

Effects of cognitive behavioral therapy on anxiety and depression in patients with chronic obstructive pulmonary disease:A Meta-analysis and Systematic Review

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Abstract

Symptoms such as depression and anxiety are common psychiatric symptoms in patients with chronic obstructive pulmonary disease (COPD). Cognitive-behavioral therapy (CBT) is still controversial in the treatment of anxiety and depression in patients with COPD. We conducted a meta-analysis and systematic review to evaluate the effect of CBT on anxiety and depression in patients with COPD, with a view to providing some guidance for clinical application. Materials and Methods Computer search Web of Science, EMBASE, PubMed, Cochrane Library, search time limit from the establishment of the library to August 2019. Collect the randomized controlled trial (RCT) for this topic. Two investigators independently screened the literature according to inclusion and exclusion criteria, extracted the data, and assessed the risk of bias in the included studies. Meta analysis using RevMan5.3 software. Results A total of 10 studies were included in a total of 1278 patients. Meta-analysis shows that cognitive behavioral therapy can improve depression and anxiety in patients with COPD. Subgroup analysis showed that intervention time ≥ 8 weeks had significant differences in improving anxiety, while intervention time < 8 weeks had significant differences in improving depression. Conclusion Cognitive-behavioral therapy can improve depression in COPD patients in a short period of time, and it takes longer to improve anxiety. Therefore, clinical practice can choose the appropriate intervention time according to the patient's psychological condition.

Background

Chronic Obstructive Pulmonary Disease (COPD) is a chronic disease of the respiratory system, which can reduce lung function and labor endurance year by year. In severe cases, life cannot take care of itself [1, 2]. In addition to causing organic damage, COPD can seriously affect the quality of life and prognosis of patients, and even lead to a variety of psychological disorders such as anxiety, depression, and fear [3]. People with COPD are 2 to 3 times more likely to have mental health problems than the general population [4, 5]. The prevalence of anxiety and depression in patients with COPD was 40% and 36%, respectively. The data show that the prevalence of COPD combined with depression in the acute exacerbation period is as high as 86%, and anxiety is as high as 55% in hospitalized patients [6]. Therefore, COPD combined with mental illness is also considered to be a "grey disease, blue mood". The study found that patients with COPD often fall into a vicious circle of dyspnea, decreased exercise capacity, inconvenient movement and social isolation. Anxiety and depression are the cycle. important part [7]. COPD patients with anxiety and depression often lack self-confidence or self-efficacy, leading to poor disease-related coping skills and poor self-care ability [8]. This indicates poor compliance with COPD medications with anxiety and depression, decreased exercise capacity and health-related quality of life, loss of labor, increased consumption of health resources, functional disability, and increased risk of acute exacerbations and deaths [9, 10]. Therefore, it is extremely important to identify patients' bad emotions early and manage them effectively [6]. However, the management of COPD psychological problems is still very poor [11]. Cognitive Behaviour Therapy (CBT) is a general term for cognitive treatment and behavioral techniques to change the cognitive and behavioral psychology of patients. It is an effective treatment for anxiety, depressive symptoms and physical health. Methods of dysfunction, there is evidence that it is effective for patients with COPD combined with anxiety and depression [12, 13]. Relevant evidence suggests that CBT is as effective as medication and may be the first choice for patients with mental health problems [14, 15]. However, the anxiety and depression of CBT intervention in patients with COPD has not been well confirmed. Taking into account the effects of these inconsistencies, we conducted a systematic review and meta-analysis of the subject's RCT to assess the effectiveness of CBT in the intervention of anxiety and depression in patients with COPD.

Materials And Methods

This review was conducted in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses guidelines (PRISMA) [16] and the recommendations of the Cochrane Collaboration [17].

Literature screening and identification of relevant studies

Computer search Web of Science, EMBASE, PubMed, Cochrane Library, search time limit from the establishment of the library to August 2019. The search term is Cognitive Behavioral Therapy, Chronic Obstructive Pulmonary Disease. The review of the retrieved articles by reading the titles and abstracts. Then, the full text of the likelihood relevant studies was examined for further. The following studies in the meta-analysis were firstly published in the primary literature with no reproduction in other studies.

Inclusion criteria

(1) Population: patients with COPD, all patients were treated with standard COPD medications, including bronchodilators, and oral corticosteroids and/or oxygenation when appropriate; (2) Intervention: cognitive behavioral therapy; (3) Comparison: usual care or health education intervention or blank control; (4) Study design: RCT, Language limited to English. (5) Outcome: anxiety and depression scale.

Exclusion criteria

(1) Incomplete data or misrepresentation of data reports; (2) repeated publication of documents; (3) case reports, reviews, etc.; (4) inability to obtain original documents.

