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Internet-based cognitive behavioral therapy for depression and anxiety in Parkinson's disease — A pilot study

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ABSTRACT

Background: Parkinson's disease (PD) is often associated with depression and anxiety. The availability of evidence-based psychological interventions is low.
Objective: This pilot study investigates the feasibility and preliminary effect of internet-based cognitive behavioral therapy (ICBT) for depression and anxiety in PD.
Methods: 9 patients with PD with comorbid symptoms on the relevant subscale of Hospital Anxiety and Depression Scale (HADS), of either depression (HADS-D > 7) or anxiety (HADS-A > 7) received 12 weeks of ICBT, specially adapted for depression and anxiety in PD. Primary outcome was change in depression and anxiety symptoms, measured with HADS total score. Effects on non-motor symptoms, PD specific health and quality of life and insomnia were explored, plus the participant's involvement, satisfaction, and subjective evaluation of the treatment.
Results: Participants reported lower symptoms on HADS after ICBT (Cohen's $d = 0.79$, $p < 0.05$). However, levels of inactivity were rather high and questionnaires and comments from participants suggested that the treatment can be improved, for example by adding more therapist support.
Conclusions: The results suggest that ICBT could be a feasible way to alleviate depression and anxiety in PD. However, a somewhat simplified treatment and different ways to provide support to enhance adherence and outcome are warranted.

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1. Introduction

Parkinson's disease (PD) is the second most common neurodegenerative disease, often associated with motor symptoms such as rigidity and resting tremor. PD is also often associated with comorbid depression, anxiety and sleep problems which impair the quality of life. A recent systematic review is suggesting that the prevalence of clinically relevant depression in patients with PD is 30–35% (Aarsland et al., 2012). Even more patients have symptoms of depression and anxiety but do not meet all criteria for a diagnosis (Aarsland et al., 2012). Most patients with PD also have some form of sleep disorder (Larsen and Tandberg, 2001).

There are only a few studies examining psychological interventions for depression and anxiety in Parkinson's disease (Yang et al., 2012). These studies suggest that cognitive behavioral therapy (CBT) can be effective. One randomized trial (n = 80) has been made where the group receiving CBT experienced a clearly significant reduction in depressive

symptoms compared with the group receiving the usual clinical monitoring (Cohen's $d = 1.59$) (Dobkin et al., 2011a).

The availability of CBT is unfortunately low, mostly because of lack of CBT-trained therapists (Larsson et al., 2009). New ways to administer CBT as self-help via books, telephone and internet, can increase access to treatment and reduce costs. Self-help with therapist support has proven to be as effective as traditional CBT in a range of conditions (Cuijpers et al., 2010).

Besides the lack of CBT trained therapists, PD patients may have difficulty getting to weekly sessions at the clinic. In a survey, 31% of PD patients reported transportation as a barrier to mental health care utilization and 52% said that mental health services were not available locally (Dobkin et al., 2013). The same survey reported that a majority had access to phone, cell phone and internet, and felt comfortable using both phone and computer.

A small case study (n = 10) evaluated telephone-administered CBT for PD patients with comorbid depressive or anxiety disorders with promising results (Veazey et al., 2009). These study participants reported that they preferred to manage their CBT treatment from home compared to having to travel to the clinic once a week. Another uncontrolled, but larger study (n = 21) of telephone CBT for depression in PD found promising improvements in depression score (Cohen's $d = 1.21$

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(Dobkin et al., 2011b). Both treatments used in these two studies of tele-phone CBT mirrored standard face-to-face CBT in both content and session length and where not based on guided self-help where the main content of the treatment is delivered via text or other media and the therapist is mainly giving additional support and feedback.

Internet-based CBT (ICBT) usually consists of self-help texts, home-work assignments, queries and guidance by an online therapist (Andersson et al., 2008). The evidence of guided ICBT's effectiveness and cost-benefit is rapidly growing (Hedman et al., 2012). ICBT has pre-viously been used to treat both psychiatric conditions such as panic dis-order (Hedman et al., 2013) and distress related to somatic problems such as tinnitus (Kaldo et al., 2008). Internet-based interventions have also been used successfully with other neurology patients in two small-er studies, one treating depression in epilepsy (n = 40) (Thompson et al., 2010) and one managing fatigue in multiple sclerosis (n = 40) (Moss-Morris et al., 2012). To our knowledge, studies of ICBT for depres-sion and anxiety in Parkinson's disease are lacking.

