A randomized controlled trial of cognitive behavioral therapy for anxiety and depression in COPD

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KEYWORDS
COPD; Cognitive behavioral therapy; Anxiety; Depression; Psychological

Summary
Background: Previous research indicates a high prevalence of untreated anxiety and depression in patients with chronic obstructive pulmonary disease (COPD). The current study examined the effect of cognitive behavioral therapy (CBT) in groups for co-morbid, clinically significant anxiety and depression in COPD outpatients of both sexes.

Methods: In a randomized, controlled trial, CBT (n = 25) was compared with enhanced standard care (n = 26). Participants in both conditions were followed up at 2 and 8 months from baseline. Main outcome measures comprised the Beck Anxiety Inventory and the Beck Depression Inventory-II. Measures of health status and sleep were included as secondary outcomes. The effects of sex and age were also investigated.

Results: CBT resulted in improvement in symptoms of anxiety and depression, with effect sizes of 1.1 and 0.9 at post-treatment, respectively. The improvement was maintained at the 8-month follow-up, with effect sizes of 1.4 and 0.9. In the control group, there was no significant change. Compared to men, women had higher symptom levels throughout the whole study period. Younger patients had more anxiety and depression, age had also differential effects in the two groups on change in depressive symptoms. Changes in sleep and health status were small in both groups.

Conclusions: The findings indicate that CBT may provide rapid symptom relief for COPD patients with clinically significant anxiety and depression, and underline the need for integrating mental health care into the overall medical regimen for COPD.

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Introduction

Psychological disturbances such as anxiety and depression affect a substantial number of patients with chronic obstructive pulmonary disease (COPD). Studies have demonstrated prevalence rates of 19–40% for depression and 28–36% for anxiety.1,2 Anxiety and depression can significantly increase physical disability, co-morbidity, morbidity, and health-care utilization, and interfere with compliance with medical treatment.3 Psychological distress has also been shown to account for a significant amount of variance in patients’ health status and sleep quality.4,5 Women with COPD seem to have higher levels of anxiety and depression compared to men.6

The co-morbid psychological disturbances in COPD are often undetected or not treated adequately.6 However, the ACCP/AACVPR Pulmonary Rehabilitation Guidelines Panel has pointed out that psychological distress is not necessarily concomitant of lung disease and can and should be treated.7 Although pharmacotherapy has been recommended as a treatment strategy for anxiety and depression in this patient group,8 significant obstacles implementing such interventions have been reported.9 In a feasibility trial of antidepressant therapy, Yohannes et al.9 found that 72% of depressed patients refused the treatment and only 14% of those who accepted completed the trial.

Cognitive behavioral therapy (CBT) is a well-known approach for treating anxiety and depression, which has demonstrated effectiveness also for older adults.10 A systematic review of CBT for COPD patients with mild to moderate anxiety or depression identified three randomized controlled trials (RCT) and one non-randomized controlled trial.11 Two RCTs demonstrated significant reductions of anxiety or depression.12,13 However, these studies examined the effect of CBT in combination with exercise training and education. None of the reviewed studies selected specifically patients with clinically significant co-morbid anxiety or depression. The overall conclusion of the review was that there is scant evidence of the effectiveness of CBT for COPD patients. Further studies addressing the effectiveness of CBT for anxiety and depression in COPD patients are being called for.3

In a more recent and larger RCT, Kunik et al. targeted COPD patients with at least moderate anxiety and/or depression.12 CBT in group format significantly improved anxiety and depression but was not superior to COPD education in groups. Participants in this study were veterans and mainly males (96.2%). In the current study, we aimed to examine further the CBT group approach tested previously in the study of Kunik et al.,14 with a sample with more equal gender distribution. The prevalence and morbidity of COPD in women is increasing, and women with COPD also report more dyspnea and lower health-related quality of life compared to men, regardless of lung function and burden of smoking.15 The high prevalence of psychological co-morbidity in women may contribute to both dyspnea and impaired health-related quality of life.

The objectives of the present study were: (1) to examine the effect of CBT on clinically significant symptoms of anxiety and depression compared with enhanced standard care; (2) to investigate the eventual effects of sex and age on change in symptoms of anxiety and depression. Measures of sleep and health status were included as secondary outcomes, as these factors seem to be affected by psychological distress,16 and thus could be expected to respond to an improvement in mental health symptoms.