Quality assessment and data extraction

Two researchers (Xuemei Zhang and Changchun Yi) independently screened the literature and extracted the data. In the event of a disagreement, the third investigator (Wuguo Tian) was asked to judge. The extracted content includes author, publication date, country, sample size, age, type of CBT, content and duration, type of anxiety and depression scale, measurement data, intervention time, intervention details, etc.

The Cochrane Systematic Review Manual 5.1.0 recommended bias risk assessment method for risk assessment for inclusion in RCT. The main items are: 1) randomization plan; 2) group concealment; 3) blind method; 4) incomplete data reporting; 5) selective outcome report; 6) other sources of bias. Each item is evaluated as "high", "low" and "unclear".

Data synthesis and statistical analysis

RevMan5.3 (The Cochrane Collaboration, Software Update, Oxford, UK) software for meta-analysis. Statistical results of continuous data were expressed as standardized mean difference (SMD). The heterogeneity between the included studies was analyzed by the χ^2 test (test level is $\alpha=0.1$), and I^2 was used to quantitatively determine the size of heterogeneity. When $P < 0.1$ and / or $I^2 > 50\%$, the random effects model is used for the combined analysis, and conversely, the fixed effect model is used for the combined analysis. Sensitivity analysis of heterogeneity sources. Subgroup analysis was performed based on the time of intervention. Draw a funnel plot to assess possible publication bias and small sample bias, including Egger's method and Begg's method.

Results

A detailed overview of the study flow is presented in Figure 1. Ten studies [12, 13, 18-25] comprising 1278 participants were included in the review. Characteristics of included studies are summarized in Tables 1 and 2. Part of the studies were deemed to be of moderate risk of bias (Figure 2-3) because of inadequate blinding of participants and intervenors (an inherent challenge in CBT studies), allocation concealment and random sequence generation. The most commonly reported outcome measure for assessing anxiety and depression symptoms was the HADS, BAI and BDI. A detailed summary of outcome data is provided in Table 3.

Symptoms of Anxiety

1 item [12] The study did not report anxiety scores after intervention, the rest [13, 18-25] The results of the pooled study were SMD = -0.28, 95% CI [-0.51, 0.05], $P = 0.02$, and the difference was statistically significant (Figure 4). Subgroup analysis revealed no significant difference in the magnitude of difference between shorter and longer programs ($P = 0.53$). However, the effect in longer programs was statistically significant, while that of shorter programs was not data for this outcome were

statistically heterogeneous ($I^2 = 70\%$). Exploratory sensitivity analysis revealed the study of Lamers et al [25]. To be the likely source of this heterogeneity, with its exclusion from meta-analysis resulting in a revised $I^2 = 34\%$. The reason may be: in this study, the number of interventions per patient with CBT intervention resulted in different of 2 items [12, 20].

Symptoms of Depression

The study did not report anxiety scores after intervention, the rest [13, 18, 19, 21-25]. The results of the combined analysis were SMD=-0.54, 95% CI [-1.06,-0.02], $P=0.04$, and the difference was statistically significant (Fig. 5). Subgroup analysis revealed no significant difference in the magnitude of difference between shorter and longer programs ($P=0.55$). However, the effect in shorter programs was statistically significant, while that of longer programs was not. Data for this outcome were statistically heterogeneous ($I^2 = 92\%$). Exploratory sensitivity analysis revealed the study of Lamers et al [25]. To be the likely source of this heterogeneity, with its exclusion from meta-analysis resulting in a revised $I^2 = 55\%$. The reason may be: in this study, the number of interventions per patient with CBT intervention resulted in different of.

Publication bias

Publication bias assessment was performed using Egger's method and Begg's method. (Figure) suggests that there are no publication bias, anxiety (Egger's, $P=0.532$; Begg's, $P=0.823$), depression (Egger's, $P=0.322$; Begg's, $P=0.960$). Figure 6~7.

Discussion

The incidence of anxiety, depression and panic in patients with COPD is significantly higher than that of normal people, which can increase the mortality rate of patients, reduce the quality of life and prognosis of patients, and increase the risk of acute exacerbation [6, 26-28]. The efficacy of psychopharmacological treatment in COPD is limited and patients are often reluctant to take additional medication [29, 30]. Psychosocial intervention has been suggested as an alternative or complementary treatment strategy for reducing psychological distress and physical impairment [31, 32]. National Institute for Health and Care

Excellence(NICE) [33] CBT is recommended as a treatment option for mental health problems in patients with chronic diseases and as an adjunct to other treatments. However, the effect of CBT intervention on anxiety and depression in patients with COPD is controversial. Our meta-analysis shows that CBT can effectively improve anxiety and depression in COPD patients. This with Smith et al [34] The results of the study are consistent. We conducted a subgroup analysis of the duration of the intervention and found that CBT short-term (<8weeks) intervention had no significant effect on improving patient anxiety, and depression showed significant differences. At the same time, Howard^[21]A 5-week CBT intervention in patients with COPD improved the patient's depression in the short term, and there was no significant difference in anxiety.Farver-Vestergaard [35]. The meta-analysis showed that CBT seems to be effective in improving the psychological status of patients with COPD, but the study was a combined analysis of Psychological (anxiety + depression) without a separate analysis of anxiety or depression, providing limited evidence. Our meta-analysis shows that CBT not only improves anxiety and depression in patients with COPD, but depression can be improved in a short period of time.

