
Article:
Melton, S., Wieland, S., Bastounis, A. orcid.org/0000-0001-5861-9373 et al. (1 more author) (2025) Cognitive behavioural therapy for seasonal affective disorder: a systematic review and meta-analysis. The Cognitive Behaviour Therapist, 18. e41. ISSN: 1754-470X

https://doi.org/10.1017/s1754470x2510024x

The Cognitive Behaviour Therapist (2025), vol. 18, e41, page 1 of 25
doi:10.1017/S1754470X2510024X

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REVIEW PAPER

Cognitive behavioural therapy for seasonal affective disorder: a systematic review and meta-analysis

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(Received 24 January 2024; revised 22 April 2025; accepted 23 April 2025)

Abstract

Seasonal affective disorder (SAD) is a seasonal pattern modifier to recurrent major depressive disorder. Despite cognitive behavioural therapy (CBT) having a strong evidence base of efficacy for depression, little research exists assessing CBT for SAD, especially in the acute phase of depression during winter months. The aim of this study was to determine the efficacy of CBT for acute SAD in adults. Eligible randomised controlled trials (RCTs) testing the efficacy of CBT on depression symptoms in adults with SAD were included. Depression outcomes were assessed using the Revised Cochrane Risk-of-Bias Tool for Randomized Trials. A meta-analysis using a fixed effects model was conducted to assess the effects of CBT on depression symptoms compared with light therapy (LT) at post-intervention and 1–2 years follow-up. Narrative synthesis was used for recurrence and remission rates. Three RCTs and two follow-up papers met the inclusion criteria. All RCTs measured efficacy of group-CBT for acute SAD and compared to LT. There was substantial variation in risk of bias for all outcomes across the trials. Three RCTs ($n = 220$ participants) were included in the meta-analysis that found CBT was effective in reducing depressive symptoms compared with LT at 1–2-year follow-up post-intervention [MD = –4.5, 95% confidence interval (CI) (–6.88, –2.12), $p<0.05$]. There was no difference between CBT and LT at immediate post-intervention. Group-CBT appears equivalent to LT in treating acute SAD in adults at post-intervention, but appears more effective at long-term follow-up. The findings should be taken with caution due to few included studies and variation in risk of bias across studies.

Key learning aims

(1) Previous research into CBT and seasonal affective disorder has focused primarily on delivery of CBT during the non-acute phase of SAD, typically in non-winter months.
(2) There are limited high quality randomised controlled trials testing the efficacy of CBT for seasonal affective disorder in the acute phase during winter months.
(3) It appears that group-CBT for SAD is superior to LT at 1–2 years follow-up.

Keywords: CBT; meta-analysis; seasonal affective disorder; seasonal depression; systematic literature review; winter depression

Introduction

Seasonal affective disorder (SAD) is considered a 'seasonal pattern' modifier to recurrent major depressive disorder (MDD) (American Psychiatric Association, 2013). MDD typically includes depressed mood and loss of interest or pleasure in doing things for at least two weeks with some/all of the following symptoms: significant appetite or weight change, insomnia/hypersomnia, moving faster/slower, fatigue, feelings of worthlessness, poor concentration and suicidal ideation (American Psychiatric Association, 2013). SAD is often associated with atypical depression symptoms such as fatigue, hypersomnia, carbohydrate craving and weight gain (Kasper *et al.*, 1989; Rosenthal *et al.*, 1984; Sohn and Lam, 2005). During spring/summer months, individuals with SAD are frequently hypomanic, having greater than average motivation and social interaction (Davis and Levitan, 2005). To meet DSM-V and ICD-11 (World Health Organization, 2018) criteria for SAD, individuals must have a consistent seasonal relationship between the onset of depression (typically autumn/winter) and remission of depression (usually in spring) for at least two years with no relapse in between. This 'seasonal pattern' must markedly outnumber previous non-seasonal depressive episodes.

SAD reportedly affects approximately 2 million people in the UK and 12 million within northern Europe (NHS Inform, 2023). North American studies suggest that SAD prevalence rises with increasing distance from the equator (Rosen *et al.*, 1990). In Europe prevalence according to latitude was not significant, proposing that factors such as climate, genetics and societal context may impact prevalence (Mersch *et al.*, 1999).

Biological aetiological explanations for SAD suggest that reduced exposure to light during winter and increased light during summer is a risk factor for SAD due to changes in circadian rhythm which affect the regulation of neurotransmitters and hormones (McClung, 2007). Biological treatments are available for SAD including light therapy (LT) and pharmacology (including anti-depressants/melatonin).

LT is bright-white full-spectrum visible light applied using a lightbox or light-visor (Pail *et al.*, 2011) at a dosage higher than standard artificial home lighting, of approximately 5000 lux per day (Levitan, 2005). LT is thought to resynchronise the circadian rhythm and increase serotonin levels, helping to regulate mood (Maruani and Geoffroy, 2019). Importantly, LT can lead to mild side-effects such as nausea, diarrhoea, headaches, and eye irritation (Maruani and Geoffroy, 2019). Approximately one-third of LT patients have problems with adherence (Michalak *et al.*, 2007), possibly due to dosage requiring at least 30 minutes daily, usually immediately after awakening (Lam *et al.*, 2006). A meta-analysis indicated that LT is superior to placebo for SAD but suggested a need for higher quality research with larger sample sizes (Pjrek *et al.*, 2020). As such, the NICE guidelines recommend advising those with a preference for LT that the evidence for the efficacy of LT for SAD is uncertain (National Institute of Health and Care Excellence, 2022).

Pharmacology is used to target neurotransmitters (typically serotonin) which play a role in SAD (Neumeister *et al.*, 2001), not unlike non-seasonal depression. A review found limited efficacy for only one second-generation anti-depressant for acute SAD (fluoxetine) and showed no significant difference between efficacy and safety of fluoxetine or LT (Nussbaumer-Streit *et al.*, 2021). In a qualitative study assessing patients' perspectives, numerous patients voiced negative attitudes towards anti-depressants, expressing desire to change their lifestyle to impact the cause of SAD rather than addressing only biological symptoms (Nussbaumer-Streit *et al.*, 2018). Meta-analysis supported these findings suggesting that approximately 75% of patients generally preferred psychological treatment relative to medication (McHugh *et al.*, 2013). Similar to LT, it is believed approximately one-third of patients treated with anti-depressants for SAD have problems with adherence (Michalak *et al.*, 2007) and poor adherence to anti-depressants is a risk factor for depression relapse (Gopinath *et al.*, 2007).

https://doi.org/10.1017/S1754470X2510024X Published online by Cambridge University Press

MDD has high relapse rates, and meta-analytic findings indicate that prior depressive episodes predict relapse/recurrence (Prieto-Vila *et al.*, 2021; Wojnarowski *et al.*, 2019). Importantly, there is evidence pointing to dysfunctional cognitions as risk factors for depression onset/recurrence (Burcusa and Iacono, 2007), which are not directly targeted with other SAD treatments like LT or pharmacology.

Cognitive behavioural therapy (CBT) is an established therapy for depression, largely derived from cognitive therapy (Beck, 1967; Beck, 1976; Beck *et al.*, 1979), with aspects developed from behavioural therapy (Marks, 1987). CBT focuses on breaking vicious cycles of negative emotions, physical sensations, cognitions, and behaviours by challenging maladaptive beliefs and developing healthier coping strategies (Greenberger and Padesky, 1995). CBT is the most extensively researched and highly recommended psychological therapy for depression (National Institute of Health and Care Excellence, 2022). There is a wealth of evidence to support CBT being efficacious in treating depression (Zhang *et al.*, 2018) and in reducing the risk of relapse for depression (Cuijpers *et al.*, 2023). CBT is considered as efficacious as anti-depressants for depression in the short term, but superior in the longer term (Cuijpers *et al.*, 2023). Within these MDD meta-analyses, depression with seasonal patterns was not reported. It is therefore currently unknown whether the efficacy for CBT differs between those with and without depression with a seasonal pattern.

As opposed to LT, which is believed to target biological vulnerabilities such as shifts in the circadian rhythm and lower available serotonin in the synaptic cleft (Campbell *et al.*, 2017), CBT targets psychological vulnerabilities such as rumination, dysfunctional thoughts and reduced activity (Rohan *et al.*, 2020). A study found that changing maladaptive seasonal beliefs was a strong mediator of acute depression outcomes in CBT for SAD (Rohan *et al.*, 2020). SAD patients who scored higher levels of dysfunctional attitudes and negative automatic thoughts, experienced less severe depression the following winter if treated with CBT rather than LT (Sitnikov *et al.*, 2013). Furthermore, if treated with CBT, participants' improvement in their dysfunctional attitudes and negative automatic thoughts was greater than those treated with LT (Evans *et al.*, 2013). This suggests CBT may offer longer term remission, especially for patients with rigid beliefs or whose SAD continues to relapse yearly after biological treatment.