1.1. Aim of this study

The aim of this study was to investigate the feasibility and prelimi-nary effect of ICBT for depression and anxiety in Parkinson's disease. We hypothesized that participants would improve on measures of symptoms of depression and anxiety. We also explored effects on PD non-motor symptoms, PD specific health and quality of life, and insom-nia as well as involvement in treatment, the participant's satisfaction and subjective evaluation of the treatment.

2. Methods

2.1. Design

This was an uncontrolled study to evaluate the effect ICBT had on depression and anxiety symptoms in PD patients (n = 9). A within-group design with repeated measurements was used. The study was approved by the Regional Ethics Review Board in Stockholm, Sweden (2011/1844-31/4). The study was also registered at ClinicalTrials.gov (NCT01545414).

Table 1
Baseline characteristics of participants.

Characteristic	n = 9
Age, years, m (sd)	66.0 (11.6)
Age span, youngest–oldest, years	37–74
Gender, n (%)	
Women	3 (33%)
Men	6 (67%)
Marital status, n (%)	
Married/living with partner	8 (89%)
Separated/divorced/widowed	1 (11%)
Single/other	
Educational level, n (%)	
Compulsary school/other	0
Upper secondary school	4 (44%)
College/university	5 (56%)
Current occupation, n (%)	
Work/studies full time	0
Work/studies part time	2 (22%)
Retired/sick leave/unemployed/other	7 (78%)
Quality of life in PD (PDQ-39SI), m (sd)	35.5 (12.8)
PD severity (UPDRS), m (sd)	41.2 (16.0)
Cognitive functioning (MoCA), n = 8, m (sd)	26.4 (1.6)
Years since PD diagnosis, m (sd)	8.1 (3.9)
Uses antidepressants, n (%)	2 (22%)
Levodopa equivalent doses medication, m (sd)[a]	835 (322) mg

Abbreviations: PD, Parkinson's disease; PDQ-39SI, The Parkinson Disease Questionnaire-39 Single Index; UPDRS, Unified Parkinson's Disease Rating Scale; MoCA, Montreal Cognitive Assessment.

[a] See Tomlinson et al. (2010).

2.2. Sample and recruitment

Table 1 presents the characteristics of the participants included in this study. Participants were recruited by a neurologist (PS) at the PD unit at the Neurology Department at the Karolinska University Hospital, Stockholm, Sweden between December 2011 and March 2013. After PD assessment with Unified Parkinson's Disease Rating Scale, UPDRS (Fahn et al., 1987), the participant completed questionnaires through a secure web page.

Inclusion criteria were: (a) a previously diagnosed PD and (b) mild to moderate depression or anxiety problems defined as Hospital Anxi-ety and Depression Scale (Zigmond and Snaith, 1983) subscale for anx-iety (HADS-A), or subscale for depression (HADS-D), greater than 7 (Bjelland et al., 2002). Exclusion criteria were: (c) current drug abuse, (d) psychosis or bipolar disorder, (e) problems that prevent the use of computer or internet, (f) lack of time or ability to perform the exercises in ICBT, (g) cognitive function less than 24 on Montreal Cognitive As-sessment (MoCA) (Gill et al., 2008), (h) severe depression defined as over 30 on Montgomery Åsberg Depression Rating Scale — Self rating version, MADRS-S (Mattila-Evenden et al., 1996), high suicide risk de-fined as (i) 5 or 6 points on the MADRS-S question on suicidal thoughts or (j) a high suicide risk identified by the neurologist or the psychologist interviewing the participant. Participants were not excluded on the basis of any concurrent medical, physiological or psychological treatment.