Coventry [36] Inclusion of 3 RCT and 1 non-RCT for meta-analysis, when CBT is combined with exercise and education, can reduce anxiety and depression in patients with COPD; but the evidence provided is valid. Small medium-quality RCT [18].The results show that CBT combined with exercise training and health education, anxiety and depression have significant therapeutic effects. Our meta-analytic inclusion of RCT, cbt interventions in a variety of forms, can be tailored to the actual situation of patients to develop a personalized cognitive behavioral intervention program. Traditional CBT has a long duration, operation

Frequent, high economic costs [37, 38] and there is not enough evidence to show which specific form of CBT treatment is best. Currently, telephone-administered CBT intervention, Mindfulness-based CBT and Nurse-led CBT, etc. [13, 19, 20]. The new CBT intervention model came into being, and different new, cost-effective CBTs should be further developed in the future.

Limitations

Our meta-analysis has certain limitations. First of all, our analysis is based on 10 rct, with 4 items [12, 18, 22, 23].The RCT sample size is small. Compared with the larger sample, it is more likely to overestimate the treatment effect in the smaller experiment. Our study is heterogeneous, although the sensitivity is found by using the culling method to find the source of heterogeneity. , remove Lamers et al [25] After the study, the heterogeneity has decreased, but there is still some heterogeneity; the generation of the randomized scheme of RCT, the allocation of concealment, the implementation of blind method, etc. may have certain methodological heterogeneity, different cbt The frequency of treatment, the degree of anxiety and depressive symptoms before intervention, age, different outcome assessment tools, and fev1% lead to possible risk of bias.

Conclusion

CBT can improve the depression of patients with COPD in a short period of time, and it takes longer to improve anxiety.

Abbreviations

COPD: Chronic obstructive pulmonary disease; CBT: Cognitive-behavioral therapy; RCT: Randomized controlled trial; SMD: standardized mean difference; NICE: National Institute for Health and Care Excellence.

Declarations

Availability of data and materials

The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

Authors' contributions

ZXM and YXM contributed to the conception and design of the study, or acquisition of data, or analysis and interpretation of data; ZXM and YCC drafted the article or revising it critically for important intellectual content; TWG and LDB gave the final approval of the version to be submitted.

Ethics approval and consent to participate

This study did not involve human subjects, so informed consent was not required. In addition, no approval was required from an institutional review board.

Consent for publication

Not applicable.

Competing interests

The authors declare that they have no competing interests

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Tables

Table 1. Baseline Characteristics of Included Studies

Study	Year	State	No. of Patients (Start)	No. of Patients (End)	Cognitive therapy group		Control group		Anxiety Measure	Depression Measure
					Age (years)	FEV ₁ (% Predicted)	Age (years)	FEV ₁ (% Predicted)		
Kunik	2008	USA	238	238	66.1±10.1	45.3±16.8	66.5±10.4	46.8±17.5	BAI	BDI
Lamers	2010	Netherlands	187	187	70.5±6.5	NA	71.5±7.1	NA	SCL	BDI
Hynninen	2010	Norway	51	51	59.3±7.6	59.8±21.1	62.6±9.9	57.8±25.8	BAI	BDI
Howard	2014	UK	222	222	71.2±10.4	55.9±15.7	73.2±11.4	59.6±15.9	HADS	HADS
Livermore	2015	Australia	31	31	72 ± 6	NA	72 ± 6	NA	HADS	HADS
Doyle	2017	Denmark	110	110	68.5±9.4	NA	67.0±9.1	NA	BAI	PHQ-9
Farver-Vestergaard	2018	Denmark	82	67	66.67±8.03	37.50±12.09	67.67±7.54	37.94±11.62	HADS	HADS
Heslop-Marshall	2018	UK	279	236	66±10.2	NA	67±9.6	NA	HADS	HADS
de Godoy	2003	Brazil	30	30	62.1±14.9	NA	58.8±11.8	NA	BAI	BDI
Kunik	2001	USA	48	48	≥60	NA	≥60	NA	BAI	GDS

Abbreviations: NA, data Not Available; BAI, beck anxiety Inventory; BDI, beck depression rating scale; SCL, anxiety subscale of the symptom checklist-90; HADS, hospital anxiety and depression scale; PHQ-9, patient health questionnaire-9; GDS, geriatric depression scale.