Rationale and aims

Studies indicate that SAD symptoms return the following year in up to two-thirds of patients (Westrin and Lam, 2007) and SAD is likely to recur yearly without effective intervention (Freed *et al.*, 2007). CBT has been found to be more time-efficient and cost-effective than LT and their combination for SAD (Freed, 2006; Ross, 2017) and treatment choice should be based on cost-effectiveness/cost-benefit of interventions, rather than just effectiveness (Yates, 2020).

The NHS recommend CBT as a treatment for SAD (NHS, 2022) but the evidence pointing to efficacy is unclear. In the NICE guidelines (National Institute of Health and Care Excellence, 2009), the routine adaptation of treatment strategies for SAD is not recommended due to the lack of evidence supporting this and no updates were made for SAD in NICE guidelines (National Institute of Health and Care Excellence, 2022). This lack of evidence and recommendation for acute SAD treatment warrants exploration.

There are existing reviews examining the prevention of SAD using LT (Nussbaumer-Streit *et al.*, 2019a), second-generation anti-depressants (Gartlehner *et al.*, 2019) and agomelatine and/or melatonin (Nussbaumer-Streit *et al.*, 2019b). A noteworthy review assessed efficacy and safety of psychological therapies, including CBT, in preventing SAD (Forneris *et al.*, 2019) but only included one low quality randomised controlled trial (RCT) which compared preventive use of mindfulness-based cognitive therapy (MBCT) with waitlist control and found no significant difference between groups.

Reviews have assessed the efficacy of LT (Pjrek *et al.*, 2020), second-generation anti-depressants (Nussbaumer-Streit *et al.*, 2021), pharmacotherapy (Cools *et al.*, 2018) and nutrition

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Table 1. Search terms

Population	TITLE: seasonal affective disorder, or SAD, or seasonal depress*, or winter depress*, or winter blues, or seasonal mood disorder, or periodic depress*, or seasonal pattern depress*, or season*, or SIGH-SAD OR KEYWORDS: seasonal affective disorder NOT TITLE: "social anxiety disorder"
Intervention	AND TITLE: CBT, or cognitive behav* therap*, or cognitive therap*, or CT, or behav* therap*, or BT, or behav* activation, or BA, or cognitive restructuring, or CR, or activity scheduling, or mindfulness? based cognitive therapy, or MBCT OR KEYWORDS: cognitive behavioural therapy

intervention (Yang *et al.*, 2020) for acute SAD. However, there appears to be no published systematic review that seeks to determine the efficacy of CBT for acute SAD (specifically during the depressive phase, typically during winter months) therefore this review is clinically relevant.

This systematic literature review with meta-analysis aims to determine the efficacy of CBT in the treatment of acute SAD in adults.

Method

Protocol

The protocol for this review was prospectively published on Prospero on 18 February 2021 (CRD42021236414; National Institute for Health Research, 2021). Changes to the protocol were as follows: (1) contribution from two additional authors, and (2) the inclusion of a meta-analysis.

Search strategy

Seven bibliographic databases (CINAHL, Cochrane, EMBASE, MEDLINE, PsycINFO, PubMed and Web of Science) were searched using the specified search terms for relevant literature on 2 February 2021. The search was repeated on all seven databases on 30 July 2024 to ensure no additional studies met inclusion criteria (see Supplementary material). Reference lists of all included studies and eight systematic literature reviews on the topic area were checked to minimise overlooked studies.

Following a thorough scoping search, comprehensive search terms were selected (see Table S1 in the Supplementary material). Boolean operators of AND/OR/NOT, parenthesis ("), truncation (*) and substitution symbols (?) were used as appropriate. Searching with just 'title' limited studies too far, so searching via 'keywords' was added on all databases where 'keywords' was available. For the databases searched within the Ovid platform we used the 'keyword' option, and the platform produced a multipurpose (.mp) search term which was used in the final search. 'NOT social anxiety disorder' was applied to limit irrelevant studies. No date restrictions were applied.

Screening

All identified data were exported to Smart Groups in the bibliographic software, EndNote X9 (The EndNote Team, 2013). Following removal of duplicates, each study was screened by title/abstract for eligibility independently by two study authors (S.M. and S.W.). All potentially eligible studies were then subjected to independent full text review by two study authors (S.M. and S.W.). Any

https://doi.org/10.1017/S1754470X2510024X Published online by Cambridge University Press

ambiguity regarding inclusion was discussed and in circumstances of doubt a third author (T.C.) was consulted.

Eligibility criteria

The PICOS framework (Tacconelli, 2010) was adopted to define eligibility criteria as follows.

Inclusion criteria

(1) *Population*: adults experiencing acute SAD, as identified through fulfilment of diagnostic criteria for recurrent MDD with 'seasonal pattern' or scoring above the clinical threshold on a validated SAD/MDD measure.
(2) *Intervention*: CBT either as a stand-alone or co-intervention in all delivery formats such as one-to-one, groups, face-to-face, computerised or remote via telephone/video. Well-established treatments which fall under the umbrella of CBT, including behavioural therapy (for example behavioural activation), cognitive therapy or MBCT.
(3) *Comparison*: any control condition, for example waiting list, usual care or non-cognitive behavioural therapies.
(4) *Outcome*: post-intervention and follow-up (any) time points for a SAD outcome reported using an assessment in line with recognised diagnostic criteria and/or a validated outcome scale of SAD/MDD. Outcomes were confined to validated continuous outcome measures of depression symptoms [i.e. Beck Depression Inventory (BDI), Hamilton Rating Scale for Depression (HAM-D), Structured Interview Guide for the Hamilton Rating Scale for Depression-Seasonal Affective Disorder version (SIGH-SAD)] or structured clinical interview with dichotomous outcome (i.e. DSM-V or ICD-11 diagnosis).
(5) *Study design*: RCTs.

Exclusion criteria

Studies were excluded if they included participants with bipolar disorder-type SAD or SAD in remission at pre-treatment. CBT targeting SAD prevention and other psychotherapies were excluded. Studies were excluded if they were not available in English.

Data extraction

Study characteristic data were extracted independently by two study authors (S.M. and S.W.) into Table 2; including study location, sample, exclusion criteria, design, outcome measure(s), intervention duration and time of assessment. Study intervention/control condition and findings data were extracted into Table 3. Any ambiguity/disagreements regarding data extraction were discussed and in circumstances of doubt a third author (T.C.) was consulted.

Quality assessment and synthesis

The outcomes of the SIGH-SAD, BDI and HAM-D were analysed using the Revised Cochrane Risk-of-Bias Tool for Randomized Trials (RoB2; Sterne et al., 2019). Risk of bias assessment was completed independently by two study authors (S.M. and S.W.). Any disagreements regarding decisions were discussed and in circumstances of doubt a third author (T.C.) was consulted.

RoB2 quality assesses randomisation process, deviations from intended interventions, missing outcome data, measurement of outcomes and selection of reported results. The effect of assignment to the intervention ('intention-to-treat' effect) was assessed.

https://doi.org/10.1017/S1754470X2510024X Published online by Cambridge University Press