In the next step, the participant was interviewed face-to-face by a psychologist (MK) which served as the start of the internet-based treat-ment phase. Once every treatment week, the participants completed the MADRS-S over the internet. If the MADRS-S question on suicidality was above 3, the psychologist contacted the participant to perform a structured evaluation for suicidal ideation. In treatment week 12 the participant again completed internet questionnaires and was then interviewed again face-to-face by the psychologist. All treatment was an adjunct to standard medical treatment in PD. After treatment the participant was assessed again by a neurologist at the PD unit.

2.3. Outcome measures

2.3.1. Primary outcome

The primary outcome measure was anxiety and depression symp-toms measured with the HADS scale (Zigmond and Snaith, 1983). The HADS measures the degree of anxiety and depression both as indepen-dent subscales with 7 items each, HADS-A and HADS-D, and as a 14 item total score. The score range is 0–21 for each subscale and 0–42 for the total score. HADS has shown internal consistency with a Cronbach's α of 0.83 for HADS-A and 0.82 for HADS-D (Bjelland et al., 2002). Internet administration of the HADS has also shown to be valid (Andersson et al., 2003).

2.3.2. Secondary outcomes

A secondary outcome measure was degree of depression measured with MADRS-S which is a psychometrically sound measure and highly correlated to other measures of depression (Mattila-Evenden et al., 1996). The score range for MADRS-S is 0–54. Degree of insomnia was measured with Insomnia Severity Index, ISI which has shown adequate psychometric properties (Bastien et al., 2001). The score range for ISI is 0–28. The Parkinson Disease Questionnaire, PDQ-39 was used at screen-ing to assess PD specific health and quality of life in 8 dimensions (Jenkinson et al., 1997a). The PDQ-8 is a shorter form measure of the same dimensions as in PDQ-39 and highly correlated to the 39 item ver-sion (Jenkinson et al., 1997b). The PDQ-8 was used at pre- and post-treatment to measure change in PD related health and quality of life by calculating the PDQ-8 Single Index, PDQ-8SI. Level of non-motor symptoms was measured with the Non-motor Symptoms Question-naire, NMSQuest (Chaudhuri et al., 2006).

2.4. Other measures

2.4.1. Participant involvement in treatment

Participant involvement in treatment was measured with the number of messages each participant sent to the therapist, the number of treatment modules accessed per participant and the number of homework assignment reports completed per participant. These measures were automatically registered in the treatment platform.

2.4.2. Therapist activity

Therapist activity per participant was measured with the number of messages sent to each participant, the total time spent on writing messages to each participant, the number of phone calls per participant and the total time spent on phone calls per participant.

2.4.3. Satisfaction and subjective evaluation

Satisfaction with treatment was assessed at post-treatment with the eight item Client Satisfaction Questionnaire, CSQ-8 (Attkisson and Zwick, 1982). This questionnaire includes both numerically rated propositions and the possibility to provide written comments to each proposition (see Table 4). These written comments constituted an important basis for the qualitative evaluation of the treatment program. This established questionnaire was complemented with self-rated questions about the amount of interaction with the treatment and a semi-structured interview about the experience of ICBT done by the psychologist.

2.5. Treatment

The initial psychologist interview provided the psychologist with clinical information relevant to the ICBT intervention including choice of optional treatment modules and a first definition of the participant's treatment goals. The ICBT program was then accessible to the participant later the same day. Table 2 presents the content of the 12 week ICBT protocol. It consisted of mandatory and optional treatment modules which were accessed by the participant one at a time. A module consisted of educative texts, interactive forms and practical exercises.

The maximum possible number of different modules for a participant was 11. Each module was designed to be used a flexible number of weeks to perform the amount of practical exercise needed to facilitate change. Modules were altered compared to the modules used in the regular ICBT-program for depression used at the Internet Psychiatry Clinic, Stockholm Sweden (Hedman et al., 2014). To meet the needs of the PD patient group, who may suffer from lowered executive functioning (Lees et al., 2009), the paragraphs and total amount of text were shorter, there were more pictures and illustrations, and all examples were PD specific. A typical module contained around 3000 words compared to 6000–9000 words per module used in the regular depression treatment for non-PD patients. The mandatory modules were based on behavioral activation to alleviate depressive symptoms and management of avoidance behaviors. The optional modules targeted specific problems with the appropriate traditional CBT methods. During treatment, the therapist contacted the participant via the treatment platform after each finished module and by phone in case of inactivity, technical problems, or indications of suicidality. The therapist (MK) had training and experience in CBT and ICBT for depression and anxiety with adults but no earlier experience of working with PD patients. The therapist was supervised by the neurologist (PS) in PD specific questions.

