Published in final edited form as:

Psychol Assess. 2019 July ; 31(7): 925–938. doi:10.1037/pas0000715.

A Measure of Cognitions Specific to Seasonal Depression: Development and Validation of the Seasonal Beliefs Questionnaire

Kelly J. Rohan,
University of Vermont

Jonah Meyerhoff,
University of Vermont

Sheau-Yan Ho,
University of Vermont

Kathryn A. Roecklein,
University of Pittsburgh

Yael I. Nillni,
National Center for PTSD, Women's Health Sciences Division, VA Boston Healthcare System and Boston University School of Medicine

Joel J. Hillhouse,
East Tennessee State University

Michael J. DeSarno,
University of Vermont College of Medicine

Pamela M. Vacek
University of Vermont College of Medicine

Abstract

We introduce the Seasonal Beliefs Questionnaire (SBQ), a self-report inventory of maladaptive thoughts about the seasons, light availability, and weather conditions, proposed to constitute a unique cognitive vulnerability to winter seasonal affective disorder (SAD; Rohan, Roecklein, & Haaga, 2009). Potential items were derived from a qualitative analysis of self-reported thoughts during SAD-tailored cognitive-behavioral therapy (CBT-SAD) and subsequently refined based on qualitative feedback from 48 SAD patients. In the psychometric study (N = 536 college students), exploratory and confirmatory factor analyses pruned the items to a 26-item scale with a five-factor solution, demonstrating good internal consistency, convergent and divergent validity, and 2-week test-retest reliability. In a known groups comparison, the SBQ discriminated SAD patients (n = 86) from both nonseasonal Major Depressive Disorder (MDD) patients (n = 30) and healthy controls (n = 110), whereas a generic measure of depressogenic cognitive vulnerability (the Dysfunctional

Correspondence concerning this manuscript should be addressed to Kelly J. Rohan, Department of Psychological Science, University of Vermont, John Dewey Hall, 2 Colchester Avenue, Burlington, VT 05405-0134. kelly.rohan@uvm.edu.

The authors have no other financial or nonfinancial competing interests.

Attitudes Scale; DAS) discriminated MDD patients from the other groups. In a randomized clinical trial comparing CBT-SAD to light therapy (N = 177), SBQ scores improved at twice the rate in CBT-SAD than in light therapy. Greater change in SBQ scores during CBT-SAD, but not during light therapy, was associated with a lower risk of depression recurrence two winters later. In contrast, DAS scores improved comparably during CBT-SAD and light therapy, and DAS change was unrelated to recurrence following either treatment. These results support using the SBQ as a brief assessment tool for a SAD-specific cognitive vulnerability and as a treatment target in CBT-SAD.

Keywords

seasonal affective disorder; seasonality; cognitive vulnerability; cognitive measure; treatment mechanism

Winter seasonal affective disorder (SAD) involves a pattern of major depressive episodes that recur in the fall and winter and remit in the spring (Rosenthal et al., 1984). Although research on chronobiological vulnerabilities to SAD has dominated the field, increasing evidence suggests a cognitive component in SAD. Specifically, cognitive constructs associated with nonseasonal Major Depressive Disorder are also correlated with SAD, including negative automatic thoughts (Hodges & Marks, 1998; Rohan, Sigmon, & Dorhofer, 2003), dysfunctional attitudes (Hodges & Marks, 1998; Golden, Dalgleish, & Spinks, 2006), and negative attributional style (Levitan et al., 1998). In two prospective, longitudinal SAD studies, rumination frequency in the fall predicted severity of depressive symptoms the following winter (Rohan et al., 2003, Young & Azam, 2003). As further indirect support for the role of cognitions in SAD, a series of randomized clinical trials suggest that a SAD-tailored cognitive-behavioral therapy (CBT-SAD; Rohan, 2008) is comparably effective to light therapy in the acute treatment of SAD (Rohan, Tierney Lindsey, Roecklein, & Lacy, 2004; Rohan et al., 2007; Rohan et al., 2015). Moreover, CBT-SAD is associated with fewer winter depression recurrences and less severe symptoms following treatment relative to initial treatment with light therapy (Rohan, Roecklein, Lacy, & Vacek, 2009; Rohan et al., 2016).

Recent etiological models integrate a role for psychological factors in SAD onset and maintenance. The first integrative model, Young's (1999) dual-vulnerability model, proposed that two separate, but necessary vulnerabilities are activated to trigger a SAD episode: a biological vulnerability and a psychological vulnerability. In an expansion of Young's model, the integrative cognitive-behavioral model of SAD (Rohan, Roecklein, & Haaga, 2009) specified content for the psychological vulnerability, consisting of cognitive vulnerability to depression constructs that have been associated with SAD such as dysfunctional attitudes, rumination, and negative attributional style, as well as SAD-specific cognitions related to light availability, the winter season, environmental cues that the seasons are changing, and weather conditions. We consider these maladaptive cognitions about the environment "SAD-specific" because we assume that they are qualitatively different in SAD relative to nonseasonal depression.

The concept of SAD-specific cognitions was originally derived from clinical observations of SAD patients in the context of our research program. During phone screens and clinical interviews and while conducting CBT-SAD, we observed that SAD patients frequently verbalized extremely negative thoughts about the winter season, short day length, environmental cues signaling the arrival of winter (e.g., falling leaves, end of daylight saving's time), and inclement weather conditions (e.g., cloud cover, cold temperatures, snow) and, conversely, expressed extremely positive thoughts about the summer season, cues signaling the arrival of spring (e.g., the first crocus), long day length, and more favorable weather conditions (e.g., clear skies, bright sunlight). We have noted several themes in these SAD-specific cognitions, including dichotomous thinking (e.g., winter/dark = globally negative vs. summer/light = hyper-positive meaning); a perceived external locus of control over one's mood, as determined primarily by current season and/or light availability rather than a sense of personal agency in affect regulation, and self-labeling around the personal implications of season/light availability for one's ability to function (e.g., associating one's "winter self" with a host of personal deficiencies, such as failure and ineffectiveness). In our experience, most participants spontaneously report these types of thoughts throughout the course of CBT-SAD. In the event that they do not, the CBT-SAD manual (Rohan, 2008) deliberately elicits them in one particular session when the therapist presents descriptions of winter scenes to identify potential SAD-specific automatic thoughts. In the CBT-SAD treatment protocol, when such SAD-specific negative thoughts arise, they are addressed the same way other automatic negative thoughts are, i.e., illustrating their effects on mood and behavior, using the Socratic method of examining evidence, and reframing them into rational responses.

These clinical observations are indirectly supported by laboratory studies indicating that SAD patients show distinct psychophysiological and self-reported emotional responses to visual environmental stimuli varying in season and light cues (Rohan, Sigmon, & Dorhofer, 2003; Sigmon et al., 2007, Tierney Lindsey, Rohan, Roecklein, & Mahon, 2011). For example, Tierney Lindsey et al. (2011) found that currently depressed SAD participants displayed more corrugator (i.e., brow-pursing) activity, more frequent significant skin conductance responses (SCR), greater SCR magnitude, and more self-reported depressed mood in response to outdoor scenes with an overcast sky and less corrugator activity, lower SCR magnitude, and less self-reported depressed mood in response to the same scenes depicted with a clear, sunny sky relative to never-depressed controls. Although the mechanism underlying these emotional responses to visual environmental stimuli is not known, it is plausible that cognitive mediation (i.e., SAD-specific cognitions) may play a role. Alternatively, these emotional responses may result from learned associations between environmental stimuli and affect, which could lead to the development of overgeneralized cognitions about the seasons and light.