Table 2. Study characteristics

Author	Place	**Study sample** Participants (*n*); mean age/age range (years); gender; ethnicity; marital status; education; employment status; antidepressant medication status; diagnosis; current Axis I co-morbidity status; recruitment setting	**Exclusion criteria**	**Design** Number of trial arms; intervention(s)/ comparator(s)	**Depression outcome measure(s)**	**Intervention duration** (weeks)	**PI assessments** PI (weeks); FU (months)
Rohan *et al.* (2004)	Washington, DC, (39˚ North), USA	Adults with active SAD (23); 50.5/18+; predominantly female (91.3%); predominantly Caucasian (87.0%;); predominantly married (66.7%), predominantly university educated (72.2%); predominantly employed (69.6%); predominantly not taking anti-depressant medication (13.0%); major depression, recurrent, with seasonal pattern; 0% co-morbidity; community advertisement	(1) Current psychological or psychiatric treatment or immediate plans to initiating such treatment (apart from stable doses of anti-depressant medication), (2) presence of any other current Axis I disorder or bipolar diagnosis, (3) plans for major vacations or absences through March, (4) bipolar-type SAD	3; CBT, LT, CBT+LT	SIGH-SAD, BDI-II,	6	6; 12
Rohan *et al.* (2007)	Washington, DC, (39˚ North), USA	Adults with active SAD (61); 45/18+; predominantly female (90%); predominantly white (79%); predominantly married (49%); predominantly university educated (77%); predominantly employed (89%); no anti-depressant medication; major depression, recurrent, with seasonal pattern; 0% co-morbidity; media advertisement	(1) Current psychiatric treatment (including psychotropic medication), (2) another current Axis I disorder or bipolar diagnosis, (3) planned absences from the area during March, and (4) bipolar-type SAD	4; CBT, LT, CBT+LT, MCDT	SIGH-SAD, BDI-II, HAM-D	6	6; 3–6
Rohan *et al.* (2009) (FU for Rohan *et al.*, 2004 and Rohan *et al.*, 2007)	Washington, DC, (39˚ North), USA	Participants from Rohan *et al.* (2004) and Rohan *et al.* (2007) who were randomised to CBT, LT, or CBT+LT and who had not dropped out of the study by the end of acute treatment phase; (55 at FU); 47/18+; predominantly female (94%); predominantly white (80%); predominantly married (49%); university educated (74%); predominantly employed (78%); no anti-depressant medication; major depression, recurrent, with seasonal pattern; 0% co-morbidity; community advertisement	(1) Current psychological or psychiatric treatment (including psychotropic medication), (2) presence of any other current Axis I disorder or bipolar diagnosis, (3) plans for major vacations or absences throughout March, and (4) bipolar-type SAD.	3; CBT, LT, CBT+LT	SIGH-SAD, BDI-II, HAM-D	6 as per Rohan *et al.*, 2004 and Rohan *et al.*, 2007, no formal treatment offered for FU	N/A; approx. 12
Rohan *et al.* (2015)	Burlington, Vermont (44.5° North), USA	Adults with active SAD (177); 45.6/ 18+; predominantly female (83.6); predominantly white (92.1); predominantly married/cohabiting (64.4%); predominantly university educated (93.8%); predominantly employed (77.9%); predominantly not taking antidepressant medication (25.4%); major depression, recurrent, with seasonal pattern; 26.6% comorbidity of Axis I diagnoses; media advertisement and referrals from health clinics	1) Current LT or psychotherapy for depression, (2) prior LT or CBT for SAD, (3) a co-morbid Axis I disorder requiring immediate treatment (e.g. psychotic disorder, substance abuse/ dependence, bipolar disorder), (4) acute and serious suicidal intent, (5) positive laboratory findings for hypothyroidism at medical workup, and (6) plans for a vacation or absence for more than a week through March	2; CBT, LT	SIGH-SAD, BDI-II, HAM-D	6	6; N/A

(*Continued*)

Table 2. (*Continued*)

Author	Place	**Study sample** Participants (*n*); mean age/age range (years); gender; ethnicity; marital status; education; employment status; antidepressant medication status; diagnosis; current Axis I co-morbidity status; recruitment setting	**Exclusion criteria**	**Design** Number of trial arms; intervention(s)/ comparator(s)	**Depression outcome measure(s)**	**Intervention duration** (weeks)	**PI assessments** PI (weeks); FU (months)
Rohan *et al*. (2016) (FU for Rohan *et al*., 2015)	Burlington, Vermont (44.5° North), USA	Participants from Rohan *et al*. (2015) who were randomized to CBT or LT and who had not dropped out of the study by the end of acute treatment phase (177); NR/ 18+; NR; NR; NR; NR; NR; predominantly not taking anti-depressant medication (25.9% at 12-month FU and 28.7% at 24-month FU; recurrent, with seasonal pattern; 0% co-morbidity; NR Refer to Rohan *et al*., 2015 for missing data	(1) Current LT or psychotherapy for depression, (2) prior LT or CBT for SAD, (3) a comorbid Axis I disorder primary to SAD requiring immediate treatment, (4) acute and serious suicidal intent, (5) initiation of a new anti-depressant medication in the past month or plans to change the dose of a current antidepressant, (6) positive laboratory findings for hypothyroidism at medical workup	2; CBT, LT	SIGH-SAD, BDI-II, HAM-D	6 as per Rohan *et al*., 2015, no formal treatment offered for FU	N/A; approx. 12 and approx. 24

CBT, cognitive behavioural therapy; LT, light therapy; MCDT, minimal contact/delayed LT control; SIGH-SAD, Structured Interview Guide for the Hamilton Rating Scale for Depression-SAD Version; BDI-II, the Beck Depression Inventory-II; SAD, seasonal affective disorder; NR, not reported; N/A, not applicable; PI, post-intervention; FU, follow-up.

Table 3. Interventions and findings

Author/year	**Format of intervention** Group (size) or individual; session number; frequency; duration of sessions (minutes); delivered by; type	**Drop-out/ attendance rate** Recruited; completed; percentage attrition; mean number of sessions attended	**Post-intervention outcome data**	**Follow-up outcome data**	**Statistical significance (between-group comparisons)**
Rohan *et al.* (2004)	CBT- Group (4–6); 12; twice weekly; 90; psychologist and student clinical psychologist; CBT for SAD using 'Coping with the Seasons' protocol LT- Individual; N/A; twice daily for 6 weeks; 45 am, 45 pm; self-administered using a 10,000-lux standard light box; NIMH Biological Rhythms Section's standard treatment protocol CBT+LT- Encompassed all elements of the CBT and LT regimens	26; PI- 23, FU- 21; PI- 12%, FU- 19%; NI	**Remission %:** SIGH-SAD: CBT- 42.86 LT- 55.55 CBT+LT- 71.43 BDI-II: CBT-71.43 LT- 33.33 CBT+LT- 50.00	**1-year winter FU-remission %:** SIGH-SAD: CBT- 42.86 LT- 37.50 CBT+LT- 83.33 BDI-II: CBT-57.14 LT- 25.00 CBT+LT- 66.67 **Relapse %:** CBT- 0 LT- 62.50 CBT+LT- 0	**PI-** SIGH-SAD: No statistically significant difference between interventions BDI-II: No statistically significant difference between interventions **1-year winter FU-** Statistically significant difference in relapse rates in favour of CBT and CBT+LT compared to LT** SIGH-SAD: Statistically significant difference in depression scores for CBT+LT compared with LT* No significant difference between depression scores between CBT and LT No statistically significant difference in remission rates between groups BDI-II: Statistically significant difference in depression scores for CBT and CBT+LT compared with LT* No statistically significant difference in remission rates between groups
Rohan *et al.* (2007)	CBT- Group (4–8); 12; twice weekly; 90; licensed psychologist and clinical graduate student; CBT for SAD using (Rohan, 2000) manual LT- Individual; N/A; daily for 6 weeks then patients can elect to continue till end of April; 45 am, 45 pm; self-administered using a 10,000-lux Sunray light box and reviewed by LT expert for weeks 2–6; first week protocol based on meta-analysis findings then flexible dose as recommended by expert CBT+LT- Encompassed all elements of the CBT and LT regimens MCDT- Individual; N/A; weekly in-person monitoring for 6 weeks then LT; N/A; LT self-administered using LT using 10,000-lux, consultant monitored and adjusted dose until	61; PI- 54, FU- 38; PI-11%, FU- 20%; CBT- 10.1, CBT+LT- 10.6, LT- 53 LT min per day	**1. ITT sample-Depression score mean (*SD*):** SIGH-SAD: CBT- 12.9 (10.5) LT- 12.7 (6.9) CBT+LT- 8.5 (6.5) MCDT- 23.1 (8.8) BDI-II: CBT- 11.9 (10.5) LT- 11.2 (7.5) CBT+LT- 8.9 (6.0) MCDT- 22.1 (9.6)	**3–4 month summer FU: completer analysis-Depression score mean (*SD*):** SIGH-SAD: CBT- 6.5 (6.8) LT- 5.8 (4.2) CBT+LT- 4.4 (5.4) BDI-II: CBT- 4.5 (5.9) LT- 5.6 (3.3) CBT+LT- 5.6 (8.6)	**PI:** SIGH-SAD: Statistically significant difference in depression score for all interventions compared with MCDT control group* No statistically significant difference between CBT, LT and CBT+LT intervention groups BDI-II: Statistically significant difference in depression scores for all interventions compared with MCDT control group*

(*Continued*)

Table 3. (*Continued*)

