes	It is a pilot study; however no details were given on protocol adherence and the development of the modified intervention (e.g., focus groups, survey, user involvement).
Bogosian et al. (2021)	Yes	Unclear	N/S	The qualitative study (qualitative interviews) showed that mindfulness is a suitable and acceptable intervention. It appears feasible to run a trial delivering mindfulness through Skype, and people with Parkinson's found the sessions acceptable and helpful.	Attendance rates were recorded in all mindfulness sessions and reasons for not attending were reported.	Unclear	N/S	Yes	It is a feasibility study; however it is unclear if they also conducted piloting.

(*Continued*)

Table 4. (Continued).

Author (Year)	Was the intervention adapted for people with PD?	Was the intervention piloted?	How was the appropriate sample size calculated?	Acceptability measures	Adherence measures	Were there any focus group, interview or survey before developing the intervention?	What user involvement was there in the development of the adapted intervention?	Was a mixed method design used?	Have the authors done enough piloting and feasibility work to be confident that the intervention can be delivered as intended?
Buchwitz et al. (2021)	Yes	Unclear	N/S	An anonymous feedback survey was used to assess patients' acceptance of the conceptualized mindfulness training programme. Patients provided favorable feedback, rating the sessions as engaging and well-instructed. The programme leader and his directions for the practical tasks made them feel supported. Patients' satisfaction with the instruction of practical exercises and the training programme in general suggests that the special modifications to the specific demands of Parkinson's disease patients were quite significant. However, some patients have found it difficult to practise the exercises at home. While the information summarizing material was good, the audio-CDs were criticized for not fully supporting the feasibility of mindful practise at home.	Participation in the training sessions was recorded for each patient of the intervention group. To track the amount of mindfulness practice at home, patients were asked to complete homework exercises and to note all additional formal mindfulness exercise in a daily documentary sheet. Patients were asked to continue their daily documentation of mindful practice for eight additional weeks (until follow-up assessment). The total amount of weekly formal mindfulness practise can be determined based on this information.	Unclear	N/S	Yes	This is a pilot study. To assess the feasibility of the intervention, all patients who completed the training programme successfully (including former control group members) were asked to complete an anonymous feedback questionnaire immediately after the intervention ended (feedback on the quality and content of the training programme, their training group, the instructor, their success with performing mindful exercises, and the quality of the audio-CDs for guided exercises). A 5-point Likert scale was used to collect ratings. They were also asked to rate the training programme and the audioCDs overall.
Ghielen et al. (2017)	Unclear	Unclear	N/S	Feedback from participants was collected. Improvement points from the participants included 1) less frequent but longer therapy sessions; 2) active involvement of caregivers; and 3) the development of a supportive workbook.	N/S	Yes, two patient researchers of the Dutch Parkinson patient association (Parkinson Vereniging) conduted a group interview on the patients' expectations at baseline and evaluation points at posttreatment. These interviews were in the absence of the academic employees and were documented anonymously for qualitative analysis.	Yes, the two patient researchers of the Dutch Parkinson patient association (Parkinson Vereniging) contributed to the study by providing input in the design phase.	Yes	The efficacy of this group intervention was investigated using a pilot randomized controlled study, with conventional group physical therapy as active control condition. There was also user involvement during the development of the intervention.

(*Continued*)

Table 4. (Continued).

Author (Year)	Was the intervention adapted for people with PD?	Was the intervention piloted?	How was the appropriate sample size calculated?	Acceptability measures	Adherence measures	Were there any focus group, interview or survey before developing the intervention?	What user involvement was there in the development of the adapted intervention?	Was a mixed method design used?	Have the authors done enough piloting and feasibility work to be confident that the intervention can be delivered as intended?
Kwok et al. (2019)	Unclear	Unclear	Sample size calculations were based on a published meta-analysis (Cramer et al., 2013).	N/S	The compliance rates of home practice in both groups were calculated. Participants in each intervention received an information leaflet with instructions for athome practise. All participants received an information booklet with instructions for each intervention, however only the MY-PD group received audios and videos (e.g., body scan, meditation, yoga moves, and regulated breathing). Furthermore, sessions were audiotaped, and a research investigator (J.Y.Y.K.) used the audio recording to evaluate instructors' adherence to the procedure for at least two sessions each group.	Unclear	N/S	Unclear	Unclear. Even thought details on protocol adherence were provided, no information was given on weather they had done piloting or considered any adaptations specifically for people with PD.

(*Continued*)

Table 4. (Continued).