Materials and methods

Patient recruitment

Participants for the RCT were recruited from an outpatient pulmonary clinic at the Haukeland University Hospital, Bergen, Norway, and by newspaper advertisement. An initial telephone interview was conducted to ensure that the patients fulfilled the basic study criteria. Those with a diagnosed COPD and who answered positively to two out of five anxiety and depression questions from the PRIME-MD questionnaire17 were invited to a screening interview.

Eligibility criteria were (1) age 40 years or older; (2) COPD diagnosis confirmed by post-bronchodilatory FEV1 of less than 80% predicted and FEV1/FVC of less than 0.7; (3) scores greater than 15 on the Beck Anxiety Inventory (BAI) and/or greater than 13 on the Beck Depression Inventory-II (BDI-II)18,19; (4) not participating in other comprehensive psychosocial interventions (i.e. pulmonary rehabilitation); (5) no signs of cognitive impairment, defined by a score of 23 or higher on the Mini-Mental State Examination (MMSE)20; and (6) no other severe psychiatric disorders as identified by clinical assessment based on the Structured Clinical Interview for the Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition (SCID I/P).21

We enrolled consecutive eligible patients interested in participating in the study, for a period of 1.5 years. Of 328 patients interviewed in telephone, 186 fulfilled the basic study criteria. Of those, 108 patients were not able or willing to participate (problems with transportation n = 30, 28%; does not feel anxiety/depression is a problem n = 22, 20%; no time n = 20, 17%; feeling too sick or fatigued n = 16, 15%; no data n = 20, 19%), and 78 were invited to screening interview. The study was approved by the Regional Committee for Medical Research Ethics in Western Norway and all patients gave informed consent.

Study design

Included patients were divided into matched pairs according to their post-bronchodilatory FEV1 predicted, and from each pair one participant was randomly assigned to CBT and the other to enhanced standard care. Allocation concealment was implemented using numbered containers that were identical in appearance for the two groups. Due to the nature of the intervention, neither participants nor therapists were blinded for group assignment. Patients in both groups met at the pulmonary clinic for spirometry at baseline and 2 and 8 months later. During these visits, they also received the self-report measures and actigraph devices for sleep registration, which they mailed to the study personnel one week later. The primary outcome measures for anxiety and depression were also administered half way through the intervention period (week 4).
Interventions

CBT. Table 1 summarizes the components of the CBT intervention. The CBT intervention was based on a manualized group approach developed by Stanley et al., tested previously by Kunik et al. The original therapy manual was modified by cutting down the number of components (from 7 to 6) and sessions (from 8 to 7) and lengthening the session from 1 to 2 h, in order to allow for more time to work on each component. The primary aim of the intervention was to help patients modify beliefs and change behavioral patterns that perpetuate or maintain psychological and somatic symptoms.

The participants attended 7 weekly 2 h group sessions at the university outpatient clinic (Department of clinical psychology, University of Bergen, Norway). In each of the treatment groups, there were 4–6 participants (5 on average). Participants in the CBT intervention were phoned one and three months after post-treatment assessment, and encouraged to maintain behavioral changes instigated by the therapy. The group sessions were facilitated by a Masters-level psychology student. The sessions were videotaped, and a specialist in clinical psychology monitored the adherence and competence of the two student therapists on the basis of the video recordings.

Control group. In addition to standard care for COPD, participants in the control group received telephone contact with the study personnel every two weeks in the intervention period of seven weeks, in order to monitor their psychological status and assess suicidal ideation. The telephone calls lasted 5–10 min, and no interventions beyond assessment of symptom level and basic information about symptoms of anxiety and depression were delivered. The telephone contact with the participants in control group was facilitated by the student therapists who also conducted the CBT treatment. There was no monitoring of telephone contact, but the student therapists received detailed written instructions for the telephone calls.

Measures

The primary outcome measures were the BAI and the BDI-II. Clinically significant anxiety was defined as a BAI score of 16 or higher (moderate to severe anxiety), since this represents a level of anxiety that is approximately two standard deviations above the mean for an older community sample. Clinically significant depression was defined as a BDI-II score of 14 or higher (mild to severe depression). This score corresponds to an empirically derived cut-off for differentiating between community and clinical adult samples.