Author/year	Format of intervention Group (size) or individual; session number; frequency; duration of sessions (minutes); delivered by; type	Drop-out/ attendance rate Recruited; completed; percentage attrition; mean number of sessions attended	Post-intervention outcome data	Follow-up outcome data	Statistical significance (between-group comparisons)
	a desirable prescription was determined; first week protocol based on meta-analysis findings then flexible dose as recommended by expert		HAM-D CBT- 8.3 (5.9) LT- 7.6 (4.8) CBT+LT- 5.5 (4.1) **2. Completer sample- Depression score mean (*SD*):** SIGH-SAD: CBT- 10.6 (9.2) LT- 11.5 (6.5) CBT+LT- 7.4 (4.8) MCDT- 22.0 (8.9) BDI-II: CBT- 8.8 (7.1) LT- 9.6 (6.0) CBT+LT- 7.9 (4.5) MCDT- 20.9 (9.8) HAM-D CBT- 7.2 (5.4) LT- 6.5 (4.1) CBT+LT- 4.9 (3.4)	HAM-D CBT- 4.8 (4.7) LT- 3.8 (3.0) CBT+LT- 3.2 (3.8)	No statistically significant difference between CBT, LT and CBT+LT intervention groups HAM-D: Statistically significant difference in depression scores for all interventions compared with MCDT control group* No statistically significant difference between CBT, LT and CBT+LT intervention groups **3–4 month summer FU:** SIGH-SAD: No statistically significant difference in depression scores between groups BDI-II: No statistically significant difference in depression scores between groups HAM-D: No statistically significant difference in depression scores between groups
Rohan *et al.* (2009) (FU study for Rohan *et al.*, 2004 and Rohan *et al.*, 2007)	RCT interventions- Refer to Rohan *et al.* (2004) and Rohan *et al.* (2007) FU- Individual; 1; once; NI; trained clinical graduate students and research assistants; administering SIGH-SAD	72; PI- 64, FU- 55; PI- 11%, FU- 13%; NI	Refer to Rohan *et al.* (2004) and Rohan *et al.* (2007)	**1-year winter FU:** **1. ITT analysis- Recurrence %:** CBT- 7.0 LT- 36.7 CBT+LT- 5.5 **Depression score mean (*SE*):** SIGH-SAD: CBT- 9.9 (1.8) LT- 16.4 (1.8) CBT+LT- 12.1 (1.7) BDI-II: CBT- 4.9 (1.3) LT- 12.2 (1.4) CBT+LT- 8.5 (1.5) HAM-D:	**PI:** Refer to Rohan *et al.* (2004) and Rohan *et al.* (2007) **1-year winter FU:** **1. ITT analysis-** Statistically significant difference in recurrence rates in favour of CBT compared to LT* Statistically significant difference in recurrence rates in favour of CBT+LT compared to LT** SIGH-SAD: Statistically significant difference in depression score in favour of CBT compared to LT* No statistically significant difference in depression score

(*Continued*)

Table 3. (*Continued*)

Author/year	**Format of intervention** Group (size) or individual; session number; frequency; duration of sessions (minutes); delivered by; type	**Drop-out/ attendance rate** Recruited; completed; percentage attrition; mean number of sessions attended	**Post-intervention outcome data**	**Follow-up outcome data**	**Statistical significance (between-group comparisons)**
				CBT- 5.2 (1.0) LT- 9.7 (1.2) CBT+LT- 6.6 (1.0) **Remission %:** SIGH-SAD: CBT- 58.3 LT- 30.1 CBT+LT- 37.3 BDI-II: CBT- 80.9 LT- 31.7 CBT+LT- 49.1 **2. Completer analysis-** **Recurrence *n* (%):** CBT- 1 (6) LT- 7 (37) CBT+LT- 1 (6) **Depression score mean (*SD*):** SIGH-SAD: CBT- 8.9 (7.6) LT- 15.7 (9.7) CBT+LT- 11.8 (5.4) BDI-II: CBT- 4.8 (3.9) LT- 11.6 (8.4) CBT+LT- 8.5 (4.7) HAM-D: CBT- 4.9 (4.6) LT- 9.0 (5.7) CBT+LT- 6.5 (3.2) **Remission: *n* (%)** SIGH-SAD: CBT- 11 (65) LT- 7 (37) CBT+LT- 7 (44) BDI-II: CBT- 13 (76) LT- 6 (32) CBT+LT- 7 (44)	between CBT+LT and LT No statistically significant difference in remission between intervention groups BDI-II: Statistically significant difference in depression score in favour of CBT compared to LT*** No statistically significant difference in depression scores between CBT+LT and LT Statistically significant difference in remission rates in favour of CBT compared to LT*** Statistically significant difference in remission rates in favour of CBT compared to CBT+LT* HAM-D: Statistically significant difference in depression score in favour of CBT compared to LT* **2. Completer analysis-** Statistically significant difference in recurrence rates in favour CBT and CBT+LT compared to LT* SIGH-SAD: Statistically significant difference in depression score in favour of CBT compared to LT* No statistically significant difference in depression score between CBT+LT and LT No statistically significant difference in remission rates between intervention groups BDI-II: Statistically significant difference in depression score in favour of CBT group compared to LT** No statistically significant difference in depression score

(*Continued*)

Table 3. (*Continued*)

Author/year	Format of intervention Group (size) or individual; session number; frequency; duration of sessions (minutes); delivered by; type	Drop-out/ attendance rate Recruited; completed; percentage attrition; mean number of sessions attended	Post-intervention outcome data	Follow-up outcome data	Statistical significance (between-group comparisons)
					between CBT+LT and LT Statistically significant difference in remission rates in favour of CBT compared with LT** No statistically significant difference in remission between CBT+LT and LT HAM-D: Statistically significant difference in depression score in favour of CBT compared to LT*
Rohan *et al.* (2015)	CBT- Group (4–8); 12; twice weekly; 90; licenced PhD-level psychologist and clinical psychology graduate student; CBT for SAD using (Rohan, 2008) manual LT- Individual; 6 weeks monitored then continue until their typical spontaneous remission time; daily am; 30 then adjusted according to response/side-effects; self-administered using the 23x15½x3¼-in. SunRay 10,000-lux cool-white florescent light and adjustments made by LT expert; treatment algorithm followed	177; 163 completed/173 provided data; PI- 8%, FU- N/A, CBT- 9.1, LT- NI	**Depression score mean (*SD*):** SIGH-SAD: CBT- 12.9 (7.3) LT-11.5 (6.2) BDI-II: CBT- 8.2 (6.7) LT- 7.2 (6.0) HAM-D: CBT- 7.6 (4.9) LT- 7.2 (4.1) **Remission %:** SIGH-SAD: CBT- 47.6 LT- 47.2 BDI-II: CBT- 56.0 LT- 63.6	N/A	SIGH-SAD: No statistically significant difference in depression scores between intervention groups No statistically significant difference in remission rates between intervention groups BDI-II: No statistically significant difference in depression scores between intervention groups No statistically significant difference in remission rates between intervention groups HAM-D: No statistically significant difference in depression scores between intervention groups
Rohan *et al.* (2016<20>) (FU study for Rohan *et al.*, 2015)	RCT interventions- Refer to Rohan *et al.* (2015). FU- Individual; 4; 1 letter per winter, 2 telephone calls per winter, 1 in-person visit per winter; NI; trained clinical psychology graduate student for contacts and self-administration of CBT intervention or LT with borrowed/purchased 10,000-lux device; self-administering CBT for SAD which was initially based on (Rohan, 2008) manual or LT using previous treatment algorithm	177; 12 months FU- 170, 24 months FU- 169; 12 months FU- 4%, 24 months FU- 5%; NI	Refer to Rohan *et al.* (2015)	**ITT analysis-** **1. 1-year winter FU-** **Depression score mean (*SE*):** SIGH-SAD: CBT- 15.0 (0.9) LT- 15.5 (0.9) BDI-II: CBT- 8.2 (0.8) LT- 7.8 (0.8) HAM-D: CBT- 9.4 (0.6) LT- 9.1 (0.9) **Recurrence %:** SIGH-SAD:	**ITT analysis-** **1. 1-year winter FU:** SIGH-SAD: No statistically significant difference in depression score between intervention groups No statistically significant difference in recurrence rates between intervention groups No statistically significant difference in remission rates between intervention groups BDI-II: No statistically significant difference in depression score between intervention groups

(*Continued*)

Table 3. (*Continued*)