Author (Year)	Was the intervention adapted for people with PD?	Was the intervention piloted?	How was the appropriate sample size calculated?	Acceptability measures	Adherence measures	Were there any focus group, interview or survey before developing the intervention?	What user involvement was there in the development of the adapted intervention?	Was a mixed method design used?	Have the authors done enough piloting and feasibility work to be confident that the intervention can be delivered as intended?
Pickut et al. (2015)	Unclear	Unclear	Unclear	N/S	The MBI group's attendance rate during training sessions was calculated (97.3%). Over the course of the eight-week training, participants reported spending a total of 32,244 minutes doing the major components, with an average of 55 minutes each day. The average amount of time spent on each major component was 47.45% for meditation, 30.76% for yoga, and 21.79% for body scan. There were instructions on how to practise and incorporate mindfulness into daily tasks. Participants were also taught how to use mindfulness to cope with stress in everyday life. The course sequence was accompanied by audio recordings of 45-minute guided mindfulness activities, as well as directions for regular home practise. Weekly time spent in mindfulness practises, as stated by participants, was recorded.	N/S	N/S	No	Unclear. No details were given about piloting and feasibility; however, the outcomes of this study could show the feasibility and adherence to a mindfulness training programme for people with PD.

(*Continued*)

Table 4. (Continued).

Author (Year)	Was the intervention adapted for people with PD?	Was the intervention piloted?	How was the appropriate sample size calculated?	Acceptability measures	Adherence measures	Were there any focus group, interview or survey before developing the intervention?	What user involvement was there in the development of the adapted intervention?	Was a mixed method design used?	Have the authors done enough piloting and feasibility work to be confident that the intervention can be delivered as intended?
Rodgers et al. (2019)	Yes	This is a pilot study	N/S	N/S	Participants were given a set of CDs that facilitate MBCT practise and were encouraged to engage in regular mindfulness activities. Each participant received a booklet that contained the weekly handouts. This included content covered in the weekly session for personal practise at home. Participants were assigned weekly homework chores that challenged them to participate in both formal meditations based on breathing exercises and informal meditation based on concentrating attention on normal everyday tasks. Homework completion was examined in following sessions to gauge adherence and facilitate group discussion on overcoming challenges.	N/S	N/S	No	Unclear, even though this is a pilot study, no details were given on protocol adherence and the development of the modified intervention (e.g. focus groups, survey, user involvement).
Siwik et al. (2022)	Yes	This is a pilot study.	N/S	No participants were lost to follow-up, suggesting MBSR was accepted by PD patients and caregiving-partner dyads and met a need early in the disease.	No participants were lost to follow-up. Participants in the MBSR group completed a mean of 2028 min (SD = 939) of at-home practice, which is equivalent to 36 min per day, and attended an average of 8 classes (SD = 1).	Unclear	N/S	Yes	It is a pilot study – however no details were given on protocol adherence and the development of the modified intervention (e.g., focus groups, survey, user involvement).

(*Continued*)

Table 4. (Continued).

Author (Year)	Was the intervention adapted for people with PD?	Was the intervention piloted?	How was the appropriate sample size calculated?	Acceptability measures	Adherence measures	Were there any focus group, interview or survey before developing the intervention?	What user involvement was there in the development of the adapted intervention?	Was a mixed method design used?	Have the authors done enough piloting and feasibility work to be confident that the intervention can be delivered as intended?
Son and Choi (2018)	Yes	Unclear	The sample size for the participant selection was calculated as 26 for each group by using the G*power 3.1.2 program.	Prior to the trial, three sessions were held with three PD patients (from the intervention group) to establish whether the programme was appropriate for PD. A research supervisor, a neurologist, a meditation specialist, and a nursing professor all agreed that the three sessions were acceptable for Parkinson's disease patients.	N/S	Unclear	The intervention program was evaluated by a neurologist, a nursing professor, and a nurse in neurology to determine whether it was suitable for PD patients.	Unclear	Unclear because no information was provided on piloting, protocol adherence, or the development of the modified intervention (e.g., focus groups, surveys, or user engagement).