Secondary outcome measures were the St. George’s Respiratory Questionnaire (SGRQ; perceived health status), the Pittsburgh Sleep Quality Index (PSQI; subjective sleep quality), and actigraphy (objective

<table>
<thead>
<tr>
<th>Component</th>
<th>Aim</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>Psychoeducation/awareness</td>
<td>Increase awareness of how COPD may affect psychological well-being,</td>
<td>Explaining how dyspnea may set off panic anxiety, and how anxious thoughts or catastrophic about physical symptoms may contribute to dyspnea.</td>
</tr>
<tr>
<td>Relaxation</td>
<td>Use breathing techniques and postural changes for relaxation and coping</td>
<td>Practicing relaxation with diaphragmatic breathing when feeling “jittery”.</td>
</tr>
<tr>
<td>Cognitive therapy</td>
<td>Identify and challenge depressive patterns of thought or anxiety-related rumination/fearful thoughts, and explore more functional patterns of thought.</td>
<td>Depressive thought pattern: Blaming self for being ill and not being able to take care of house and family. More functional thought: “I am doing my best under the circumstances and I can ask for help when I need it.”</td>
</tr>
<tr>
<td>Behavioral activation</td>
<td>Identify depressive, passive behaviors and replace them with activities that are pleasant and/or increase one’s sense of mastery.</td>
<td>Depressive pattern: sitting on the couch and watching TV, while ruminating about past failures. Behavioral activation: making a plan to go for a walk three times a week with a neighbor.</td>
</tr>
<tr>
<td>Fear-based exposure</td>
<td>Replace avoidance of anxiety-provoking situations and activities with graded exposure, in order to increase tolerance and reduce anxiety.</td>
<td>Fear-based avoidance: restaurants, movie theatres, shopping malls. Exposure: going to a shopping mall with a trusted friend for 15 min. Planning ahead and practicing breathing techniques.</td>
</tr>
<tr>
<td>Sleep management skills</td>
<td>Learn about sleep hygiene and use sleep management skills when needed.</td>
<td>Going to bed and getting up at the same time every morning, restricting afternoon nap to max. 15 min.</td>
</tr>
</tbody>
</table>
sleep efficiency). On the SGRQ, higher scores imply more impairment in perceived health status, and a four unit change is considered to be clinically significant. On the PSQI, a total score of greater than 5 has yielded a high diagnostic sensitivity and specificity distinguishing poor from good sleepers. Concerning actigraphic sleep measurement, sleep efficiency below 85% is a common cut-off value for making a diagnosis of insomnia in adults.27

Spirometry was performed with a Vitalograph S-model according to the ATS criteria.28 Demography, smoking status, and medical co-morbidities were assessed from participant self-report. The Client Satisfaction Questionnaire (CSQ) was used to assess participants’ satisfaction with treatment.29 Scores range from 8 to 32, higher scores indicating more satisfaction with the treatment.

Statistical analyses

Statistical analyses were performed with the SPSS statistical software, version 14. Intention-to-treat analyses were used. Mixed models with random effects were used to examine the change on outcome variables over time and to compare changes between groups from baseline to follow-up.30 In contrast to the ANOVA approach, using mixed models with random effects allows fitting a line for each individual based on available data, and missing values at one measurement point did not prevent including an individual in the analysis.31 The models included terms for time, quadratic time to account for nonlinear change, group, and interaction of group with time/nonlinear time, and the model with best fit with the data was chosen for each outcome variable. In further pre-specified exploratory analysis, terms for sex and age were added to examine the contribution of these variables (main effect and three-way interactions sex × group × time and age × group × time). Assessment time (weeks from baseline) for posttest and follow-up assessments were specified in the models for each individual, in order to take into account possible deviations when participants were not available for the pre-scheduled follow-up appointments. The flexibility of the mixed models approach obviates the need for parallel measurements, since the mean and variability structures can be clearly separated.32

Secondary analysis using t-tests were conducted to examine within-group time effect from pretreatment to post-treatment and from post-treatment to follow-up. Within-group effect sizes were expressed with the Cohen’s d.33 Between-group effect sizes (d) with 95% confidence intervals were computed using the software program DSTAT.34

Expecting a difference between the groups at follow-up equivalent of an effect size of approximately 0.8, with a power of 0.80 and an alpha at $P = 0.05$, the number of participants needed in each group was estimated to be 33.

Results

Study population

The number of participants estimated in the power analysis was not reached by the end of the study period. Fig. 1 shows the participant flow in the study. Seventy-eight patients were assessed for eligibility and 22 were excluded for not fulfilling the eligibility criteria. Fifty withdrew from the study before randomization. Forty-six of the 51 participants originally randomized completed the intervention (23 women, 23 men).