Author/year	**Format of intervention** Group (size) or individual; session number; frequency; duration of sessions (minutes); delivered by; type	**Drop-out/ attendance rate** Recruited; completed; percentage attrition; mean number of sessions attended	**Post-intervention outcome data**	**Follow-up outcome data**	**Statistical significance (between-group comparisons)**
				CBT- 28.9 LT- 24.9 **Remission %:** SIGH-SAD: CBT- 37.0 LT- 34.2 BDI-II: CBT- 63.5 LT- 65.3 **2. 2-year winter FU-** **Depression score mean (*SE*):** SIGH-SAD: CBT- 15.0 (1.0) LT- 18.7 (0.9) BDI-II: CBT- 7.7 (0.9) LT- 11.3 (0.9) HAM-D: CBT- 9.4 (0.6) LT- 11.9 (0.6) **Recurrence %:** SIGH-SAD: CBT- 27.3 LT- 45.6 **Remission %:** SIGH-SAD: CBT- 34.1 LT- 22.9 BDI-II: CBT- 68.3 LT- 44.5 **All available data analysis-** **1. 1-year winter FU-** **Depression score mean (*SD*):** SIGH-SAD: CBT- 15.0 (9.1) LT- 15.1 (8.0) BDI-II:	No statistically significant difference in remission rates between intervention groups HAM-D: No statistically significant difference in depression scores between intervention groups **2. 2-year winter FU:** SIGH-SAD: Statistically significant difference in depression scores in favour of CBT compared to LT** Statistically significant difference in recurrence rates in favour of CBT compared to LT* No statistically significant difference in remission rates between intervention groups BDI-II: Statistically significant difference in depression scores in favour of CBT compared to LT** Statistically significant difference in favour of CBT in remission rates compared to LT** HAM-D: Statistically significant difference in depression scores in favour of CBT compared to LT** **All available data analysis-** **1. 1-year winter FU:** SIGH-SAD: No statistically significant difference in depression score between intervention groups No statistically significant difference in recurrence rates between intervention groups No statistically significant difference in remission rates between intervention groups BDI-II: No statistically significant

(*Continued*)

Table 3. (*Continued*)

Author/year	**Format of intervention** Group (size) or individual; session number; frequency; duration of sessions (minutes); delivered by; type	**Drop-out/ attendance rate** Recruited; completed; percentage attrition; mean number of sessions attended	Post-intervention outcome data	Follow-up outcome data	Statistical significance (between-group comparisons)
				CBT- 8.2 (7.7) LT- 7.9 (7.0) HAM-D: CBT- 9.4 (6.0) LT- 9.0 (5.3) **Recurrence %:** SIGH-SAD: CBT- 29.4 LT- 23.8 BDI-II? **Remission %:** SIGH-SAD: CBT- 37.6 LT- 35.7 BDI-II: CBT- 61.2 LT- 60.0 **2. 2-year winter FU-** **Depression score mean (*SD*):** SIGH-SAD: CBT- 15.1 (8.6) LT- 18.7 (9.3) BDI-II: CBT- 7.8 (7.0) LT- 11.1 (8.7) HAM-D: CBT- 9.5 (5.2) LT- 11.9 (6.2) **Recurrence %:** SIGH-SAD: CBT- 28.0 LT- 46.5 **Remission %:** SIGH-SAD: CBT- 34.1 LT- 23.3 BDI-II: CBT- 62.7 LT- 44.2	difference in depression score between intervention groups No statistically significant difference in remission rates between intervention groups HAM-D: No statistically significant difference in depression scores between intervention groups **2. 2-year winter FU:** SIGH-SAD: Statistically significant difference in depression scores in favour of CBT at compared to LT** Statistically significant difference in recurrence rates in favour of CBT compared to LT* No statistically significant difference in remission between intervention groups BDI-II: Statistically significant difference in depression scores in favour of CBT compared to LT** Statistically significant difference in recurrence rates in favour of CBT compared to LT* HAM-D: Statistically significant difference in depression scores in favour of CBT compared to LT**

CBT, cognitive behavioural therapy; LT, light therapy; PI, post-intervention; FU, follow-up; MCDT,minimal contact/delayed LT control; SAD, seasonal affective disorder; SIGH-SAD, Structured Interview Guide for the Hamilton Rating Scale for Depression-SAD Version; HAM-D, Hamilton Rating Scale for Depression; BDI-II, Beck Depression Inventory-II; ITT, intention to treat; RCT, randomised controlled trial; NI, no information; *SD*, standard deviation; *SE*, standard error; *n*, number of participants; $^{*}p<0.05$; $^{**}p<0.01$; $^{***}p<0.001$.

Risk-of-bias was reported as 'yes', 'probably-yes', 'no', 'probably-no', 'no-information' or 'not-applicable' for each item and each domain was evaluated individually as 'low-risk-of-bias', 'some-concerns-of-bias' or 'high-risk-of-bias'. An overall evaluation of each study was given of 'low-risk-of-bias', 'some-concerns-of-bias' or 'high-risk-of-bias' according to the scoring of the individual domains.

Data analysis

Fixed-effects meta-analyses (Higgins and Thomas, 2024) were conducted to assess the effects of CBT on depression symptoms compared with LT at post-intervention and 1–2 years follow-up. Technically, a meta-analysis can be performed with as few as two studies (Ryan, 2016). As all included studies used the same outcome measures for all outcomes of interest, mean differences (MD) plus 95% CI were computed and reported. Data from case-complete (per-protocol) analyses were included in the meta-analysis. The level of heterogeneity was quantified using the I^2 statistic. Where data were not reported in text but were rather presented in graphs, it was extracted using the WebPlotDigitiser (https://automeris.io/). Stata software (version 18) was used to conduct the meta-analyses and produce the forest plots. Due to the small number of studies (n of studies <10), a formal investigation of heterogeneity (i.e. sensitivity and subgroup analyses) and publication bias was precluded. For the outcomes that cannot be meta-analysed, we used the vote-counting synthesis in accordance with the Synthesis Without Meta-Analysis guidelines to synthesise the findings (Campbell *et al.*, 2020).

Results

Study selection

After the initial search, 665 records were identified and after screening for duplicates, 422 records were assessed for eligibility; 400 records were excluded upon examination of title/abstract. Full text was sought for 22 articles and after examination a further 17 records were excluded. Following the repeated search, 99 additional records were identified and screened for eligibility; 95 records were excluded upon examination of title/abstract and four were excluded following review of full text. Following both searches, the primary reason for exclusion after review of the full text was secondary analysis of results.

In total, five articles were eligible for inclusion, including three RCTs and two follow-up papers. The Preferred Reporting Items for Systematic Reviews and Meta-analyses (PRISMA) flow diagram displays the study selection process (Moher *et al.*, 2009; see Fig. 1).

Study characteristics

See Table 2 for a summary of the included studies.

All included studies were conducted in the United States of America (USA) by the same primary investigator (PI). Rohan *et al.* (2004) was a feasibility RCT comparing the efficacy of a novel SAD-tailored group-CBT, LT and CBT+LT in remitting and maintaining remission of acute SAD at post-intervention and 1-year winter follow-up. Rohan *et al.* (2007) compared the efficacy of a SAD-tailored group-CBT, LT and CBT+LT in remitting and maintaining remission of acute SAD at post-intervention and 3–4-month summer follow-up, whilst comparing with a concurrent waitlist control. Rohan *et al.* (2009) was a naturalistic 1-year winter follow-up of Rohan *et al.* (2004) and Rohan *et al.* (2007) participants allocated to CBT, LT and CBT+LT. Rohan *et al.* (2015) compared group-CBT and LT for SAD in a larger RCT with a higher sample size including participants with stable co-morbid diagnosis and more patients taking stable anti-depressants. Rohan *et al.* (2016a) measured SAD outcomes for Rohan *et al.* (2015) participants at 1- and 2-year winter follow-ups.