Table 2. Description of Interventions

Study	Year	Cognitive therapy group		Control group		Duration
		Methods	Frequency	Methods	Frequency	
Kunik	2008	group CBT	eight 1-h sessions	Health education	45-minute lectures/15-minute discussions	8,w
Lamers	2010	Individual CBT	1 to10 times at 12 weeks, 60-min sessions	usual care	NA	12,w
Hynninen	2010	group CBT	120-min sessions, 3 times/week	usual care	2 times /week	4,w
Howard	2014	group CBT	60-min sessions,1 times/day	usual care	NA	5,w
Livermore	2015	Individual CBT	60-min sessions, 4 times/week	usual care	NA	8,w
Doyle	2017	telephone-administered CBT intervention	8 times/week	usual care	8 times/week	8,w
Farver-Vestergaard	2018	Mindfulness-based CBT	105-min sessions, 8 times/week	blank control	NA	8,w
Heslop-Marshall	2018	Nurse-led CBT	30-min sessions, once every 4 to 6 weeks	usual care	NA	3,mo
de Godoy	2003	group CBT	1 times/week	blank control	NA	12,w
Kunik	2001	group CBT	2 hour session	Health education	2 hour education session	2,h

Abbreviations:NA,data Not Available;w,week;mo,month;h,hour.

Table 3. Outcome Data Summary

Outcome	Instrument	Study	Year	Cognitive therapy group			Control group				
				No. of Patients	Baseline	No. of Patients	Post-treatment	No. of Patients	Baseline	No. of Patients	Post-treatment
Anxiety	BAI	Kunik	2008	118	22.67±14.22	118	15.89±14.87	120	22.67±13.84	120	17.46±1
	SCL	Lamers	2010	96	20.6±6.2	61	20.76±0.73	91	20.4±7.3	66	21.43±0
	BAI	Hynninen	2010	25	17.5±7.3	25	12.7±6.8	26	17.5±9.5	26	18.7±
	HADS	Howard	2014	112	8.4±4.5	112	6.8±3.7	110	7.8±4.2	110	6.8±3
	HADS	Livermore	2015	18	5.3 ± 3.0	18	NA	13	5.8 ± 2.7	14	NA
	BAI	Doyle	2017	54	20.0±11.2	54	18.4 ±11.8	56	20.9±10.4	56	17.2 ±
	HADS	Farver-Vestergaard	2018	37	7.72±4.72	30	6.80±3.86	45	7.57±4.12	37	7.92±4
	HADS	Heslop-Marshall	2018	130	12.3±3.19	115	8.8±4.49	140	12.0±2.94	121	10.0±4
	BAI	de Godoy	2003	14	12.9±6.9	14	4.2±3.8	16	10.9±9.8	16	9.2±8
	BAI	Kunik	2001	21	15.3±9.2	21	12.6±8.7	27	10±6.8	27	11.9±7
Depression	BDI	Kunik	2008	118	23.44±12.49	118	14.19 ±13.69	120	21.12±12.09	120	14.54±1
	BDI	Lamers	2010	96	17.1±6.5	64	15.45±0.8	91	18.3±7.2	68	17.31±0
	BDI	Hynninen	2010	25	20.7 ±8.6	25	14.8 ±7.8	26	20.5 ±9.7	26	19.5 ±9
	HADS	Howard	2014	112	8.8±3.7	112	6.0±3.5	110	8.6±3.5	110	7.8±3
	HADS	Livermore	2015	18	3.8 ± 2.0	18	NA	13	4.6 ± 2.7	13	NA
	PHQ-9	Doyle	2017	54	12.6 ±6	54	9.6 ±6	56	11.2 ±6.8	56	9.5 ±7
	HADS	Farver-Vestergaard	2018	37	6.32±3.67	30	5.33±3.77	45	5.90±4.10	37	6.26±4
	HADS	Heslop-Marshall	2018	130	NA	NA	NA	140	NA	NA	NA
	BDI	de Godoy	2003	14	13.7±8.9	14	5±4.5	16	14.9±11.5	16	12.3±1
	GDS	Kunik	2001	21	11.5±7.3	21	9.4±6.5	27	7.7±5.4	27	8.8±7

Abbreviations:NA,data Not Available;BAI,beck anxiety Inventory;BDI,beck depression rating scale;SCL,anxiety subscale of the symptom checkli 90;HADS,hospital anxiety and depression scale;PHQ-9 ,patient health questionnaire-9;GDS,geriatric depression scale.