There are currently only two measures that assess SAD-specific cognitions, neither of which is published or widely used: the Seasonal Attitudes Scale (SAS; Sigmon, Rohan, Boulard, Whitcomb, & Dorhofer, 2000) and the Seasonal Automatic Thoughts Survey (SATS; Whitcomb-Smith, Sigmon, & Kendrew, 2002). The SAS is a 25-item questionnaire designed to measure feelings, behavior, and reactions regarding the changing seasons, using a 7-point Likert scale, where 1 = "does not describe me at all" and 7 = "describes me very well."

Some SAS items appear cognitive/attitudinal in nature (e.g., “I often think about the changing seasons and what will happen to my mood” and “I feel that there is little to do to improve my mood in the winter months”). However, most SAS items are related to SAD symptom domains such as mood (e.g., “As winter approaches, I start to feel down”), energy (e.g., “As winter approaches, my energy level begins to decrease”), weight (e.g., “I tend to gain weight during the winter months”), appetite (e.g., “I notice that I like to eat different types of food depending on the season”), and activity level (e.g., “During the winter months, I tend to engage in fewer social activities”). A preliminary study using a college student sample (Sigmon et al., 2000) found that the SAS possesses good internal reliability (Cronbach’s $\alpha = 0.86$), good test-retest reliability ($r = 0.81$), and good convergent validity [rs = 0.41 and 0.38 with the Beck Depression Inventory (BDI; Beck, Rush, Shaw, & Emery, 1979) and the Automatic Thoughts Questionnaire (ATQ; Hollon & Kendall, 1980), respectively]. Sigmon et al. (2007) found that three known groups could be distinguished on the basis of SAS scores: currently depressed SAD patients, currently depressed patients with nonseasonal Major Depressive Disorder, and never-depressed controls.

Despite sound psychometrics, the SAS not only measures attitudes and assumptions in SAD, but also behavioral and affective changes (i.e., symptoms) associated with the changing seasons. Sixteen SAS items assess a perceived increase or decrease in specific SAD symptoms (e.g., energy, mood, appetite, food preferences, weight, social activity level) in the summer or winter or when day length is long or short. In this respect, the SAS overlaps with the Seasonal Pattern Assessment Questionnaire (SPAQ; Rosenthal, Bradt, & Wehr, 1984), a dispositional seasonality measure that involves rating the degree of perceived seasonal change in six indices (i.e., mood, energy, appetite, weight, sleep length, and social activities).

The SATS is a 22-item questionnaire designed to measure the frequency of daily thoughts over the past week, using a 5-point Likert scale, where 1 is “not at all” and 5 is “all the time.” Preliminary results in a college student sample indicated that the SATS possesses excellent internal reliability (Cronbach’s $\alpha = 0.92$) and adequate convergent validity with other instruments related to seasonality and depression ($r = 0.65, 0.70, 0.63$; BDI, ATQ, and SAS, respectively; Whitcomb-Smith et al., 2002). Despite sound psychometrics, 11 items on the SATS appear to reflect automatic thoughts and symptoms associated with current depression, in general, whether or not it is seasonal (e.g., “It’s hard to be social,” “I’m too tired to do anything,” “I am overwhelmed,” “It is hard to get out of bed in the morning,” and “I can’t control my food cravings”). The remaining 11 items appear more applicable to the types of SAD-specific cognitions postulated in the integrative, cognitive-behavioral model in that they reference a particular season (e.g., “I am always going to feel down in the winter months”) or environmental cues (e.g., “I dread the cold”).

This study seeks to develop and test a new self-report measure, the Seasonal Beliefs Questionnaire (SBQ), to more comprehensively assess the array of SAD-specific cognitions observed in our clinical research and proposed in the integrative, cognitive-behavioral model of SAD (Rohan, Roecklein, & Haaga, 2009). In the SBQ, we aim to develop and disseminate a brief, self-report scale that both researchers and clinicians could use to assess SAD-specific cognitions without the limitations of the SAS (i.e., 16/25 items are

confounded with SAD symptoms) or the SATS (i.e., 11/22 items represent thoughts applicable to current depression, in general, whether or not it is seasonal). SBQ items represent intermediate-level cognitions (Beck, 2011), between core beliefs and automatic thoughts. Therefore, the SBQ was modeled after the Dysfunctional Attitudes Scale (DAS; Weissman & Beck, 1978) in response format and instructions, including a Likert scale of agreement based on "how you generally think." We derived the initial pool of prospective scale items from a qualitative analysis of self-reported thoughts from audio-recorded sessions of CBT-SAD patients enrolled in our randomized clinical trials.

The goals of this paper are to 1) reduce the overall number of SBQ items from an initial pool of 94 items to a more efficient 25- to 40-item scale, while attempting to maintain reliability and data integrity; 2) determine the SBQ's internal consistency, test-retest reliability, and convergent and divergent validity; 3) perform a known groups analysis comparing SAD patients to nonseasonal Major Depressive Disorder patients and never-depressed controls on the SBQ and a more generic cognitive vulnerability to depression measure (i.e., Dysfunctional Attitudes Scale; DAS; Weissman & Beck, 1978); 4) examine changes in seasonal beliefs and dysfunctional attitudes over the course of CBT-SAD relative to light therapy; and 5) relate changes in seasonal beliefs and dysfunctional attitudes during acute treatment to winter depression recurrence status one and two winters following treatment with CBT-SAD or light therapy.

Study 1: Scale Development and Psychometric Evaluation

Study 1 surrounds the development of an initial pool of prospective scale items based on the Principal Investigator's (K.J.R.'s) clinical experience and review of audio-recorded CBT-SAD sessions of CBT-SAD (in Phase 1) and subsequent refinement of items based on qualitative feedback from SAD patients (in Phase 2). We expected to identify a large pool of candidate items, reflecting the proposed content domain of seasonal beliefs. Phase 3 evaluated psychometric properties in a large, general sample. Our aim was to reduce the overall number of SBQ items to a more efficient 25- to 40-item scale and to examine the resulting scale's internal consistency, test-retest reliability, and convergent and divergent validity, which we expected to be high. We expected high stability of SBQ scores (high test-retest reliability) across a 2–4 weeks retest interval, given the scale's instructions to reflect on general thinking and the naturalistic follow-up interval (in the absence of any intervention to modify seasonal beliefs).