Participant characteristics are summarized in Table 2. Seventeen participants (33.3%) fulfilled the diagnostic criteria (DSM-IV; based on clinical assessment with the SCID I/P) for a mood disorder, 13 (25.5%) for an anxiety disorder, and 23 (45.1%) for a mood disorder or anxiety disorder. There were no statistically significant differences between the groups in any of the clinical or sociodemographic variables, except for mean education years (CBT > Control group, $P = 0.040$).
Table 2  Participant characteristics.

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>CBT (n = 25)</th>
<th>Control group (n = 26)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sex, women/men</td>
<td>11/14</td>
<td>15/11</td>
</tr>
<tr>
<td>Age, mean (SD, Range)</td>
<td>59.3 (24.7)</td>
<td>62.6 (24.7)</td>
</tr>
<tr>
<td>Mean education yrs. (SD)</td>
<td>13.1 (3.8)</td>
<td>11.2 (2.1)</td>
</tr>
<tr>
<td>Mean FEV1 % predicted (SD)</td>
<td>59.8 (21.1)</td>
<td>57.8 (25.8)</td>
</tr>
<tr>
<td>Current smokers, no. (%)</td>
<td>6 (24)</td>
<td>7 (26.9)</td>
</tr>
<tr>
<td>Co-morbid illnesses, mean (SD)</td>
<td>1.7 (1.1)</td>
<td>2.6 (1.9)</td>
</tr>
<tr>
<td>SCID diagnosis, no. (%)</td>
<td>10 (40)</td>
<td>13 (50)</td>
</tr>
</tbody>
</table>

CBT, cognitive behavioral therapy; FEV1, forced expiratory volume in one second; SCID, Structured Clinical Interview for the Diagnostic and Statistical Manual of Mental Disorders; SD, standard deviation.

Primary and secondary outcomes

Mean values for all outcome measures at baseline, post-treatment and follow-up are presented in Table 3.

Table 3  Outcome data at all assessment points and effect sizes with 95% confidence intervals.

<table>
<thead>
<tr>
<th>Measure</th>
<th>Time</th>
<th>Cognitive behavioral therapy (n = 25)</th>
<th>Control group (n = 26)</th>
<th>Between-group ES, Cohen’s d (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anxiety (BAI)</td>
<td>Pretreatment</td>
<td>17.5 (7.3)</td>
<td>17.5 (9.5)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Post-treatment</td>
<td>12.7 (6.8)**</td>
<td>18.7 (10.0)</td>
<td>0.1 to 0.7</td>
</tr>
<tr>
<td></td>
<td>Six-month follow-up</td>
<td>11.0 (6.1)*</td>
<td>18.7 (10.1)</td>
<td>0.1 (0.7)</td>
</tr>
<tr>
<td>Depression (BDI-II)</td>
<td>Pretreatment</td>
<td>20.7 (8.6)</td>
<td>20.5 (9.7)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Post-treatment</td>
<td>14.8 (7.8)**</td>
<td>19.5 (9.4)</td>
<td>0.1 to 0.7</td>
</tr>
<tr>
<td></td>
<td>Six-month follow-up</td>
<td>13.4 (5.9)</td>
<td>19.7 (8.9)</td>
<td>0.1 (0.5)</td>
</tr>
<tr>
<td>Health status (SGRQ)</td>
<td>Pretreatment</td>
<td>54.8 (13.1)</td>
<td>59.2 (12.8)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Post-treatment</td>
<td>50.9 (11.5)</td>
<td>58.6 (13.6)</td>
<td>0.1 (0.7)</td>
</tr>
<tr>
<td></td>
<td>Six-month follow-up</td>
<td>51.6 (11.3)</td>
<td>60.6 (13.2)</td>
<td>0.1 (0.6)</td>
</tr>
<tr>
<td>Sleep efficiency (%)</td>
<td>Pretreatment</td>
<td>86.0 (9.5)</td>
<td>89.0 (7.8)</td>
<td></td>
</tr>
<tr>
<td>(actigraphy)</td>
<td>Post-treatment</td>
<td>86.4 (7.4)</td>
<td>89.9 (8.2)</td>
<td>0.1 (0.6)</td>
</tr>
<tr>
<td></td>
<td>Six-month follow-up</td>
<td>89.3 (6.7)*</td>
<td>88.0 (7.2)</td>
<td>0.1 (0.5)</td>
</tr>
<tr>
<td>Sleep quality (PSQI)</td>
<td>Pretreatment</td>
<td>9.8 (4.4)</td>
<td>8.4 (4.2)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Post-treatment</td>
<td>9.5 (3.5)</td>
<td>9.0 (4.5)</td>
<td>0.1 (0.4)</td>
</tr>
<tr>
<td></td>
<td>Six-month follow-up</td>
<td>8.8 (3.6)</td>
<td>8.6 (3.9)</td>
<td>0.1 (0.4)</td>
</tr>
</tbody>
</table>

ES, Effect size; SD, standard deviation; BAI, Beck Anxiety Inventory; BDI-II, Beck Depression Inventory-II; SGRQ, St George’s Respiratory Questionnaire; PSQI, Pittsburgh Sleep Quality Index.