2.6. Data analysis

Descriptive statistics were calculated to summarize demographics and characteristics at baseline. Outcome measures were evaluated from baseline to end of ICBT with T-tests and Cohen's d was then calculated as a measure of within group effect size. In case of missing data at post treatment, the last available observation was used as post data in accordance with an intent-to-treat analysis with last observation carried forward. All participants were included in the description of participant adherence and activity and therapist activity while only participants who completed the client satisfaction questionnaires were used in the client satisfaction analysis.

3. Results

3.1. Recruitment and attrition

Thirteen participants were screened for inclusion in the pilot study. The participants' flow throughout the study can be seen in Fig. 1. Three participants dropped out from treatment. Interviews gave that in two cases this was because of problems in managing the technological aspects of the treatment, and in one case the reason was difficulties in concentrating on the treatment. Two post treatment questionnaires were lost and one post treatment questionnaire did not include the patient satisfaction forms.

3.2. Primary outcome — depression and anxiety

Change in anxiety and depression symptoms, measured with the total score of the HADS scale, can be seen in Table 3. The change in HADS mean score was moderate and was statistically significant ($t(8) = 3.09$; $p < .05$). The change in depression symptoms (HADS-D) was also significant ($t(8) = 2.44$; $p < .05$). The change in anxiety symptoms (HADS-A) encompassed a small and non-significant change.

3.3. Secondary outcomes

No significant effects were observed in degree of depression measured with MADRS-S, insomnia measured with ISI, PD related health and quality of life measured with PDQ-8SI or non-motor symptoms measured with NMSQuest (Table 3).

Table 2
Content of the treatment modules.

Treatment module	Mandatory/optional[a]	Homework assignment
1. Introduction	Mandatory	Identifying values and setting long term goals
2. Behavioral activation	Mandatory	Activity scheduling
3. Avoidance and mastery	Mandatory	Activity scheduling
Sleep and circadian rhythm	Optional	Sleep diary and sleep restriction
Social anxiety	Optional	Anxiety hierarchy and graded exposure
Cognitive distortions	Optional	Cognitive reappraisal
Mindfulness	Optional	Mindfulness and acceptance exercises
Physical exercise	Optional	Scheduling of physical exercise
Relaxation	Optional	Progressive relaxation training with audio files
Last module	Mandatory	Summary and future

[a] An optional module for panic disorder was not used in this study, since none of the participants received it in their personalization of treatment.
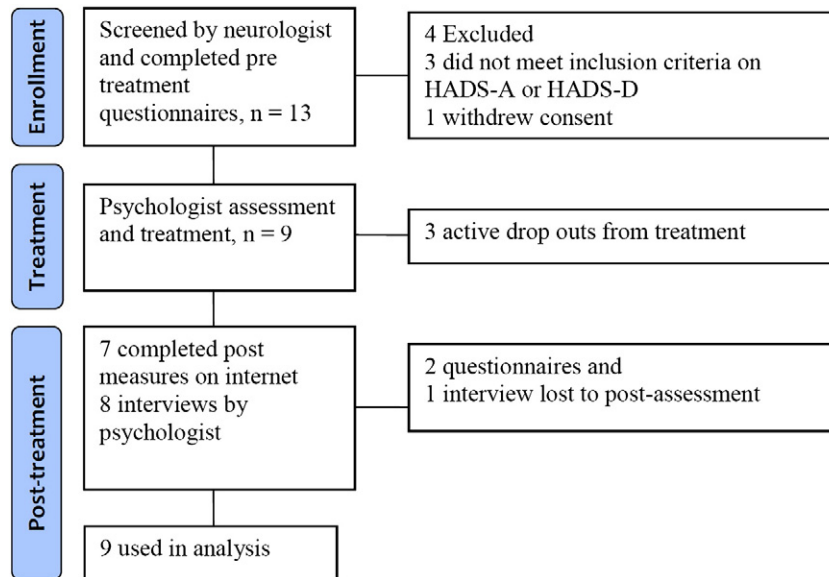
Fig. 1. Participants' flow through the study.