Method

Phase One: Item Development.—Potential scale items were initially derived through clinical experience and qualitative analysis of self-reported thoughts from audio taped sessions of group CBT-SAD sessions with SAD patients enrolled in our first two published randomized clinical trials (Rohan et al., 2004, 2007). A clinical psychology graduate student reviewed CBT-SAD sessions and extracted content. Any self-disclosed cognition with the hypothesized SAD-specific content (e.g., about the seasons, light availability, weather conditions, and cues about the changing seasons) from CBT-SAD sessions was added to the pool of potential SBQ items. The Principal Investigator (K.J.R.) reviewed the potential item

pool to ensure items were accessible and appropriate. This preliminary work yielded 76 candidate items. Analogous to other cognitive vulnerability and attitudinal measures designed for use in depressed populations (e.g., Dysfunctional Attitudes Scale), the instructions ask respondents to rate their level of agreement with each statement on a 7-point Likert scale with anchors of 7 = “totally agree” to 1 = “totally disagree” based on “how you generally think.”

Phase Two: Descriptive Feedback from SAD Participants and Item Refinement.—The next step in the development of the SBQ involved obtaining preliminary feedback from a clinical sample the new measure was designed to target (i.e., SAD patients) and using this feedback to refine items. After obtaining Institutional Review Board approval at the Uniformed Services University of the Health Sciences (USUHS), the 76-item SBQ was mailed to the 87 SAD participants from the trials that generated the item pool (Rohan et al., 2004, 2007), along with a cover letter explaining our purpose and a feedback form posing open-ended questions about the clarity of the instructions and the individual items and soliciting suggestions for any items to be excluded or included and any other comments about the measure. Forty-eight participants returned packets in pre-paid envelopes (response rate = 55%).

In qualitative review of the returned SBQ measures, there was an overall strong endorsement of the majority of the items. Many of the SAD respondents provided written comments that the SBQ items were “right on target” with the way they thought about light, weather, and the changing seasons. This type of comment was consistently reported on the feedback form. Based on feedback from several respondents, one item was deleted due to its potentially offensive nature: “I am a slave to Mother Nature.” Some participants suggested minor rewording of a few items, which we incorporated if it improved the item’s clarity. None of the respondents recommended adding any new items to the SBQ. All respondents indicated that the instructions were clearly written. The most frequently voiced comment was that many of the items were redundant, which was intentional in order to ensure the comprehensiveness of item development.

Phase Three: Administration to a Large General Sample.—Subsequent to the initial patient feedback and item refinement, 19 reverse-coded items were added to the remaining 75 candidate items to avoid a positive response bias (e.g., “Winter is the best season of the year” versus “I hate winter”), resulting in a 94-item measure that served as the starting point for the psychometric analyses that follow. The next step was to administer the measure to a large, general sample where seasonality, depression, and related cognitions are presumably normally distributed[1]. To that end, the 94-item version of the SBQ was administered to a sample of college students at the University of Vermont along with eight other self-report questionnaires to determine its convergent and divergent validity. All questionnaires were administered electronically via a secure, password-protected website

[1]In our sample, the Shapiro-Wilk, Kolmogorov-Smirnov, Cramer-von Mises, or Anderson-Darling tests for non-normality of depression scores on the Center for Epidemiological Studies–Depression Scale and global seasonality scores on the Seasonal Pattern Assessment Questionnaire were statistically significant. However, the histograms of the distributions of these variables show only slight deviations from normality.

using Internet survey software (Test Pilot™). After accessing the website, participants self-registered by typing a unique password and user identification code of their choosing. After log-on and registration, participants read an informed consent form before proceeding to the questionnaires. Participants were invited (i.e., prompted by email), but not required, to return to the website 2 weeks later to complete the SBQ again to provide data on its test-retest reliability within 2 weeks. Potential student volunteers were recruited from undergraduate psychology courses. Participants were compensated with extra credit towards coursework. This research was approved by the University of Vermont's Institutional Review Board.

Measures Related to Depressive Symptoms and Cognitions

The following nonseasonal depression measures were administered to determine convergent validity with the SBQ.

Dysfunctional Attitudes Scale-Form A (DAS).—The DAS (Weissman & Beck, 1978) is a 40-item measure of common cognitive assumptions endorsed by individuals with depression. Example items include: "If I fail at my work, then I am a failure as a person," and "It is difficult to be happy unless one is good looking, intelligent, rich, and creative." Ratings are given on a 7-point Likert scale with anchors of 7 = "totally agree" to 1 = "totally disagree," indicating degree of agreement with each statement. Weissman and Beck (1978) found that the DAS demonstrated good internal reliability (Cronbach's $\alpha = 0.86$), good test-retest reliability ($r = 0.71$), and good concurrent validity with the Beck Depression Inventory (BDI; $r = 0.53$). The results of a later study with undergraduate students (Dobson & Breiter, 1983) also showed good internal reliability (Cronbach's $\alpha = 0.90$ and 0.88 for males and females, respectively) and good concurrent validity between the DAS and the BDI ($r = 0.30$).

Automatic Thoughts Questionnaire (ATQ).—The ATQ (Hollon & Kendal, 1980) is a 30-item measure of the frequency of automatic negative thoughts associated with depression. Example ATQ items are: "I'm no good," "No one understands me," and "There must be something wrong with me." For each item, a rating is given on a 5-point Likert scale for how frequently the respective thought occurred over the last week with anchors 1 = "not at all" and 5 = "all the time." Hollon and Kendall (1980) reported that the ATQ possesses excellent internal reliability (Cronbach's $\alpha = 0.96$), excellent split-half reliability ($r = 0.97$), and good concurrent validity with the BDI ($r = 0.45$). A separate analysis with an equal number of male and female college students (Dobson & Breiter, 1983) further supported the ATQ's high reliability and validity (Cronbach's $\alpha = 0.96$ and 0.95 for males and females, respectively; inter-correlation with the BDI of $r = 0.30$).

Center for Epidemiological Studies–Depression Scale (CES-D).—The CES-D (Radloff, 1977) is a 20-item measure that assesses symptoms of depression. Each of the items states an experience related to depression, including depressed mood, feelings of guilt and worthlessness, feelings of helplessness and hopelessness, loss of energy, and sleep and appetite disturbances. Responses are coded on a 4-point Likert scale ["Rarely, or none of the time (less than 1 day) to "Most or all of the time (5–7 days)"], indicating frequency over the previous week. Ratloff (1977) reported high internal consistency (ranging from .84 to .90)

and moderate test-retest reliability (ranging from .32 to .67) for three different population samples. The CES-D has shown good reliability and validity across a wide variety of demographic characteristics including age, education, geographic area, and racial, ethnic, and language groups (Radloff, 1977, 1991; Radloff & Locke, 1986).

Measures Related to Seasonality Symptoms and Cognitions in SAD

The Seasonal Attitudes Scale (SAS; Sigmon et al., 2000) and the Seasonal Automatic Thoughts Survey (SATS; Whitcomb-Smith et al., 2002) were administered to evaluate convergent validity with the SBQ. The SAS and SATS were reviewed at length in the introduction, see above. Both of these measures are unpublished, but it was essential to include them in this study because they are the only existing measures of cognitions hypothesized to be more strongly associated with seasonal than nonseasonal depression. The following measures of seasonal depression severity were also administered to determine convergent validity with the SBQ.