*P < 0.05, **P < 0.01; P value is based on paired-samples t tests to examine time effects within each treatment condition; from pretreatment to post-treatment and post-treatment to 6-month follow-up.

Fig. 2 shows the change over time in the BAI and the BDI-II scores in both groups, for women and men, as estimated by the mixed models with random effects. Significant group by time (F = 23.18; d.f. = 110, 365; P < 0.001) and group by nonlinear time (F = 16.40; d.f. = 110, 204; P < 0.001) interactions emerged for the BAI, implying that the groups differed in the rate and manner of change. The BAI scores in the CBT group were significantly improved from baseline to post-treatment (P < 0.001) and the improvement continued during the follow-up period (P = 0.041). The change in the control group was not significant. Female sex and younger age were associated with higher BAI scores at baseline. However, there were no differential interaction effects by sex or by age on the BAI scores.

For the BDI-II, a significant group by time interaction (F = 5.78; d.f. = 45, 559; P = 0.020) was present. The improvement from baseline to post-treatment was significant in the CBT group (P < 0.001), whereas in the control group there was no significant change. From post-treatment to follow-up, there was some further improvement in the CBT group but the change was not significant. A negative covariance between intercepts and slopes (rate of change) implied that individuals with lower baseline scores changed less compared to individuals with higher baseline scores. Sex and age had significant main effects for the BDI-II scores, female sex and younger age being associated with more depressive symptoms at
The three-way interaction age × group × time was significant ($F = 19.65; \text{d.f.} = 42, 735; P < 0.001$), which indicates that across the two groups, age had a differential effect on change over time. In the control group, younger patients tended to get worse over time and there was a larger variance in outcomes between younger and older patients in the control group compared to the CBT group.

In the CBT group, there was a significant improvement in sleep efficiency from post-treatment to follow-up ($t(22) = -2.65, P = 0.015$). No significant interaction effects were found for any of the secondary outcome measures.

**Satisfaction with treatment**

The mean score was 28.8 (SD 2.4; range 25–32), implying a high satisfaction with the CBT intervention.

**Discussion**

Our study investigated the effect of group CBT as a treatment for anxiety and depression in a COPD outpatient sample with a wide range of disease severity. In contrast to previous randomized trials examining the effect of CBT, the study sample comprised patients with clinically significant symptoms of anxiety and depression and had an equal gender distribution. The significant findings of our study are that (1) a CBT group intervention may provide relatively rapid symptom relief for COPD patients with clinically significant levels of anxiety and depression; (2) women have higher levels of anxiety and depression, and although their symptoms may be improved with CBT, the symptom level remains higher relative to men; (3) although younger age is associated with more anxiety and depressive symptoms, age does not have an effect on responsiveness to CBT; (4) sleep and health status do not seem to improve significantly as a consequence of reduction in mental health symptoms.

The symptoms of anxiety and depression significantly improved in the CBT group compared to the control group (between-group ES 1.4 and 0.9, respectively), and most change occurred during the 8-week period from baseline to posttest assessments. The relatively rapid improvement is in line with the results of Kunik et al. In the present study, the CBT intervention included more hours than the previous group trial, therefore allowing for somewhat more individualized attention, which may in turn have been beneficial for achieving larger treatment effects. The participants reported also high levels of satisfaction with the intervention.

In the present study, women had higher levels of both anxiety and depression at baseline, and their symptom

![Figure 2](image-url) Change in anxiety (BAI) and depressive symptoms (BDI-II) for men and women in both groups from baseline to follow-up, as estimated by the mixed models.
levels remained relatively high throughout the follow-up period compared to men. Women seem to be more susceptible to some of the systemic complications in COPD, such as muscle dysfunction or fat-free body mass depletion, of which depression may be a consequence. Women may also have a tendency to cope with the illness in unfavorable ways, which might elevate emotional distress. Special attention for women may be required, in order to identify and treat mental health distress, and to maintain the improvement.