Figures

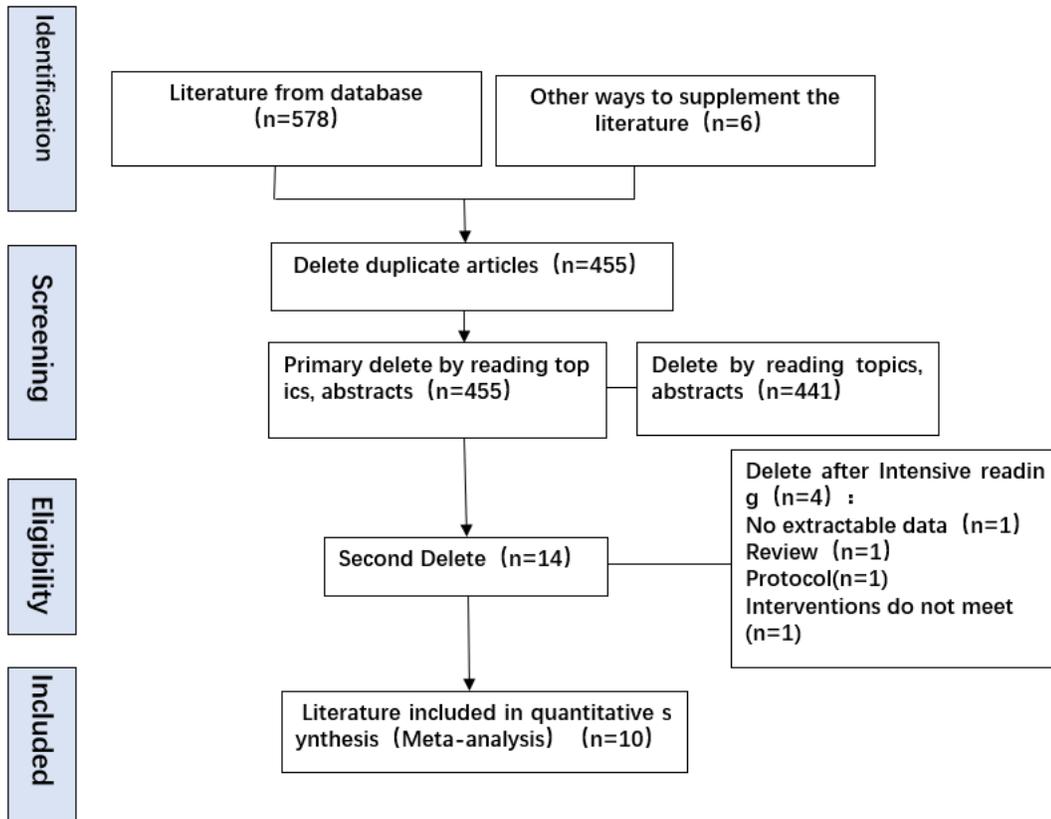


Figure 1

Flowchart of selection of studies for inclusion in meta-analysis.