Structured Interview Guide for the Hamilton Rating Scale for Depression–Seasonal Affective Disorder Version–Self Report (SIGH-SAD-SR).—The SIGH-SAD-SR (Williams et al., 1992) is a self-report questionnaire that matches items on the Structured Interview Guide for the Hamilton Rating Scale for Depression (SIGH-SAD, Williams et al., 1993), which includes the 21-item Structured Interview Guide for the Hamilton Rating Scale for Depression (HAM-D) and the supplementary 8-item SAD subscale that assesses atypical or reverse vegetative symptoms most commonly found in seasonal depression (i.e., anergia, hypersomnia, and hyperphagia). Each symptom is rated on severity over the previous week. The HAM-D has been shown to possess adequate psychometric properties including: internal consistency, test-retest reliability, and convergent and predictive validity (Bagby et al., 2004). The SIGH-SAD is the most commonly used measure to assess SAD symptom severity in research studies. The Self-Report version (SIGH-SAD-SR) of the SIGH-SAD was used to conform to the online survey format of this study.

Seasonal Pattern Assessment Questionnaire (SPAQ).—The SPAQ (Rosenthal, Bradt, & Wehr, 1984) is a widely used self-report instrument to screen for SAD. One of the SPAQ subscales, Global Seasonality Score (GSS), was used here. The GSS represents the sum of 6 items that measure seasonal variations in mood, appetite, weight, sleep, energy, and socializing on a 5-point Likert scale, ranging from 0 (no change) to 4 (extremely marked change). The GSS has shown high internal reliability (Cronbach's $\alpha = 0.82$, Magnusson et al., 1997) and test-retest reliability ($r = 0.62$, Raheja et al., 1996).

Measure Used to Determine Divergent Validity

Current Symptoms Scale (CSS).—To examine the divergent validity of the SBQ, we administered a measure of attentional deficits and hyperactivity, the CSS (Barkley & Murphy, 1998), which assesses the 18 symptoms of attention deficit hyperactivity disorder (ADHD) as outlined in the Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition (DSM-IV; APA, 1994). Items reflect the two ADHD subtypes (i.e., 9 "inattentive" items and 9 "hyperactive/impulsive" items). Each item is measured on a 4-point Likert scale

with anchors 0 (“never or rarely”) and 3 (“very often”). The CSS has been shown to possess good internal consistency (Cronbach’s α = 0.63 – 0.75) and good test-retest reliability (*r* = 0.82; Aycicegi & Harris, 2003).

Factor Structure

We randomly split our sample into two groups: one for an initial exploratory factor analysis (EFA) and the second for a confirmatory factor analysis (CFA). We performed common factor analysis to evaluate the factor structure of the SBQ on the first group of 268 participants. The number of factors was determined through examining the results of several methods: scree plot, Kaiser rule (number of eigenvalues > 1), percent variance accounted for, and theory (i.e., expectation that different factors would emerge for different hypothesized dimensions). In addition, a Parallel Analysis was conducted as an additional method of determining the number of factors to be extracted for the EFA and supported that that five factors was the appropriate number. The Parallel Analysis procedure involves generating a series of random data sets that parallel the actual data set, with regard to the number of cases and variables, and computing eigenvalues for each of the random data sets. The eigenvalues derived from the actual data are then compared to the eignevalues derived from the random data. Factors or components are retained as long as the *i*th eigenvalue from the actual data is greater than both the mean and the 95th percentile of the *i*th eigenvalue from the random data.

Factors were extracted using principal components.[2] An oblique rotation was used (i.e., Direct Oblimin) due to the hypothesized correlation between factors. Interpretation of the factors was guided by examination of the standardized regression coefficients. Items with relatively low individual loadings (< .50), cross-loadings of .30 or higher, or content inconsistent with the other items grouped in its factor were removed. Inter-factor correlations and internal consistency reliability were also examined. As part of the CFA procedure, results for “Goodness of Fit” modification indices using the EFA model were obtained. The following decision rules for these indices were used, in order to determine goodness of fit of the model : X^2/df ratio of < 2.0, a CFI of .95 or greater, and an RMSEA of < .05 (Bentler & Bonett, 1980; Brown & Cudeck, 1993; Carmines & McIver, 1981). Based on the magnitudes of cross loadings with other factors, seven items were removed from factors, so that all modification indices had values that met each of the decision rules. Potential limitations of these indices include sensitivity to model misspecification, small sample bias, estimation method effect, effects of violation of normality and independence, and bias of fit indices resulting from model complexity (Hu & Bentler, 1999).

Results

Participant Characteristics

Participants (*N* = 536) included 385 women and 151 men and were predominantly white (93.3%), young adults (*M* age = 18.9 yrs., *SD* = 1.2). The mean CES-D score was 16.3 (*SD*

[2]The original EFA and CFA subsets of the data (i.e., with cases designated for each subset, using random sampling) are no longer available. Therefore, we were unable to conduct factor extraction using alternate methods, such as Principal Axis Factoring, and compare results to the original Principal Components method using the same data subsets.

= 10.4, range = 0–53) and the mean SIGH-SAD-SR score was 13.8 (*SD* = 9.9, range = 0–51), suggesting that the student sample was, on average, mildly depressed. The mean global seasonality score (GSS) on the SPAQ was 8.9 (*SD* = 4.7, range = 0–23), indicating mild to moderate dispositional seasonality. The majority of students were assessed in the fall months (i.e., Sept.-Nov; *n* = 254), followed by spring (i.e., Mar.-May, *n* = 187) and winter (i.e., Dec.-Feb.; *n* = 95).

Factor Analysis

Although the scree plot suggested a model with 4 to 7 factors, variance accounted for, interpretability of the factors, and Parallel Analysis results suggested that a five-factor model was most appropriate. From the original 94 items, 61 items were excluded because of low individual loadings, excessive cross-loadings, and/or content inconsistent with other items in the factor. Factor 1 consisted of 10 items, labeled “Personal Deficiency Related to Winter (PD).” Factor 2 had 6 items, which we labeled “Global Summer Positivism (GS).” Factor 3 had 5 items and was labeled “Global Winter Negativity (GW).” Factor 4 had 8 items, which we labeled “Effects from Lack of Light (ELL).” Factor 5 had 4 items, which was labeled “Lack of Perceived Seasonal or Weather Effect (LPSWE).” Internal consistency for these scales was fair (LPSWE α = .66) to excellent (PD α = .94, GW α = .93, ELL α = .91). (See Table 1).

We followed up this EFA with a CFA on the second half of the sample (*n* = 268). The results obtained in the earlier EFA informed the structure of the model tested in this analysis. A good model fit is indicated by a X^2/df ratio of < 2.0, a CFI of .95 or greater, and an RMSEA of < .05 (Carmines & McIver, 1981; Brown & Cudeck, 1993; Bentler & Bonett, 1980). Initially, the CFA model was tested using IBM SPSS Amos 7.0. All items from the EFA were included. This resulted in a moderate fit: X^2 (485) = 1098.6, $p < .001$; X^2/df =2.3, CFI = .90; RMSEA = .068. The results of the modification indices suggested that seven items should be deleted because they had high cross-loadings with other factors. Re-running the model after deleting these items significantly improved the fit: X^2 (285) = 461.5, $p < .001$; X^2/df =1.6, CFI = .96; RMSEA = .048, indicating excellent fit to the data. We re-examined internal consistency on the revised scales. There were minor decreases in Cronbach alphas, which continued to be good to excellent (.66 to .93). (See Tables 1 and 2). Furthermore, the shorter revised scales had very high correlations with the original longer ones (*r*s = .93–.99). In addition, interfactor correlations ranged from r = 0.23 – 0.60, and average interitem correlations ranged from r = 0.33 – 0.73. (See Supplementary Tables 1 and 2). The resulting 26-item SBQ (Appendix A) was used in all remaining analyses. To examine the appropriateness of using the SBQ as a single summary index, a Parallel Analysis was conducted using only the five subscales, which revealed a one factor solution. Also, the preliminary Principal Factor Analysis for this solution showed high loadings for all five items of the one factor.