PD-specific adaptations

Five trials included information on specific adaptations for people with PD: a Mindfulness intervention delivered via videoconferencing (Bogosian et al., 2021), an IPSUM (Buchwitz et al., 2021), an MBCT (Rodgers et al., 2019), an MBSR (Siwik et al., 2022), and an MMBCEP (Son & Choi, 2018). In contrast, the other five trials did not provide clear information on adaptations (Mindfulness based lifestyle program: Advocat et al., 2016; MBSR: Ayromlou et al., 2020; BEWARE-ACT with physical therapy: Ghielen et al., 2017, Minfulness yoga: Kwok et al., 2019; MBSR: Siwik et al., 2022).Three of the five trials (Bogosian et al., 2021; Buchwitz et al., 2021; Rodgers et al., 2019) reported details on how they adapted the intervention to fit the specific needs of people with PD. MBCT adaptions (Bogosian et al., 2021) included reducing mindfulness home practice time from 45 to 20 minutes and reducing the length of weekly sessions from 2/2.5 hours to 1 hour, as a larger time commitment may be a barrier to their participation. PD-specific examples were added to the manual. IPSUM (Buchwitz et al. (2021) consisted of mindfulness training which included several PD-specific adaptations: The theoretical component was reduced to accommodate potential cognitive impairment; potential mobility concerns were addressed by carrying out yoga whilst seated; mild movement was added in the guided sitting meditation to keep the participant from falling asleep. Anonymous feedback from participants rated the sessions as engaging, well-instructed, and that they felt supported by the program leader. However, some patients found it difficult to practise the exercises at home and, while information summarizing material was good, the audio-CDs were criticized for not fully supporting the feasibility of mindful practise at home (Buschwitz

The third study, an MBCT (Rodgers et al., 2019), used a shorter 3-week program based on MBCT (Dissanayaka et al., 2016), instead of the typical 8-week program. To accommodate motor difficulties, the walking meditation component was removed, and the instructions were adjusted in terms of language and pace to accommodate cognitive challenges. The metaphors and examples used in educational exercises were adapted to address common symptoms and thought patterns associated with PD. In addition, participants were provided with a set of CDs to guide their MBCT practice and encourage regular engagement in mindfulness activities (Rodgers et al., 2019).

Discussion

This systematic review aimed to evaluate the effectiveness of a range of third-wave psychotherapies on depression and anxiety, psychological distress, psychological well-being and quality of life in people with PD, as well as intervention adaptations for this population. The inclusion of these outcomes measures was critical since the majority of people with PD experience significant distress affecting their psychological wellbeing and quality of life (Lacy et al., 2023) and we aimed to obtain a better understanding of the potential effectiveness of third-wave psychotherapies in improving these symptoms (Galway et al., 2012; Winefield et al., 2012).

Of the ten included studies, the majority were pilot or feasibility studies, whose primary aim was to establish whether a full-scale trial was feasible or to test specific aspects of the study design, such as recruitment processes, intervention protocols, and data collection methods. There was wide heterogeneity in eligibility criteria for the studies, including participants' disease stage, prior mindfulness experience or current practice, and use of pharmacotherapy and differences in the duration and method of intervention delivery.

Of the four effectiveness trials, only three provided a sample size justification, and it could be argued that only one was adequately powered to detect differences in study outcome measurements (Kwok et al., 2019). This limits interpretation of the mixed findings reported across all of the trial outcomes (Wang & Ji, 2020).

Nevertheless, several tentative conclusions can be drawn. Firstly, there was evidence, based on data from the trial with the largest sample size, of an effect of Mindfulness Yoga on both its primary outcome (depression and anxiety) and on secondary outcomes (psychological well-being and quality of life), at the end of the 8-week intervention, which was sustained after 3 months (Kwok et al., 2019). Of

note this trial included an active control and excluded participants who were receiving pharmacotherapy for depression or anxiety.

Secondly, although it is difficult to draw conclusions regarding efficacy from the remaining studies, they have highlighted the need for a greater focus on PD-specific adaptations. Aspects for further consideration in the design of future studies are the mode of delivery (e.g., video conference), the optimal duration of sessions, and the type and content of home assignments and tools (e.g., audio CD) to meet the individual needs of people with PD. The impact of executive dysfunction, the way in which on-off periods are incorporated into the trial design and the impact of PD severity on the type of intervention need to be addressed. The group mode of therapy used in all of the included studies may have the added benefit of decreasing isolation and fostering a sense of closeness, as participants were able to explore ways in which mindfulness may be applied in managing some of the problems they were experiencing (Bogosian et al., 2021).

Thirdly, this review has clearly demonstrated the gap in our understanding of non- mindfulness-based third-wave psychotherapies and underscores the need for further research in this area. There is an increasing awareness of the relatively unharnessed potential of ACT-based interventions in people with neurological conditions, following the recent publication of COMMEND trial, which found ACT plus usual care was clinically effective for maintaining or improving quality of life in people with motor neuron disease (Gould et al., 2024). (ISRCTN12655391). ACT appears particularly relevant due to its emphasis on psychological flexibility, a crucial factor in adapting to a progressive and unpredictable condition such as PD (Hayes et al., 2012). While traditional cognitive-behavioral therapies focus on modifying maladaptive thoughts, ACT shifts the focus toward accepting distressing experiences while engaging in values-driven behavior. Given that individuals with PD often struggle with emotional distress, frustration, and loss of identity due to physical decline, ACT may offer a beneficial framework that promotes resilience and well-being (Dissanayaka et al., 2016). This perspective supports the need for further research into ACT's effectiveness in PD populations, particularly in comparison to other third-wave interventions.