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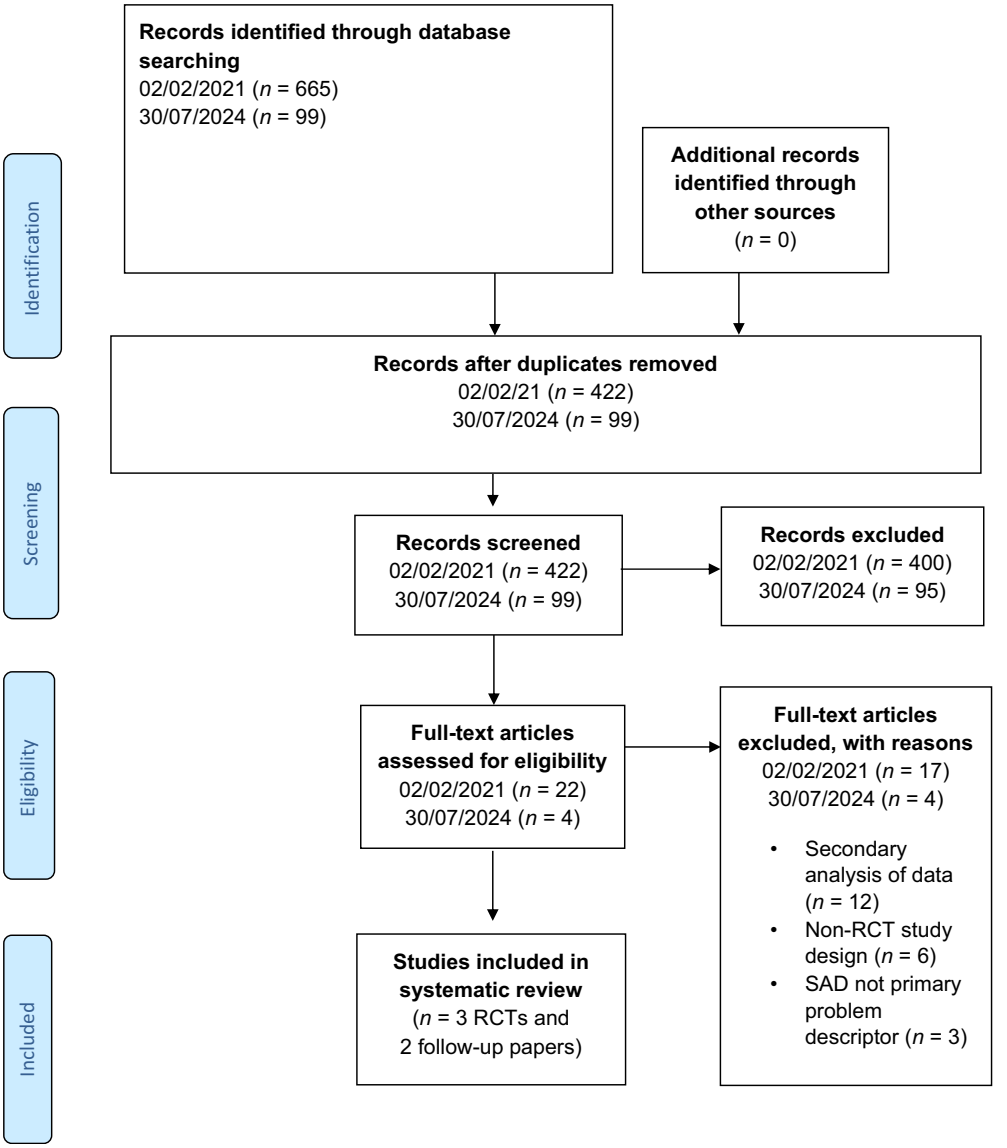

Figure 1. PRISMA flow diagram.

In Rohan *et al.* (2004) no information was provided about randomisation process, within Rohan *et al.* (2007) participants were randomised in blocks of 4, and in Rohan *et al.* (2015) participants were randomised using permuted random blocks of 4 or 6.

Population

All RCTs included adults with a current episode of winter SAD as assessed by DSM-IV criteria and a score of ≥20 on the Structured Interview Guide for the Hamilton Rating Scale for Depression-Seasonal Affective Disorder version (SIGH-SAD; Williams *et al.*, 1992).

In Rohan *et al.* (2007) participants taking psychotropic medication were excluded, in Rohan *et al.* (2004) 13.0% were taking stable doses of anti-depressants (one participant in each treatment

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group) and in Rohan *et al.* (2015) 25.4% were taking stable doses of anti-depressants (53.3% in the CBT group and 46.7% in the LT group).

In Rohan *et al.* (2015), 26.6% of participants had a co-morbid axis-I disorder but were excluded if this disorder required immediate treatment, compared with exclusion with diagnosis of a co-morbid axis-I disorder in the other RCTs. In Rohan *et al.* (2015), it was reported that baseline characteristics, including anti-depressant medication and co-morbidity status, did not predict differential outcome in CBT versus LT.

Sample sizes varied from 23 to 177. Demographic diversity was limited, as mean age only varied from 45 to 50.5, gender was disproportionally female (83.6–94%) and race was predominantly White (79–92.1%); 49–66.7% of participants were married, 69.6–89% were employed and 72.2–93.8% were university educated.

Outcome measures

All studies used SIGH-SAD to measure SAD/depression outcome. SIGH-SAD is an interview of current/past SAD episode severity that encompasses the 21-item HAM-D (Williams, 1988) with an additional eight items measuring atypical depression symptoms such as hyperphagia and hypersomnia, often seen in SAD. HAM-D is widely used with satisfactory internal, inter-rater, and retest reliability and convergent, discriminant, and predictive validity; however, the item-level inter-rater reliability, test–retest reliability, and content validity were found to be inadequate (Bagby *et al.*, 2004). All but one study (Rohan *et al.*, 2004) reported the outcomes of the HAM-D as a secondary outcome, in addition to the SIGH-SAD.

All studies used BDI-II (Beck *et al.*, 1996) to measure SAD/depression outcome. BDI-II is a well-established 21-item self-report measure of depressive symptom severity, which has respectable test–retest reliability and convergent validity. A longitudinal study found significant changes in BDI-II as seasons changed in participants with SAD, compared with non-depressed controls, and therefore concluded BDI-II to be a valid SAD outcome (Rohan *et al.*, 2003).

Description of intervention and comparison conditions

All studies were based in a community setting and offered a SAD-tailored group-CBT intervention based on the PI's CBT-SAD protocol, which tailored traditional CBT for depression to SAD (Rohan, 2000; Rohan, 2008). This 'Coping with the Seasons' protocol consisted of twice weekly 1.5-hour group-CBT sessions with 4–8 participants, over 6 weeks for 12 sessions. CBT for depression (Beck *et al.*, 1979) is usually offered for 12–20 1-hour weekly sessions but CBT-SAD was offered twice weekly to reduce the chance of unrelated springtime remission. The treatment started with psychoeducation of SAD onset/maintenance, rationale, behavioural activation to encourage wintertime activities using the Pleasant Events Schedule (MacPhillamy and Lewinsohn, 1982) and cognitive restructuring which focused on common depressive cognitions whilst considering SAD-specific cognitions such as those related to winter, light and weather. The protocol ends with relapse prevention to maintain gains by addressing negative anticipatory thoughts about next winter and diminish future SAD behaviours.

In all studies, CBT was delivered by a clinical psychologist and a student clinical psychologist. In two studies the PI was the sole primary therapist, and in only one study was the primary therapist either the PI or one of two other qualified therapists (Rohan *et al.*, 2015).

In two RCTs the mean number of CBT sessions attended was 9.1–10.1, but this was not reported in Rohan *et al.* (2004). In Rohan *et al.* (2007) there was no significant difference in attendance between interventions, but the other trials did not report this information.

All studies compared with LT which was self-administered for 6 weeks using a 10,000 lux standard lightbox. In two trials, LT was initially delivered twice daily, and in the other it was

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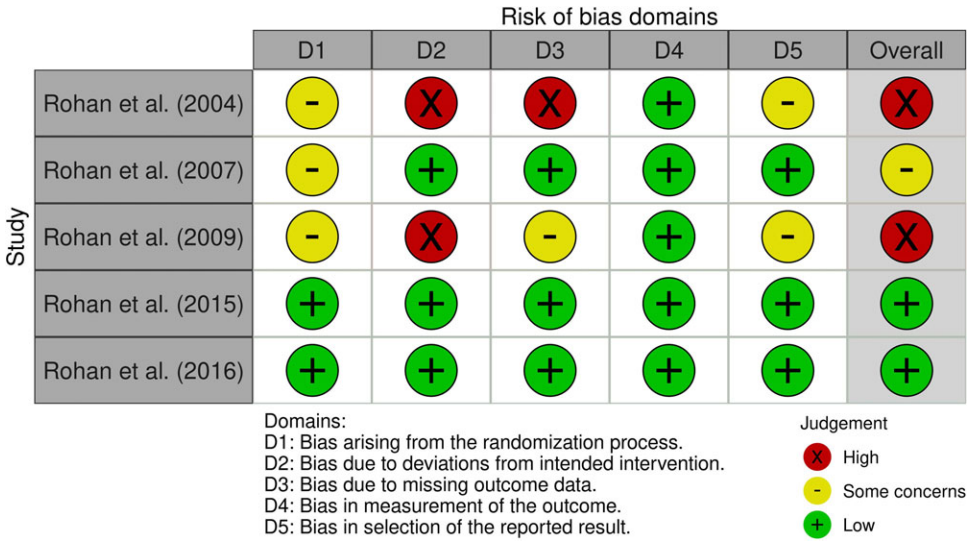

Figure 2. SIGH-SAD outcome for all studies.

delivered once daily in the morning (Rohan *et al.*, 2015). In two trials for weeks 2–6, dose was tailored by a LT consultant towards the individual's needs to maximise response and reduce side-effects (Rohan *et al.*, 2007; Rohan *et al.*, 2015).