Reliability

As expected, internal consistency for the 26-item SBQ, using item scores as indicators, was very high, Cronbach’s α = .93. Reliability using the five subscale scores as indicators resulted in Cronbach’s α of .78. The split-half reliability coefficient was also high, Guttman

split-half = .93. Using the subsample of 142 participants who completed the SBQ again 2 to 4 weeks later, test-retest reliability was also high, $r = .89$, $p < .01$.

Validity

The 26-item SBQ demonstrated good convergent validity with instruments related to seasonality and depression. (See Table 3). All correlations with the SBQ were statistically significant. As expected, the SBQ correlated more strongly with measures designed for seasonal depression (i.e., SAS, SATS, SPAQ, and SIGH-SAD-SR) than with non-seasonal depression measures (i.e., DAS, ATQ, and CES-D). The lowest correlation was observed between the SBQ and the measure of the most dissimilar construct (i.e., the CSS measuring ADHD symptoms), indicating divergent validity.

Summary of Study 1's Results.—Exploratory and confirmatory factor analyses pruned the original 94 items to a 26-item scale with a five-factor solution, demonstrating good internal consistency, convergent and divergent validity, and 2-week test-retest reliability.

Study 2: Known Groups Comparison

A known groups comparison was conducted to determine whether the SBQ distinguishes between individuals with SAD, those with nonseasonal major depression, and never-depressed controls relative to a more generic depressogenic cognitive vulnerability (i.e., dysfunctional attitudes measured by the DAS). We hypothesized that the SBQ, but not the DAS, would discriminate currently depressed SAD patients from currently depressed patients with nonseasonal depression and never-depressed controls, suggesting that the SBQ captures a SAD-specific cognitive vulnerability to depression.

The SBQ was incorporated into an ongoing study at the University of Pittsburgh. Potential participants were recruited from the greater Pittsburgh, PA metropolitan area through community advertisements in the greater Pittsburgh Metropolitan area and through the Pitt +Me Research Registry at the University of Pittsburgh and were screened using the Structured Clinical Interview for DSM-IV-TR Axis I Disorders, Research Version, Patient Edition with Psychotic Screen (SCID-I/P; First, Spitzer, Gibbon, & Williams, 2002). Individuals with a substance induced mood disorder, current substance use disorder, or history of psychotic or bipolar disorders on the SCID-I/P were excluded from the study. Individuals enrolled in the nonseasonal Major Depressive Disorder (MDD) group were diagnosed with MDD, whereas individuals in the SAD group were diagnosed with Major Depressive Disorder, Recurrent with Seasonal Pattern. Control group participants were required to have no history of Major Depressive Episodes and scores in the normal range on the Seasonal Pattern Assessment Questionnaire (SPAQ; Rosenthal, Bradt, & Wehr, 1984), defined as a global seasonality score either ≤ 7 or 8–9 without endorsing problems across the seasons. The SBQ and DAS were administered in the winter months, when SAD and MDD participants were in a current Major Depressive Episode, as confirmed using SCID criteria.

Given that the cognitions represented on the SBQ are proposed to constitute a cognitive vulnerability with greater specificity to SAD than to depression in general, we expected that the SAD group would have higher SBQ scores than the MDD group and controls, but that

both depressed groups would score higher than controls on the DAS. Analysis of variance (ANOVA) was used to compare the three groups on SBQ and DAS scores, and significant group effects were followed with pairwise contrasts. Although the groups differed on age, $F(2, 277) = 5.63$, $p = .004$, group differences in mean age do not appear clinically meaningful in terms of developmental periods that might affect the SBQ or DAS outcomes [*M*s (±*SD*): SAD = 36.94 (±13.53), MDD = 34.48 (±13.72), and controls = 31.77 (±13.26)]. Nevertheless, we ran an analysis of covariance (ANCOVA) controlling for age, and the same significant group differences emerged on each outcome. The groups also differed on sex distribution (proportion females in each group: SAD (83.3%), MDD (58.8%), and controls (75.4%), $X^2(2) = 8.99$, $p = .011$. ANCOVAs controlling for sex revealed the same significant group differences as ANOVAs. Therefore, ANOVAs are presented below and in Table 4. The groups did not differ on race (proportion White vs. African American, Asian, or multi-race: SAD (90.3%), MDD (91.2%), and control (93.3%), $X^2(6) = 9.21$, $p = .162$. The majority was non-Hispanic in each group: SAD (89.5%), MDD (91.4%), and control (93.3%), $X^2(2) = 1.15$, $p = .562$.

Although both depressed groups were experiencing a current Major Depressive Episode per DSM-5 criteria, the SAD group was more severely depressed than the MDD group on continuous depression scores on both the SIGH-SAD and BDI-II (see Table 4). The groups differed significantly on total SBQ scores, with the SAD group having significantly higher SBQ scores compared to the MDD group ($p < .001$) and the control group ($p < .001$), and the MDD group scoring significantly higher than the control group ($p < .001$). Four of five SBQ subscales (Global Winter Negativity, Personal Deficiency Related to Winter, Effects from Lack of Light, Lack of Perceived Seasonal or Weather Effect) showed the same pattern of group differences as was found for total SBQ scores, with all contrast *p*s < .001, except for SAD vs. MDD on Global Winter Negativity ($p = .009$). For the remaining SBQ subscale (Global Summer Positivism), the SAD group differed significantly from the MDD and control groups (both contrast *p*s < .001), but the MDD group did not differ from controls ($p = .116$).

The groups also differed significantly on DAS scores, with the SAD and MDD groups both differing from the control group (*p*s < .001), but MDD patients scoring significantly higher than SAD patients ($p = .003$). It is noteworthy that, relative to SAD patients, MDD patients were less depressed yet endorsed more rigid dysfunctional attitudes. These results suggest that seasonal beliefs, but not general depressogenic attitudes, discriminate individuals with SAD from those with a nonseasonal pattern of MDD. Conversely, dysfunctional attitudes may discriminate individuals with nonseasonal MDD from individuals with SAD.