3.4. Participant involvement in treatment

The participants sent on average 8.3 (SD = 7.5) messages, ranging from 0 to 24 messages per participant. Each participant accessed on average 3.4 (SD = 2.1) treatment modules, ranging from 1 to 7 treatment modules per participant. The most used optional treatment modules where relaxation, social anxiety and sleep and circadian rhythm. Each participant submitted on average 3.0 (SD = 3.9) homework assignment report forms, ranging from 0 to 11 reports per participant.

3.5. Therapist activity

The therapist sent on average 8.8 (SD = 7.4) messages to each participant, ranging from 1 to 24 messages per participant. The total time spent on writing messages to each participant was on average 118.2 (SD = 98.3) minutes ranging from 4.6 to 275.2 min per participant, this equals an average of 10 min per participant and week. The therapist called the participant on average 2.8 (SD = 3.3) times, ranging from 0 to 8 phone calls per participant. The total time spent on phone calls with each participant was on average 31.8 (SD = 41.5) minutes, ranging from 0 to 111 min, this equals less than 3 min per participant and week on average.

3.6. Satisfaction and involvement

3.6.1. Quantitative analysis

The participants who completed the CSQ-8 (n = 6) scored an average of 19.67 (SD = 4.03) out of a possible 32 indicating a moderate degree of patient satisfaction. Degree of satisfaction measured with CSQ-8 did not correlate with change in depression and anxiety symptoms measured with HADS.

The participants who completed the CSQ-8 (n = 6) also rated their degree of involvement in treatment on a number of questions which included the questions seen in Table 4. These self-ratings reveal that although many participants considered the amount of text to be too much, they often found it interesting and relevant and, on average, they read most of it. Many participants admitted to not working very actively with the homework assignments, and another potential problem was that many participants did not contact the therapist every time they encountered a problem, or had a question.

3.6.2. Comments and interview

The participants' written comments about treatment satisfaction and semi-structured interviews showed high satisfaction with the telephone-based parts of treatment, example quote: "The contact over

Table 3
Observed mean (SD), change values and effect sizes (n = 9).

	Pre	Post[b]	Change pre to post		
	Mean (SD)	Mean (SD)	Mean difference (95% CI)	Effect size d (95% CI)[a]	T-test
Main outcome: anxiety and depression					
HADS	20.1 (6.2)	15.3 (6.0)	−4.8 (−8.3 to −1.2)	0.79 (1.36 to 0.20)	t(8) = 3.09; p < .05
HADS-A, anxiety	9.6 (5.7)	7.6 (4.1)	−2.0 (−4.6 to +0.6)	0.40 (0.94 to −0.12)	t(8) = 1.75; p = .118
HADS-D, depression	10.6 (2.7)	7.8 (2.5)	−2.8 (−5.4 to −0.1)	1.08 (2.08 to 0.04)	t(8) = 2.44; p < .05
Secondary outcomes					
MADRS-S, depression	16.7 (6.0)	14.2 (8.5)	−2.4 (−7.9 to +3.1)	0.34 (1.09 to −0.43)	t(8) = 1.02; p = .336
ISI, insomnia	11.8 (5.4)	10.9 (5.3)	−0.9 (−3.8 to +2.0)	0.17 (0.71 to −0.37)	t(8) = 0.71; p = .498
PDQ-8SI, PD related health	37.2 (14.6)	37.2 (20.0)	0.0 (−6.5 to +6.5)	0.00 (0.38 to −0.38)	t(8) = 0.00; p = 1.00
NMSQuest, non-motor symptoms	12.6 (5.9)	12.1 (5.8)	−0.4 (−2.0 to +1.1)	0.08 (0.34 to −0.19)	t(8) = 0.66; p = .525