Although psychological disturbance has sometimes been linked to higher age or more severe COPD, younger patients in our sample had higher levels of both anxiety and depression than older patients. Also other studies have found high prevalence of psychological distress even in patients with mild COPD. In our study, age had also differential effects in the two groups on change in depressive symptoms over time, and in the control group there was larger variance in outcomes between younger and older patients. However, both younger and older patients in the CBT group seemed to respond well to the treatment, which suggests that CBT may be a suitable treatment alternative for a wide age range of COPD patients.

We also examined the potential of CBT for beneficial effects on health status and sleep. Although sleep problems have been associated with anxiety and depression in COPD, previous trials have not included measures of sleep. In our study, objectively measured sleep efficiency in the CBT group was within normal range at baseline but showed some improvement at follow-up, whereas patients' own ratings indicated an unchanged experience of poor sleep at all measurement times. Rather than resulting from actual lack of sleep or insomnia, sleep complaints in COPD patients may reflect feelings of fatigue during the day as a consequence of the lung disease, and possibly also poor sleep quality and breathing disorders during sleep. Anxiety and depression can influence feelings of fatigue, but improvement in psychological symptoms may not be sufficient in itself to reduce sleep complaints significantly.

Limitations

Our study had certain limitations. Although there were statistically significant differences between the groups in change in anxiety and depression, as a consequence of the low sample size it is possible that other significant differences were not detected when they truly existed. With a larger sample size, age might have had an effect also on change in anxiety symptoms. The differences between the groups on sleep and health status were also not statistically significant. However, both sleep problems and health status are likely to be connected to the underlying respiratory illness, and thus may not respond to improvement in emotional symptoms.

Since many of the patients who were initially contacted declined to participate, the generalizability of the results may be limited. For those who responded positively to the PRIME-MD questions for anxiety and depression in the initial telephone interview but did not wish to participate (58%, 108 out of 186 patients), the most common reported reason was problems with transportation, followed by not believing that depressed or anxious feelings were a problem, being too busy, or feeling too sick or fatigued to participate. In the framework of the present trial, it was not possible to address the problems with transportation or provide more individualized attention. Thus, it is possible that the participants in this study may represent a patient population that is in relatively good health, has more resources available and/or is well suited for psychosocial interventions or group treatment. However, some proportion of the patients who declined to participate may also not have suffered from anxiety or depression to a significant degree and this may have reduced their motivation to participate.

Clinical implications and future research

Our results alongside with previous findings underline the need for a comprehensive treatment approach that addresses the complex web of medical illness, disability and psychological distress, by integrating mental health care into the overall medical regimen. The benefits of existing treatment alternatives, such as multidisciplinary pulmonary rehabilitation (PR), may be improved by targeting also more explicit psychological health aspects. Components of CBT may be integrated into PR programs relatively easily and be helpful for many patients, regardless of their psychological status. For example, psychoeducation and increased awareness of the role of psychological symptoms in COPD are likely to be useful knowledge for all patients. Breathing retraining is a common component in PR programs, and patients can benefit from learning how to use breathing techniques and exercises to relax and manage anxiety. Similarly, exercise and behavioral activation are often part of PR, and their role in improving psychological health and reducing anxiety-related avoidance and depressive patterns can be emphasized. The potential benefits of integrating mental health care in existing treatment alternatives, such as PR, should be addressed in future studies. Also, more studies focusing on the impact of sleep and its connections to COPD and psychological symptoms are needed.

For patients with more severe disability and/or psychological distress, CBT in group format may not be appropriate, and there seems to be a need for a more individualized approach to overcome the barriers for care. Due to a shortage of CBT practitioners and resources, individual treatment may be difficult to provide, and computerized and telephone-delivered CBT have been suggested as alternatives. Problem-solving skills-training to address behavioral limitations as well as access to a care manager who works with the patient to identify and overcome the specific barriers have been suggested as ways to improve adherence to treatment. Future studies should compare individually delivered CBT to group CBT, as well as examining the effectiveness of group CBT delivered by non-mental health professionals, such as nurses or other health personnel.

For future trials of CBT for COPD patients, there is also a need to address how best to provide support and assurance to potential participants, in order to facilitate the participation and ensure an adequate participation rate.
Strategies such as arranging transportation, flexibility and attention to and flexibility in terms of assessment and treatment locations and times (e.g. availability of public transportation and parking, running groups during the day and after work hours), and assurance regarding fears or concerns about participation may be employed.

Conflict of interest statement

The authors have no conflicts of interest.

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