Study 3: Seasonal Beliefs in the Context of a Randomized Clinical Trial Comparing CBT-SAD to Light Therapy

We examined seasonal beliefs across a randomized clinical trial of two treatments for SAD (Rohan et al., 2013): cognitive-behavioral therapy for SAD (CBT-SAD) or light therapy (LT). Assuming that CBT-SAD engages seasonal beliefs as a treatment target whereas LT does not, we hypothesized that CBT-SAD improves SBQ scores more than light therapy and

that treatment-induced changes in SBQ scores is mechanistic in offsetting recurrence following CBT-SAD, but not following LT. In contrast, we expected DAS scores to improve comparably over both acute treatments with no relationship between DAS change and recurrence following either treatment. The primary efficacy analysis in the parent trial comparing CBT-SAD and LT found a lower risk of recurrence following CBT-SAD (27.3%) relative to light therapy (45.6%) two winters later (Rohan et al., 2016). If CBT-SAD's enduring effect is explained by treatment-related changes in seasonal beliefs, the SBQ has two benefits for clinical practice: (1) its brief, self-report format lends itself to repeated measurement of these cognitions over CBT-SAD in predicting treatment effects and (2) the CBT-SAD intervention could be adjusted to place an even greater emphasis on seasonal beliefs to further improve treatment effects.

Community adults in the greater Burlington, VT area in a current episode of Major Depression, Recurrent with Seasonal Pattern ($N = 177$) were randomized to 6-weeks of CBT-SAD ($n = 88$) or LT ($n = 89$). CBT-SAD followed our manual (Rohan, 2008) and consisted of 12 group therapy sessions at a frequency of two 1½-hr sessions/week, administered by one of three Ph.D. psychologists. LT was administered at home using 10,000-lux cool-white florescent light, initiated at 30 minutes/day each morning and adjusted per treatment algorithm based on response and side effects. Participants were predominantly female (83.6%) and non-Hispanic White (92.1%) with a mean age of 45.6 years ($SD = 12.7$; see Rohan et al., 2015 for complete participant characteristics). CONSORT flow diagrams were previously published from screening through treatment endpoint (Rohan et al., 2015) and through second winter followup (Rohan et al., 2016). Retention was excellent: Of 177 randomized, 173 (97.7%), 170 (96.0%), and 169 (95.5%) provided data at post-treatment, next winter followup, and second winter followup, respectively. The primary efficacy results concluded that the treatments did not differ on any outcome in the acute treatment phase (Rohan et al., 2015); however, CBT-SAD was associated with fewer depression recurrences and less severe patient- and interviewer-rated symptoms by two winters after initial treatment (Rohan et al., 2016).

The 26-item SBQ was administered at pre-, mid- (after 3 weeks), and post-treatment. For comparison, the DAS was also administered as a more generic (i.e., not believed to be SAD-specific) measure of cognitive vulnerability to depression. Linear mixed models were used to examine the effects of treatment on changes in SBQ scores, overall and within each subscale. SAS PROC MIXED procedure with Restricted Maximum Likelihood (REML) estimation was used to fit the models. The basic model included a fixed effect of treatment group (CBT-SAD or LT) and a fixed effect of time (pre-treatment, mid-treatment, and post-treatment), as well as a two-way interaction of treatment group and time. For these data, we used a compound symmetry covariance structure. Time was modeled both as a categorical variable with subject as a random effect to control for correlations between repeated measures on the same person, and as a continuous variable with person-specific intercepts and slopes as random effects (random coefficients regression):

$$y(\text{Seasonal Beliefs})_{ij} = \beta_0 + \beta_1 \text{Time}_{ij} + \beta_2 \text{Txgrp}_i + \beta_3 \text{Time}_{ij}\text{Txgrp}_i + b_{0i} + b_{1i}\text{Time}_{ij} + \varepsilon_{ij}$$

Note: Seasonal Beliefs = Raw, uncentered SBQ score, TxGrp= treatment received.

For SBQ total scores, there was no overall main effect of treatment group [$F(1, 175) = 0.14$, $p > .05$], but there was an overall time main effect [$F(2, 328) = 71.36$, $p < .0001$], whereby seasonal beliefs became significantly less rigid as treatment progressed (see Table 5). This main effect was qualified by a significant interaction between treatment group and time [$F(2, 328) = 8.43$, $p < .001$], such that seasonal beliefs changed at different rates depending on treatment modality (Table 5). To probe this interaction, we ran a second mixed model, using a random coefficients regression, making time a continuous variable rather than a categorical variable. SBQ scores improved at twice the rate in CBT-SAD (decrease of 3.02/week) compared to LT (decrease of 1.48/week); the two slopes differ at $p < .001$. The difference between treatments in SBQ scores was statistically significant only at post-treatment (see Table 5). In probing the SBQ subscales, the treatment × time interaction was significant on the Personal Deficiency Related to Winter [$F(2, 329) = 7.00$, $p = .001$] and Global Summer Positivism [$F(2, 330) = 5.33$, $p = .005$] subscales. Similar to the pattern of results for SBQ total scores, subscale results indicated greater change in CBT-SAD than in LT and a statistically significant difference between treatments at post-treatment (Table 5). There was a significant overall time main effect on the Effects from Lack of Light SBQ subscale [$F(2,330) = 52.32$, $p < .0001$], indicating that subscale scores improved (i.e., decreased) comparably over both treatments. In contrast to the significant interaction on SBQ scores, when examining DAS scores, there was only an overall time main effect, indicating that dysfunctional attitudes improved over the course of both treatments, $F(2, 332) = 62.74$, $p < .0001$.

Logistic regression was used to examine the relation between pre- to post-treatment change in SBQ score and depression recurrence status at followups conducted one and two winters after study treatment. Recurrence was the primary outcome in the parent clinical trial, defined as score on the 29-item Structured Interview Guide for the Hamilton Rating Scale for Depression—Seasonal Affective Disorder Version (SIGH-SAD; Williams et al., 1992) ≥ 20 with 21-item Hamilton Rating Scale for Depression (HAM-D) score ≥ 10 and 8-item Atypical score ≥ 5. The treatment type × change score interaction was significant for total SBQ scores ($p = .029$), as well as for Global Winter Negativity subscale scores ($p = .014$), and was marginally significant for Global Summer Positivism in predicting recurrence status at the second winter followup. In the CBT-SAD group, but not the LT group, subjects who did not recur at second winter exhibited a significantly greater decrease in total SBQ scores ($t(79) = 2.70$, $p = .008$) and Global Winter Negativity subscale scores ($t(79) = 2.76$, $p = .007$), and a marginally significant decrease in Global Summer Positivism subscale scores ($t(79) = 1.95$, $p = .053$) than those who had a recurrence. There was no significant SBQ change score main effect or interaction with treatment for recurrence at the first winter of followup, and there was no significant DAS change score main effect or treatment interaction for recurrence at either followup. These findings suggest that CBT-SAD more specifically targets seasonal beliefs than LT does and that change in this target offsets recurrence following CBT-SAD, which is not the case in LT.

Discussion

The Seasonal Beliefs Questionnaire (SBQ) demonstrated good factor structure, including a five-factor solution with 26 total items that showed an excellent fit to the data. The five

factors are: Personal Deficiency Related to Winter (PD), Global Summer Positivism (GS), Global Winter Negativity (GW), Lack of Perceived Seasonal or Weather Effect (LPSWE), and Effects from Lack of Light (ELL). Conceptually, these factors are consistent with the integrative cognitive-behavioral theory of SAD (Rohan, Roecklein, & Haaga, 2009), our clinical observations about central themes in SAD-specific thinking, and domains of thinking specifically targeted in our SAD-tailored cognitive-behavioral therapy (CBT-SAD; Rohan, 2008). As a limitation, the resulting scale content might have been improved if we had sought consultation with experts in the field to ensure sampling of the content domain.