A key advantage of ACT lies in its approach to emotional regulation and distress tolerance. Many individuals with PD experience significant anxiety and depression, often related to fears about disease progression and loss of independence (Blundell et al., 2023). ACT's emphasis on cognitive defusion, observing thoughts rather than being dominated by them, can help mitigate these concerns by fostering a more adaptive relationship with distressing cognitions (Assaz et al., 2018). Furthermore, the commitment component of ACT encourages individuals to continue engaging in meaningful activities despite physical limitations, thereby preserving their sense of autonomy and purpose (Sander et al., 2021). These mechanisms suggest that ACT may be particularly effective in promoting long-term psychological adjustment in individuals with PD.

Beyond ACT, other third-wave approaches such as Dialectical Behavior Therapy (DBT) and Compassion-Focused Therapy (CFT) may also warrant consideration in people with PD. DBT, originally designed for borderline personality disorder, integrates mindfulness with emotional regulation, distress tolerance, and interpersonal effectiveness (Linehan, 2014). These components could be particularly relevant for individuals with PD, especially in addressing frustration, emotional dysregulation, and difficulties in social interaction (Roberts et al., 2011). For example, distress tolerance strategies in DBT may help individuals cope with the unpredictability of symptoms, while interpersonal effectiveness skills could enhance social support networks, reducing isolation and improving overall quality of life (Rizvi et al., 2011).

Similarly, CFT may be a valuable intervention for those struggling with self-criticism and feelings of inadequacy due to their condition (Kirby & Gilbert, 2017). Many individuals with PD experience guilt and frustration regarding their physical decline, which can contribute to negative self-perceptions and emotional distress. By fostering self-compassion and reducing self-judgment, CFT may help mitigate these effects, promoting greater emotional resilience and well-being (Kirby et al.,

2017). Given the evidence supporting self-compassion as a protective factor in mental health, investigating the role of CFT in PD populations may offer new insights into psychological interventions for this group. Overall, the potential benefits of ACT, DBT, and CFT highlight the need to broaden the scope of research on third-wave therapies for PD.

Limitations

There were several limitations of this review, some of which have already been discussed, including small sample sizes and heterogeneity in all aspects of trial design. In addition, the included studies evaluated outcomes of interest solely using self-report measures. Participants may have found it hard to appraise their own cognitive processes and emotions for several reasons. For example, they may have difficulty recalling details, interpreting their feelings, or expressing them accurately. These challenges can lead to inaccuracies in the data collected, potentially skewing the results of the study.

Participants in the studies were largely homogeneous, with a predominance of white individuals and recruitment primarily from a single neurological clinic. As a result, the findings may not be generalizable to a broader population. Attrition rates exceeded 20% in three studies, and one study did not report enough details to calculate the attrition rate, which may have a detrimental impact on research outcomes (Ahern et al., 2024). Ensuring minimal attrition is of utmost importance to researchers, as it poses a risk to the validity of the findings (Dumville et al., 2006). To eliminate the bias that might result from this, participants who drop out must be included in statistical analyses. Only two out of ten trials included in this review explicitly stated that intention-to-treat analyses (ITT) were performed, but this reflects the fact that the primary aim of the majority of trials was to collect pilot or feasibility data.

As previously discussed, it was not possible to draw any conclusions about the effectiveness of ACT or other forms of third-wave psychotherapies due to the lack of studies. Neither was it possible to compare the effectiveness of third-wave psychotherapies with other types of psychotherapies. No studies compared the adapted interventions to their non-adapted counterparts, limiting the ability to draw conclusions about the effectiveness of the adaptations. Additionally, some papers lacked sufficient detail about intervention-level adaptations and the rationale behind them, making it challenging to replicate the findings in future research or implement them in practice.

Regarding pilot work, only a minority of studies reported details of preliminary research conducted before developing the intervention, including the involvement of individuals with lived experience in evaluating the adapted intervention. Addressing this gap is crucial for promoting shared learning about the specific needs of the Parkinson's community and enabling other researchers to replicate or build upon the study's findings (Cybulski et al., 2016).

Clinical implications

- Large scale trials in the NHS are needed to establish the clinical meaningfulness of any observed mindfulness-based interventions in PD.
- Further research is urgently needed to adapt and evaluate non-mindfulness-based psychotherapies such as ACT, which are largely unexplored.
- The involvement of people with lived experience of PD, including carers, their families and health professionals should be prioritized when considering PD-specific adaptations.

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Data availability statement

The authors confirm that the data supporting the findings of this study are available within the article or its supplementary materials.

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