In Rohan *et al.* (2015), LT was the only control; the other two studies also compared with CBT+ LT, whilst one trial included a control of minimal contact/delayed LT treatment (MCDT) where LT was offered after a 6-week waiting list delay (Rohan *et al.*, 2007).

Risk of bias assessment

SIGH-SAD

RoB2 was completed for the SIGH-SAD outcome for all RCTs (see Fig. 2). One study scored 'high-risk-of-bias' which favoured the experimental condition (Rohan *et al.*, 2004), another had 'some-concerns-of-bias' but the direction the concerns favoured was unpredictable (Rohan *et al.*, 2007), whilst Rohan *et al.* (2015) was rated as 'low-risk-of-bias'. Both trials with elevated risk of bias had either inadequate allocation sequence or no information to determine whether this was undertaken. Rohan *et al.* (2004) did not have a published protocol or a pre-specified analysis plan and had no intention-to-treat analysis whilst more than 5% of participants dropped out across both intervention arms.

BDI -II

RoB2 was completed for the BDI-II outcome for all RCTs (see Supplementary material). Overall, two studies were assessed as being high risk of bias (Rohan *et al.*, 2004; Rohan *et al.*, 2009) and three studies were as assessed as some concerns (Rohan *et al.*, 2007; Rohan *et al.*, 2015; Rohan *et al.*, 2016)

HAM-D

RoB2 was completed for the HAM-D outcome for all RCTs (see Supplementary material). Overall, two studies were assessed as being high risk of bias (Rohan *et al.*, 2004; Rohan *et al.*, 2009) and three studies were as assessed as some concerns (Rohan *et al.*, 2007; Rohan *et al.*, 2015; Rohan *et al.*, 2016)

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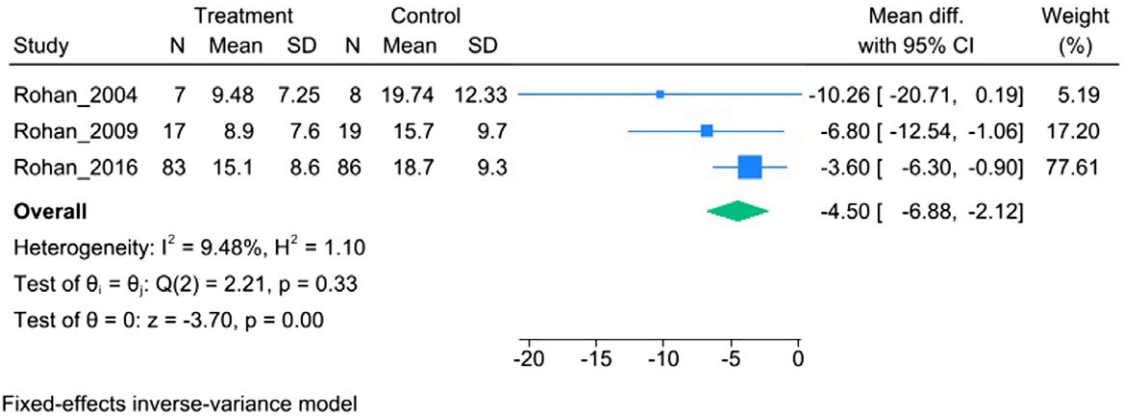

Figure 3. Forest plot of SIGH-SAD outcome at long-term follow-up.

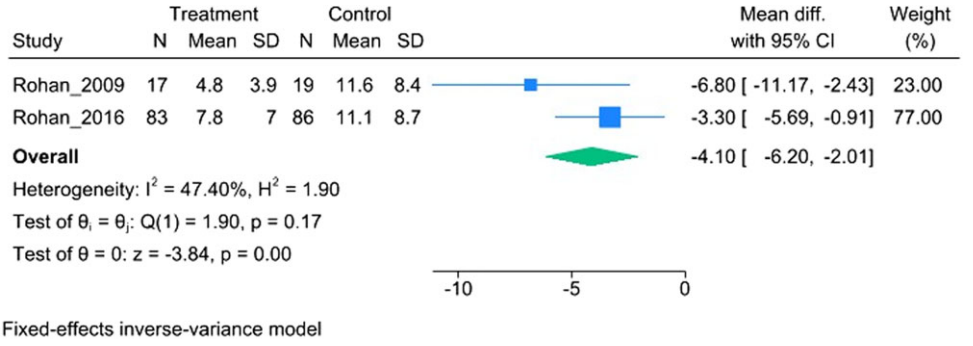

Figure 4. Forest plot of BDI outcome at long-term follow-up.

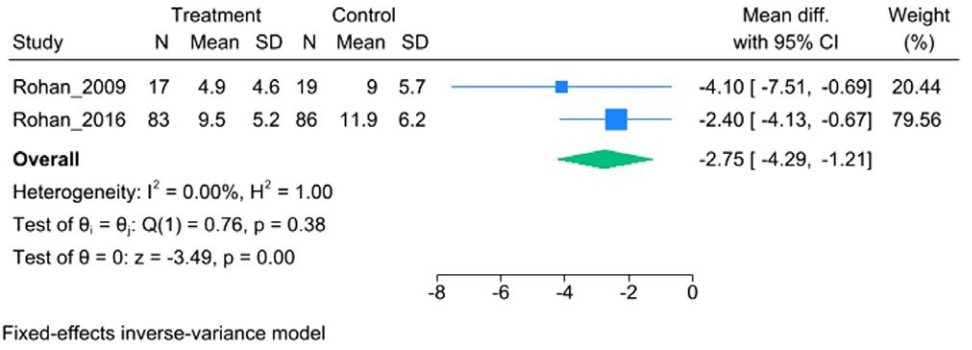

Figure 5. Forest plot of HAMD outcome at long-term follow-up.

Meta-analyses: CBT vs LT

At post intervention, the meta-analysis showed no statistically significant difference between CBT and LT in reducing depressive symptoms on any outcome.

At 1–2 years follow-up, the meta-analysis of the d SIGH-SAD outcomes (n studies = 3 [RoB low, some concerns; high]; n = 220) showed that CBT was effective in reducing depressive symptoms in SAD patients compared with LT [MD = –4.5, 95% CI (–6.88, –2.12), I^2 = 9.48%,

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$p<0.05$] (see Fig. 3). Data on BDI-II (n studies = 2; $n = 205$) showed that CBT was effective in reducing depressive symptoms in SAD patients compared with LT at 1–2 years follow-up [MD = –4.1, 95% CI (–6.20, –2.01), $I^2 = 47.4\%$, $p<0.05$] (see Fig. 4). Data on HAM-D (n studies = 2; $n = 205$) showed that CBT was effective in reducing depressive symptoms in SAD patients compared with LT at 1–2-year follow-up [MD = –2.75, 95% CI (–4.29, –1.21), $I^2 = 0\%$, $p<0.05$]] (see Fig. 5).

Synthesis of other findings

See Table 3 for full details on the findings for each individual study.

CBT vs LT: remission and recurrence rates

There were no statistically significant differences in remission rates from pre-intervention to post-intervention between groups (Rohan *et al.*, 2004; Rohan *et al.*, 2015).

There was no statistically significant difference in remission rates on SIGH-SAD and BDI-II at 1-year winter follow-up between CBT and LT (Rohan *et al.*, 2004; Rohan *et al.*, 2016). At 1-year winter follow-up, Rohan *et al.* (2009) found no significant difference in remission between interventions as measured by SIGH-SAD. Although when assessed by BDI-II at 1-year winter follow-up, there was a statistically significant difference in remission rates in favour of CBT compared with LT.

Rohan *et al.* (2016) was the only study to measure a 2-year winter follow-up and found there was no significant difference in remission between CBT and LT on the SIGH-SAD; however, there was a statistically significant difference in recurrence rates in favour of CBT (less recurrence) compared with LT.

CBT vs waitlist control: depression scores

Only one study (Rohan *et al.*, 2007) compared CBT with a waitlist control (specifically this was referred to as minimal contact/delayed LT treatment or MCDT). There was a statistically significant difference in depression change scores (pre–post) between CBT and MCDT, in favour of CBT.