The SBQ demonstrated high internal consistency, indicating homogeneity of the items comprising the scale. Test-retest reliability over approximately a 2- to 4-week period was high, indicating stability of SBQ scores over a short time. The SBQ also demonstrated high positive correlations with a measure of dispositional seasonality (i.e., SPAQ), two measures of cognitions related to depression (i.e., ATQ and DAS), and two measures of current depression severity (i.e., CES-D and SIGH-SAD-SR). The observed correlations suggest good convergent validity for the SBQ. The SBQ showed the lowest correlation with a measure of a different construct (i.e., CSS), suggesting good divergent validity. These preliminary psychometric properties are promising and justify the continued validation of the SBQ. The large college student sample was used for convenience and feasibility, but the sample characteristics are a limitation of the factor analysis and psychometric portions of this study. It would be ideal to use a general population sample varying in age, gender, race, ethnicity, and geographic location in future studies. One limitation is that the subscales demonstrate a wide range of reliabilities, which could result in interpretative confounds. That is, effects will be larger—all things being equal—for scale scores that are more reliable.

As expected, the SBQ correlated positively with two measures of thoughts and attitudes towards the seasons (e.g., SAS and SATS). Although named the “Seasonal Automatic Thoughts Survey,” half (11/22) of the SATS items list general depressogenic automatic thoughts and symptoms that are not specific to SAD. Similarly, despite the name “Seasonal Attitudes Scale,” most (16/25) SAS items assess the extent to which specific depressive symptoms are associated with certain seasons or photoperiod. As a whole, the SBQ items are more representative of the range of cognitions about the seasons, light availability, and weather, as articulated in the integrative cognitive-behavioral model of SAD (Rohan, Roecklein, & Haaga, 2009), and represents an improvement over the SAS and SATS for assessing SAD-specific cognitions.

We supplemented the initial psychometric study with a known groups analysis to compare SAD patients, nonseasonal Major Depressive Disorder (MDD) patients, and never-depressed controls on SBQ scores in the winter when both depressed groups were in a Major Depressive Episode. As hypothesized, each group differed from the other two, with SBQ scores highest (most maladaptive) for SAD patients, moderate for MDD patients, and lowest for participants in the control group. The same pattern of group differences was observed across all SBQ subscales, with the exception of the Global Summer Positivism subscale, which discriminated the SAD group from the other two, but did not discriminate between MDD patients and controls. Relative to other types of seasonal beliefs, hyperpositive

thoughts about summer may have even greater specificity to SAD than to nonseasonal depression. The overall pattern of results from the known groups comparison suggests that the SBQ captures a cognitive vulnerability construct that is more specific to seasonal than nonseasonal depression. However, in contrast to our a priori assertion that seasonal beliefs would represent qualitatively different cognitions in SAD relative to nonseasonal depression, these findings indicate that seasonal beliefs differ more in degree than kind in seasonal versus nonseasonal depression.

Similar to the SAS (Sigmon et al., 2007), the SBQ discriminated between SAD and nonseasonal MDD patients in the direction of elevated scores for SAD patients. Each group also differed from the other two on a more generic depressogenic cognitive vulnerability measure, the Dysfunctional Attitudes Scale (DAS), but in a different direction, with MDD patients having the highest (most maladaptive) DAS scores, followed by SAD patients, and then controls. We had expected the two depressed groups to score higher on the DAS than controls, but not to differ from each other. DAS scores are positively correlated with measures of depression severity (e.g., Weissman & Beck, 1978). Therefore, the observed pattern of group differences on the DAS was especially surprising given that SAD patients, on average, were more severely depressed than MDD patients on both the SIGH-SAD and the BDI-II.

The distribution of DAS scores for the sample of 114 SAD patients in Pittsburgh, PA included in our known groups analysis (Mean = 126.31, SD = 40.5) was very similar to the sample of 177 SAD patients in the randomized clinical trial comparing CBT-SAD and light therapy in Burlington VT we included in Study 3 (Mean DAS score at pre-treatment = 126.54, SD = 32.7). Therefore, we feel confident that our sample's DAS scores provide a reasonable estimate of true DAS scores for the population SAD patients. Only one prior published study (Hodges & Marks, 1998) compared currently depressed SAD (n = 10) and MDD patients (n = 11) to never-depressed controls (n = 10) on the DAS, and found both depressed groups significantly outscored controls but did not differ from each other. There are notable differences between that study and the current study including sample size, study site (Northeastern United States vs. London, UK), and depression severity (SAD and MDD patients were more severely depressed on the basis of mean Beck Depression Inventory scores in the range of 26–28 in Hodges and Marks, 1998). Given that there are only two studies comparing seasonally and nonseasonally depressed patients to controls on the DAS, including the current study, evidence is inconclusive on whether the DAS discriminates nonseasonal MDD patients from SAD patients. If the current study's finding that seasonal beliefs are more specific to SAD and dysfunctional attitudes are more specific to nonseaonal MDD is replicated in additional research, this would support a point of divergence in the contents of the underlying cognitive vulnerability to depression when depression expresses in a seasonal vs. nonseasonal pattern.

The application of the SBQ as a process measure in our recently completed clinical trial suggests that CBT-SAD targets seasonal beliefs more specifically than LT and that offsetting seasonal beliefs appears mechanistic of CBT-SAD's greater durability of effects in terms of recurrence prevention. Consistent with the National Institute of Mental Health's emphasis on "target engagement" (NIMH, 2015), seasonal beliefs improved at twice the rate over the

course of CBT-SAD as compared to LT, and SBQ scores were significantly lower in CBT-SAD than in LT at post-treatment. This effect appeared primarily driven by the Personal Deficiency Related to Winter and Global Summer Positivism subscales, which showed the same pattern of results as was evident for total SBQ scores. In contrast, dysfunctional attitudes, representing more generic depressogenic cognitive schemas, improved comparably over the course of both CBT-SAD and LT. Lack of treatment group differences on the DAS replicates a relatively robust finding in the field of nonseasonal unipolar depression whereby dysfunctional attitudes improve from pre- to post-treatment, and not differentially so, over effective depression treatments (i.e., cognitive therapy, group CBT, pharmacotherapy, other psychotherapy interventions, or a combination of modalities; Barber & DeRubeis, 2001; Bowers, 1990; DeRubeis et al., 1990; Dingle et al., 2010; Dozois et al., 2009; Imber et al., 1990; Jones et al., 2008; Kwon & Oei, 2003; Oei et al., 2006; Oei & Sullivan, 1999; Oei & Yeoh, 1999; Schmaling et al., 2002; Seligman et al., 1999; Simons et al., 1984; Stravynski et al., 1994; Westra et al. 2002). At least when assessed in pre- and post-treatment snapshots, the DAS appears to capture state changes in depressive symptoms. Change in seasonal beliefs has greater specificity to CBT-SAD than to LT, even though both treatments showed very similar improvements in the acute treatment of SAD (Rohan et al., 2015).