Abbreviations: Pre, Pre-treatment assessment; Post, Post-treatment assessment; HADS, Hospital Anxiety and Depression Scale; MADRS-S, Montgomery Åsberg Depression Rating Scale — Self rating; ISI, Insomnia Severity Index; PDQ-8SI, The Parkinson Disease Questionnaire-8 Single Index; PD, Parkinson's disease; NMSQuest, Non-motor Symptoms Questionnaire.
[a] Effect sizes calculated within groups, pre-post, with pooled standard deviation.
[b] Last observation carried forward, in case of missing data at post.

Table 4
Participant involvement in treatment (n = 6).

	n (%)
How often was the text interesting and relevant?	
Never	0
Seldom	0
Sometimes	3 (50%)
Often	1 (17%)
Always	2 (33%)
Was the amount of text too much or too little?	
Way too little	0
Too little	1 (17%)
Just right	2 (33%)
Too much	3 (50%)
Way too much	0
How much of all text did you read in total?	
None	0
25%	1 (17%)
50%	0
75%	1 (17%)
100%	4 (67%)
How actively did you work with the homework assignments?	
I did not do any homework assignments at all	0
I did not work very actively with the homework assignments	3 (50%)
I worked quite actively with the homework assignments	2 (33%)
I worked actively with most homework assignments	1 (17%)
I did all the homework assignments	0
When you had a problem or questions, how often did you contact the therapist?	
Never	1 (17%)
Occasionally	2 (33%)
Every other time	1 (17%)
Almost every time	2 (33%)
Every time	0

the phone with [the psychologist] was good!". There were also examples of specific gains in function, example quote: "I cannot determine what has influenced my behavior, but the fact is that I sleep substantially better now compared to a month ago". Some comments showed dissatisfaction with the treatment method, example quote: "My depression depends on Parkinson, and I believe it can only be alleviated by medications". Other comments showed dissatisfaction with the internet-based parts of treatment, example quote: "To hard to get in contact. [I needed] more practical help and demonstration of the computer system". In summary, the participants' views of the treatment were mixed, but it is clear that some participants wished for more active input from the therapist.

4. Discussion

This study investigated the feasibility and effect of ICBT for depression and anxiety in PD. The ICBT tested in the study was based on behavioral activation for depression and optional symptom specific modules were matched to each participant's needs. The results suggest that this form of ICBT can be effective in the treatment of depressive symptoms in PD. ICBT was associated with a significant drop in HADS with a medium to large within group effect, especially in the depressive symptoms subscale HADS-D. No significant effects were seen on anxiety symptoms measured with the sub-scale HADS-A, or the secondary outcomes of insomnia, PD related health and quality of life, depressive symptoms measured with MADRS-S, or non-motor symptoms. The treatment might be a cost effective treatment alternative since the therapist spent less than 15 min per participant and week, which is less than seen in previous face-to-face or telephone-CBT (Dobkin et al., 2011a; Dobkin et al., 2011b).

Many participants were quite inactive in working with the homework assignments with an average of just three completed assignments per person. The average number of messages sent to the therapist was just above eight and the treatment evaluation form suggested that few participants contacted the therapist every time they encountered a problem. Three out of nine participants decided to end treatment