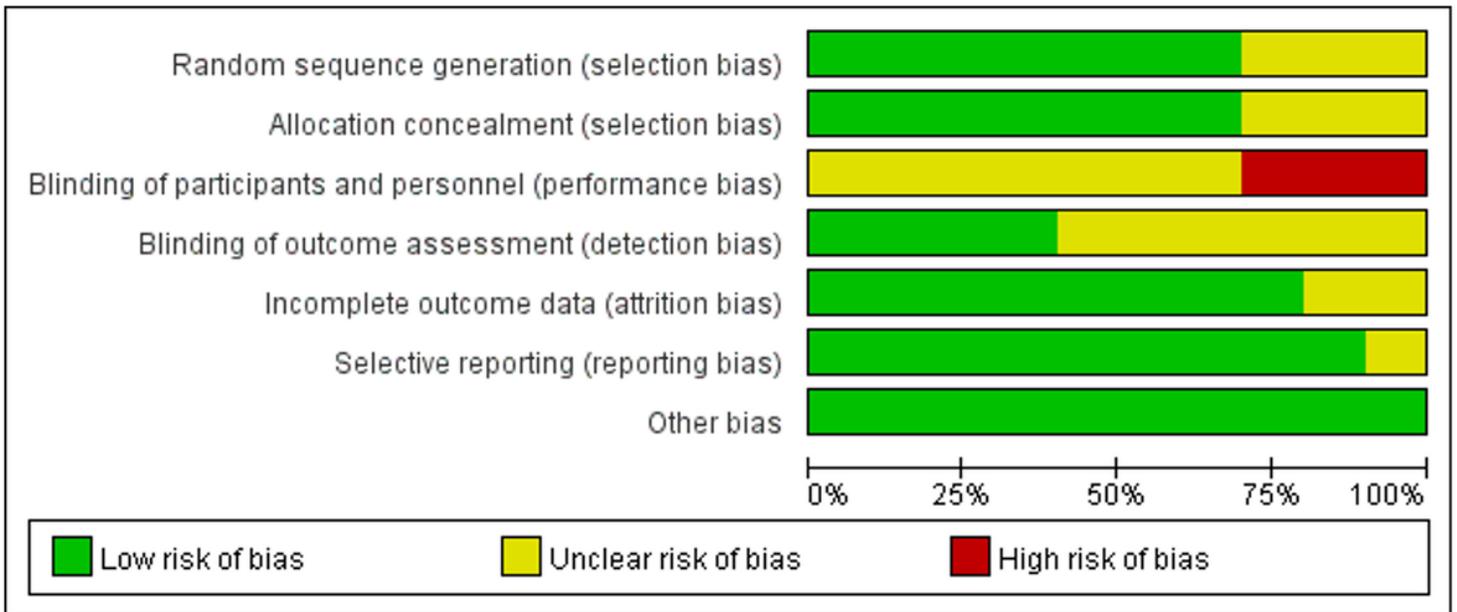


Figure 2

Risk of bias graph

Study	Random sequence generation (selection bias)	Allocation concealment (selection bias)	Blinding of participants and personnel (performance bias)	Blinding of outcome assessment (detection bias)	Incomplete outcome data (attrition bias)	Selective reporting (reporting bias)	Other bias
de Godoy 2003	?	?	?	?	+	?	+
Doyle 2017	+	+	?	+	+	+	+
Farner-Vestergaard 2018	+	+	-	?	?	+	+
Heslop-Marshall 2018	+	+	?	?	?	+	+
Howard 2014	+	+	?	+	+	+	+
Hynninen 2010	?	+	-	?	+	+	+
Kunik 2001	+	?	?	?	+	+	+
Kunik 2008	+	+	-	+	+	+	+
Lamers 2010	+	+	?	+	+	+	+
Livermore 2015	?	?	?	?	+	+	+

Figure 3

Risk of bias summary

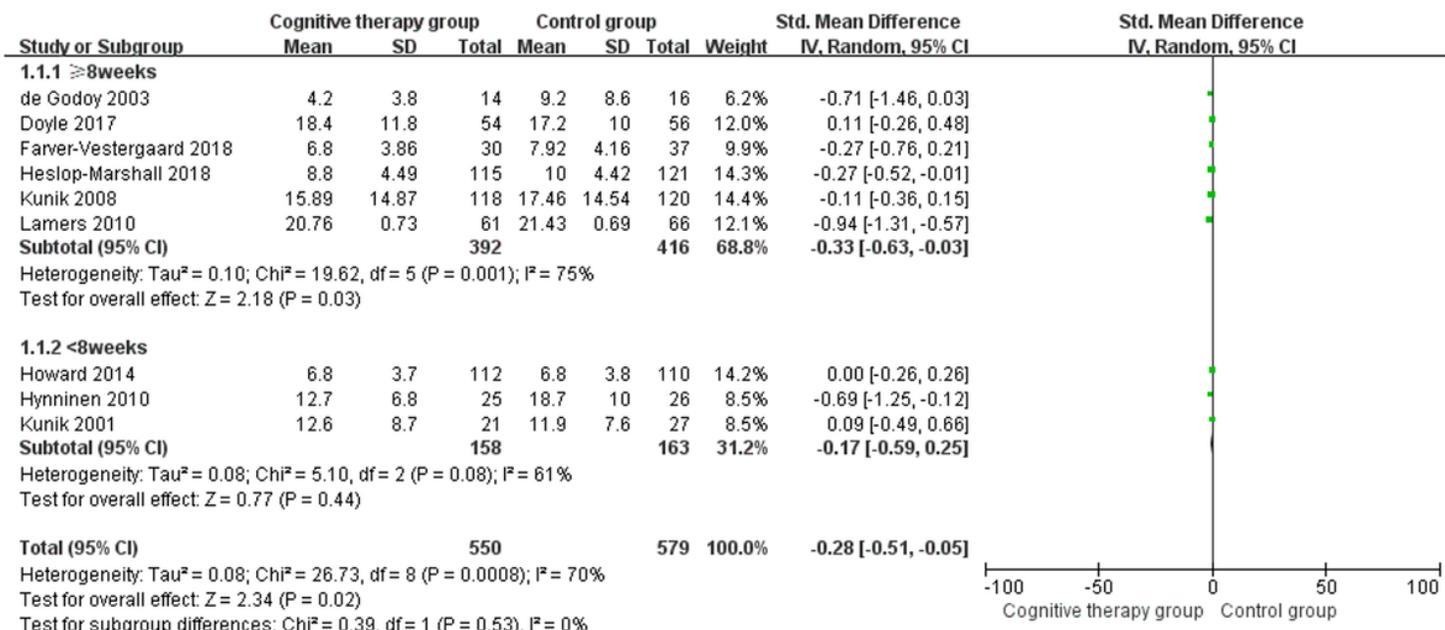


Figure 4

Pooled effect of cognitive therapy group compared with control group on symptoms of anxiety in people with COPD.