Rohan *et al.* (2007) measured 3–4-month summer follow-up, finding no significant difference between CBT and MCDT.

Discussion

This review is the first to assess the efficacy of CBT for acute SAD and included three RCTs (Rohan *et al.*, 2004; Rohan *et al.*, 2007; Rohan *et al.*, 2015) and two follow-up papers (Rohan *et al.*, 2009; Rohan *et al.*, 2016) all of which delivered group-CBT using the same protocol which was tailored specifically for SAD in adults. We found from combined meta-analysis that CBT leads to significantly lower depression scores than LT at longer-term follow-up (1–2 years). Evidence from one study indicates that CBT appears more effective than a waitlist control but no different from LT when measured at post-intervention.

At 1-year winter follow-up remission rates varied between trials, although Rohan *et al.* (2016) found no significant difference on remission rates between CBT and LT. Whilst results differ, greater confidence in conclusions from Rohan *et al.* (2016) is warranted owing to larger sample size and 'low-risk-of-bias' and these findings were consistent with the reduction in depression symptoms observed in the meta-analysis. However, in Rohan *et al.* (2016), telephone calls in the interim between post-intervention and 1-year follow-up were added to track depression recurrences and retreatment. Treatment differences emerged without these additional telephone calls between 1-year follow-up and 2-year follow-up and within Rohan *et al.* (2009) at 1-year follow-up when these additional contacts were not part of the protocol. It is therefore possible that these additional contacts in Rohan *et al.* (2016) created a testing effect in the LT group.

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CBT as a treatment for SAD

Our findings indicating CBT for SAD is as efficacious at post-intervention as LT treatment, are consistent with previous research recommending CBT for recurrent depression (Zhang *et al.*, 2018) and SAD (Evans *et al.*, 2013; Sitnikov *et al.*, 2013). Whilst LT targets biological symptoms, SAD can relapse 1–2 weeks after discontinuation (Terman *et al.*, 1989) so meta-analysis recommends annual LT due to its unsustainable effects (Pjrek *et al.*, 2020). This review supports the hypothesis that CBT may provide SAD patients longer-term remission than LT, which may be due to CBT directly challenging dysfunctional cognitions which are likely to be risk factors for depression recurrence (Burcusa and Iacono, 2007).

Secondary analysis of Rohan *et al.* (2016) found CBT was superior to LT regardless of whether participants were taking stable doses of anti-depressants, supporting the notion that CBT has enduring effects in SAD treatment (Rohan *et al.*, 2023).

Importantly, only three RCTs were included so findings indicate that very few studies have tested CBT for adults with SAD in their acute episode, and these studies have only tested one type of delivery via group-CBT, rather than individualised CBT. This review does support previous findings that group-CBT is efficacious for depression including at 1-year follow-up (Chiang *et al.*, 2015). Group-CBT for depression can have benefits over individual-CBT from cost-effectiveness, group cohesion, normalisation and patients acting as co-therapists (Thimm and Antonsen, 2014).

Limitations of the review

MESH-terms were not used within the search strategy which potentially could have led to records with relevant terms in the abstracts being overlooked; however, it appears unlikely given the hand searching of the included studies and related reviews.

Any studies conducted in northern countries that were not reported in the English language may have been missed.

Methodological considerations of included studies

Two trials were assessed as having substantial risk-of-bias across all outcomes (Rohan *et al.*, 2004; Rohan *et al.*, 2007), meaning the findings need to be interpreted with caution. Furthermore, the overall sample was predominantly white and well educated, suggesting limited generalisability to those of different ethnicities and socio-economic status. Considering seasonal variations in mood maybe more prevalent amongst those with lower education and income (Øyane *et al.*, 2005), and this is particularly problematic. Two trials were conducted in Washington (39° North) and one in Vermont (44.5° North) making it unclear if the results can be generalised to other geographical locations/latitudes, especially as it is theorised that prevalence of SAD is higher with increasing distance from the equator.

It was evident that the studies used multiple tests of the same outcome/construct (i.e. depression symptoms). This may be problematic and increases the risk of type-1 error. However, the meta-analysis found significant differences on all depression symptom outcomes, which offers some reassurance that this is not a false positive.

Future recommendations

Each successive episode of depression increases the risk for subsequent episodes (Nuggerud-Galeas *et al.*, 2020) so it is imperative that effective treatment is administered at first episode to minimise recurrence. Although findings suggest CBT, delivered in the acute phase of SAD, may be more efficacious than LT at longer-term follow-up, this is based on only three RCTs of varying methodological quality, and is limited to group-based CBT. As such, further high-quality, adequately powered RCTs, also testing individual CBT, are needed to inform future meta-analyses

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and subsequent treatment decisions and policies. This is particularly important as NHS Talking Therapies services routinely deliver individual CBT for the most part. Future studies could use a larger sample of clinicians and focus on recruiting larger, more generalisable samples including people taking stable doses of anti-depressants, all genders, educational levels, ethnicities, and a wider spread of geographical areas. Several CBT-SAD protocols could be trialled and compared with traditional CBT for depression to discover whether SAD-specific adaptions enhance traditional CBT for SAD.

How the findings influence current practice

Although CBT is routinely offered for recurrent depression, SAD is overlooked in CBT training and healthcare settings, such as NHS Talking Therapies, where CBT is routinely delivered in the UK. Without training in SAD, therapists are unlikely to routinely assess for 'seasonal patterns' in recurrent depression and therefore omit adaptions to target SAD-specific symptoms. This review seeks to highlight that minor adaptions to CBT practice can be made for SAD, such as targeting SAD-specific cognitions relating to weather, winter, light and anticipatory thoughts about next winter. This review encourages CBT training institutes and healthcare providers to consider SAD symptoms within recurrent depression, especially in those living in geographical areas with less access to natural light in winter. By highlighting this under-studied phenomenon and encouraging CBT assessment and treatment of SAD, recurrent depression outcomes and the associated burden could improve.

Conclusion

This review aimed to explore and synthesise the efficacy of CBT for acute SAD in adults. Our review found a general paucity of RCTs in this area, with only three having been published to date. Our meta-analysis found no difference between CBT and LT at immediate post-intervention on depressive symptoms, suggesting both may be effective interventions for the acute phase of SAD. Interestingly, we found that CBT was more effective than light therapy at 1–2 years follow-up in reducing depression symptoms, suggesting CBT has a prolonged effect over and above light therapy alone for SAD. These findings should be considered with caution due to the limited number of included studies, all of which were conducted by the same research team. Regardless, considering that recurrent depression affects 2 million people in the UK (NHS Inform, 2023), SAD should be increasingly considered in CBT assessment and treatment. Considering these emerging findings and the favourable cost-effectiveness of CBT over LT, further high-quality SAD research is warranted to confirm conclusions, including larger and more representative samples.

Key practice points

(1) Group-CBT may be an efficacious treatment option for people with a diagnosis of seasonal affective disorder who are experiencing acute depression.
(2) Practitioners and educators should be vigilant for depression cases that present in winter months, especially if this is a recurring pattern.
(3) Group-CBT may lead to longer lasting effects than LT alone; this should be communicated to clients who opt for LT treatment.

Further reading

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Supplementary material. To view supplementary material for this article, please visit https://doi.org/10.1017/S1754470X2510024X

Data availability statement. This is a secondary data analysis. All data can be found in the cited articles.

Acknowledgements. None to declare.

Author contributions. **Sarah Melton:** Conceptualization-Lead, Data curation-Lead, Formal analysis-Lead, Methodology-Equal, Writing - original draft-Lead; **Stephania Wieland:** Data curation-Supporting, Methodology-Supporting, Writing - review & editing-Supporting; **Anastasios Bastounis:** Formal analysis-Lead, Methodology-Supporting, Writing - review & editing-Supporting; **Tim Carter:** Conceptualization-Supporting, Data curation-Supporting, Formal analysis-Supporting, Methodology-Supporting, Supervision-Lead, Writing - original draft-Supporting, Writing - review & editing-Lead.

Financial support. None to declare.

Competing interests. None to declare.

Ethical standards. Authors have abided by the Ethical Principles of Psychologists and Code of Conduct as set out by the British Association for Behavioural and Cognitive Psychotherapies and British Psychological Society. No ethical approval was required by the affiliated institutions.

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Cite this article: Melton S, Wieland S, Bastounis A, and Carter T (2025). Cognitive behavioural therapy for seasonal affective disorder: a systematic review and meta-analysis. *The Cognitive Behaviour Therapist* 1–25. https://doi.org/10.1017/S1754470X2510024X