prematurely. This rate of drop-out was not seen in the studies of face-to-face- or telephone-CBT done by Dobkin and colleagues (Dobkin et al., 2011a; Dobkin et al., 2011b). Besides the different ways of administering treatment, the studies by Dobkin and colleagues also included active caregiver support. Parkinson severity, defined as mean UPDRS-score, in this sample was similar to what was seen in the randomized trial by Dobkin and colleagues (Dobkin et al., 2011a). The caregivers' engagement in treatment was a significant predictor of response to CBT (Dobkin et al., 2012). In the current study, high initial problem severity could also be a partial explanation to the rather inactive participants. PD severity in this sample was similar to the PD severity seen in the randomized trial by Dobkin and colleagues. On the other hand the levels of non-motor symptoms, measured with NMSQuest, were in the range of severe PD (Chaudhuri et al., 2006). Though participants on average found the text mostly interesting and relevant, they were less satisfied with treatment than participants in a comparable ICBT-treatment for depression who in a large (n = 1203) effectiveness study (Hedman et al., 2014), had a mean sum score of 24.51 (4.75). This is a significantly higher degree of self-reported treatment satisfaction than in the present study (t(1207) = 2.49; p < .05). Written comments, interview data and the reasons for drop out suggest that some participants thought the internet platform was hard to use and would have gained from either a simpler system or more practical help with the current internet platform. Many phone calls with participants were used for technical counseling and these could perhaps be preventable with a more simplistic technical solution. This is also supported by the participants' comments and the reasons the three participants out of nine gave for actively leaving treatment. The involvement of a caregiver could be another way to increase engagement in treatment and prevent inactivity and drop out in future studies. A more active therapist may be a way to counter that the participants were inactive in contacting the therapist when they had a problem or a question.

Strengths of this study include the novelty of using an internet based treatment on PD patients which is an often neglected group when it comes to psychological treatments, the large number of questionnaire and interview data measuring the participant's interaction and satisfaction with treatment, and the significant effect on the main outcome. Internet based treatments have earlier rarely been used with patient groups with a high degree of functional impairment. The preliminary results indicating comparably low degrees of participant satisfaction and involvement could be used as a warning not to assume that the adaptations made in this treatment program were sufficient.

This study also displays limitations. First, since this was a pilot study without a control condition, any detected effect could be caused by non-specific treatment factors such as time and the attention of a therapist. Thus, the findings in this feasibility study need to be replicated in a randomized controlled trial. Second, the small sample size makes the study underpowered, leading to difficulty detecting treatment effects. However, despite low statistical power there were significant treatment effects on the primary outcome measure. Third, there was no significant drop in depressive symptoms measured with MADRS-S similar to the drop in HADS-D. However, HADS-D is more adapted to measure depression in somatic patients than MADRS-S because of HADS-D's exclusion of items affected by the physical illness of the patient (Zigmond and Snaith, 1983). Fourth, only one psychologist (MK) treated the participants leading to difficulties generalizing the results to other therapists. However, the therapeutic role of the psychologist was limited since the treatment was delivered as guided self-help via the internet. Fifth, the participants were recruited by a single neurologist (PS) and may not be generalizable to the whole population of people with depression and anxiety in PD. The high degree of non-motor symptoms may for example be an indication that the participants were unusually symptomatic in this sample. Finally, since assessors were not blinded to time point, there could be a bias towards describing improvements in the participants. However, the primary outcome measure and most other measures were self-administered by the participant.

Implications for future studies of internet-based treatment for depression and anxiety in PD include the need to adapt the treatment protocol to the patient group even further. The qualitative evaluation regarding adherence and drop out implies that the technological aspects of treatment easily can become a hurdle for this patient group. The internet platform needs to be simple enough for the participants to use, and the interaction between participants and therapist needs to be active to ensure participant involvement in treatment. Additionally, the engagement of a caregiver could motivate the participant to work with the treatment assignments.

5. Conclusions

ICBT for depression and anxiety in PD could be a time saving and accessible alternative. The results are encouraging in that ICBT had effect on depressive symptoms, however further adaptations of the ICBT program, the type of therapeutic support, and technical platform could probably improve the participants' involvement in treatment and satisfaction. More feasibility trials of ICBT in different forms, as well as larger randomized-controlled trials, with long term follow-up data, are warranted to evaluate the short- and long-term efficacy of ICBT for this group of patients.

Conflict of interest

The authors have no conflict of interest to report.

Author roles

Study design: MK, PS, NL, VK; Acquisition of the data: MK, PS; analysis and interpretation of the data: MK, PS, NL, VK; drafting of the manuscript: MK, PS, NL, VK; critical revision of the manuscript: MK, PS, NL, VK.

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