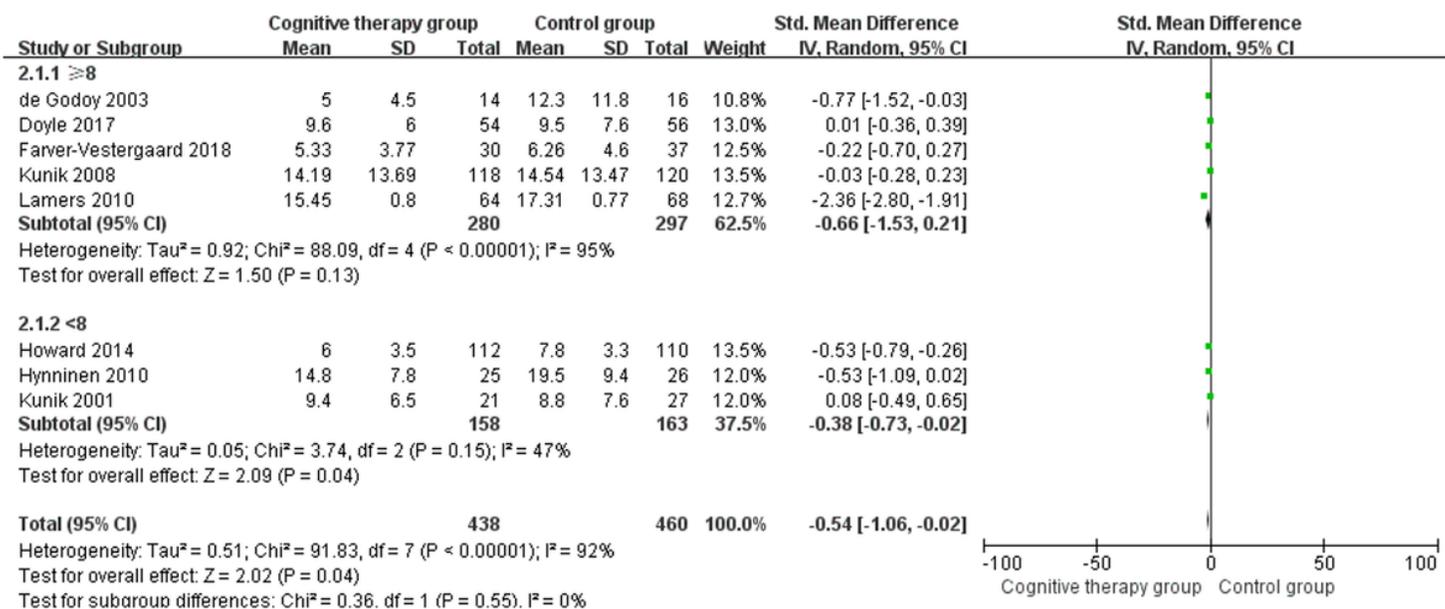


Figure 5

Pooled effect of cognitive therapy group compared with control group on symptoms of depression in people with COPD.

Begg's funnel plot with pseudo 95% confidence limits

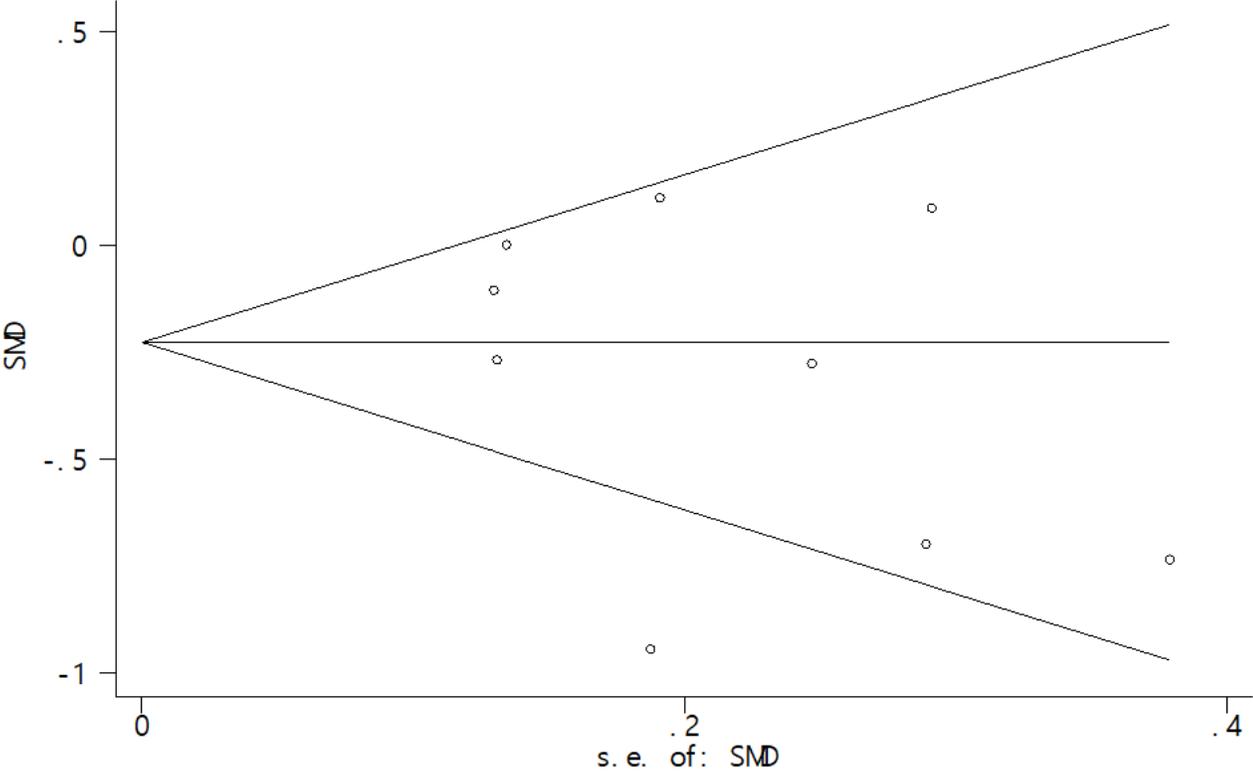


Figure 6

Begg's funnel plot of cognitive therapy group compared with control group on symptoms of anxiety in people with COPD

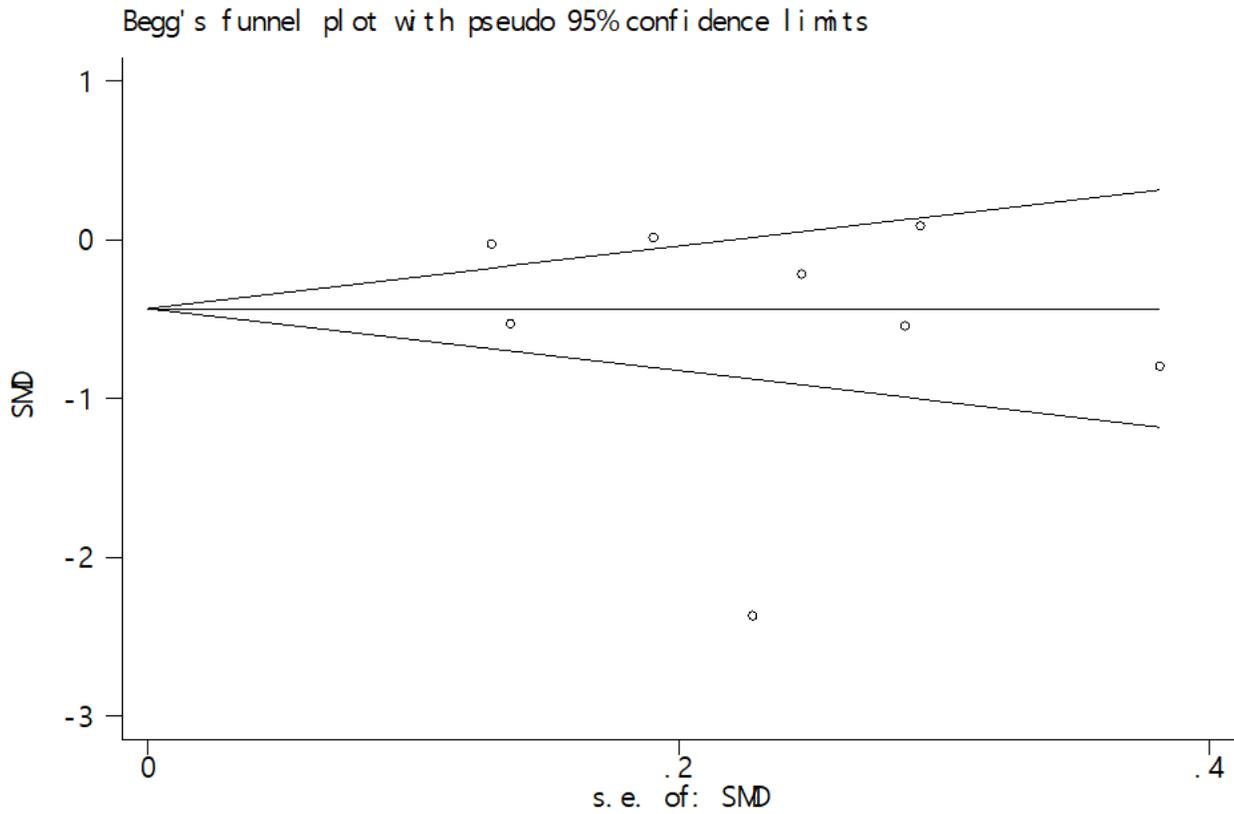


Figure 7

Begg's funnel plot of cognitive therapy group compared with control group on symptoms of depression in people with COPD

Supplementary Files

This is a list of supplementary files associated with this preprint. Click to download.

- [PRISMAchecklist.pdf](#)