NIMH (2015) defines the term *target* as “a factor that an intervention intends to modify, based on a hypothesis that modification of that factor will result in improvement of symptoms, behavior, or functional outcomes.” To assert that CBT-SAD engages seasonal beliefs as a target, observing greater change in seasonal beliefs over CBT-SAD relative to LT is a necessary criterion, but this must also bear a relationship with an outcome in CBT-SAD as opposed to LT. A larger reduction in SBQ, but not in DAS, during treatment was associated with a lower recurrence risk two years following CBT-SAD, with no effect for either in LT. Recurrence was the primary outcome in the parent trial, which found a lower risk of recurrence in CBT-SAD (27.3%) than in LT (45.6%) at second winter followup (Rohan et al., 2016). Subsequent analyses suggested that the Global Winter Negativity subscale of the SBQ was driving this effect, suggesting that fostering less magnification/catastrophizing in one’s thoughts about the winter may be mechanistic in offsetting recurrence following CBT-SAD.

These results provide evidence that CBT-SAD exerts its lasting effects by offsetting a SAD-specific, rather than a more generic, cognitive vulnerability to depression. The first half of the CBT-SAD protocol focuses more on behavioral activation (i.e., scheduling pleasurable activities that can be done in the winter months to derive positive reinforcement), whereas the second half focuses on cognitive restructuring of automatic thoughts and core beliefs. At least when assessed at pre-, mid-, and post-treatment in this study’s design, degree of improvement in seasonal beliefs was fairly consistent over the course of CBT-SAD. These findings imply that that seasonal belief change can be comparably effected via behavioral and cognitive interventions. By virtue of initially going through the motions of performing an activity and eventually experiencing a sense of pleasure/mastery from these behaviors, patients are likely collecting contradictory evidence to beliefs like those articulated on the SBQ. As the focus of CBT-SAD becomes more explicitly cognitive, patients are encouraged to identify and restructure seasonal beliefs. CBT-SAD session 6 elicits seasonal beliefs by asking patients to imagine themselves in scenarios, such as watching the weather report

leading up to the winter solstice and seeing fewer minutes of daytime each day, seeing the first signs of fall foliage, and waking up to a cold, snowy day. Although the CBT-SAD protocol follows the patient's lead in terms of exploring cognitive content and does not require patients to focus on seasonal beliefs if more generic depressogenic thoughts are reported, these results show that seasonal beliefs continue to improve steadily over the more cognitively-focused portion of CBT-SAD.

Seasonal beliefs also improved over the first 3 weeks of LT, but then leveled off between mid- and post-treatment, whereas SBQ scores continued to improve in the second half of CBT-SAD. The two treatments did not differ on SBQ scores at mid-treatment, but CBT-SAD was associated with significantly lower SBQ scores at post-treatment than LT. It is plausible that antidepressant effects of LT provide evidence to the contrary of some seasonal beliefs as articulated in the SBQ, particularly those on the Effects of Lack of Light subscale, which showed comparable improvement over both treatments. As an example, a SAD patient may rate lower agreement with the SBQ item "It's difficult to feel good on dark, dreary days," following experience with LT if he/she perceives that light treatment improves mood on dark days. However, seasonal beliefs decreased overall at twice the rate in CBT-SAD relative to LT because seasonal beliefs continued to improve in the second half of CBT-SAD. Again, these latter CBT-SAD sessions are primarily devoted to cognitive restructuring, some of which specifically targets seasonal beliefs, and may be particularly important for engaging this target. Although our pre-, mid-, and post-assessments were an important preliminary step; future studies should administer the SBQ more frequently over the course of SAD treatment—at least weekly or after each session in CBT-SAD—to estimate the shape of change in SBQ scores over the entire acute treatment phase. More frequent assessments would also allow for mediation analyses to determine if changes in seasonal beliefs drive changes in depression in CBT-SAD vs. LT.

In conclusion, these results support the use of the SBQ as a brief assessment tool for a cognitive vulnerability that appears more specific to seasonal than nonseasonal depression and as a treatment target in clinical practice using CBT-SAD. Future studies with the SBQ should employ more diverse samples and further administration to the population for which the SBQ is intended (i.e., clinical SAD samples). The SBQ should be included in future studies examining unique and overlapping features in the cognitive profiles of seasonal versus nonseasonal depression.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

Acknowledgments

This work was supported, in part, by grant R01MH078982 from the National Institute of Mental Health to Kelly J. Rohan. Dr. Rohan receives book royalties from Oxford University Press for the treatment manual for the cognitive-behavioral therapy for SAD intervention.

APPENDIX A

Seasonal Beliefs Questionnaire

Directions: Below is a list of thoughts, attitudes, and beliefs about the seasons that people might have. Please read each statement carefully and decide how much you agree or disagree with it. For each item, write the number that corresponds to how much you agree or disagree with that statement in the blank space in front of it. Answer each statement based on HOW YOU GENERALLY THINK.

1	2	3	4	5	6	7
totally disagree	disagree very much	disagree slightly	neutral	agree slightly	agree very much	totally agree

___ 1. Winter is the best season of the year. (sbq10, GW)

___ 2. I can’t be productive on dark, dreary days. (sbq12, ELL)

___ 3. Dark, gloomy days are depressing. (sbq14, ELL)

___ 4. I look forward to winter. (sbq25, GW)

___ 5. Everything is easier in the summertime. (sbq29, GS)

___ 6. I don’t pay much attention to the changing seasons. (sbq32, LPSWE)

___ 7. Spring is no better than any other season. (sbq37, LPSWE)

___ 8. It’s difficult to feel good on dark, dreary days. (sbq40, ELL)

___ 9. I’m in a fog all winter long. (sbq43, PD)

___ 10. It’s hard to get up in the dark. (sbq50, ELL)

___ 11. I love winter. (sbq51, GW)

___ 12. Sunlight doesn’t affect my mood. (sbq55, LPSWE)

___ 13. There’s something wrong with me in the winter. (sbq61, PD)

___ 14. All is well if the sun is shining. (sbq65, GS)

___ 15. I don’t expect much of myself in the winter. (sbq68, PD)

___ 16. Dark, dreary days exhaust me. (sbq70, ELL)

___ 17. I can’t seem to get going on dark, dreary mornings. (sbq73, ELL)

___ 18. I'm a failure in the winter. (sbq76, PD)

___ 19. I welcome cold winter days. (sbq77, GW)

___ 20. I'm stuck in a rut in the winter. (sbq78, PD)

___ 21. The weather is irrelevant to how I feel.3 (sbq85, LPSWE)

___ 22. I am going to have the winter blues every year. (sbq86, PD)

___ 23. I'm not a winter person. (sbq88, GW)

___ 24. I'm always happier when it's warmer. (sbq89, GS)

___ 25. I can't snap out of my winter funk. (sbq93, PD)

___ 26. I'm ineffective in the winter. (sbq94, PD)

Notes. Reverse-coded items are shown in **bold**. Item number on the original 94-item SBQ and subscale are shown in ().

References

Aycicegi AD, & Harris CL (2003). Assessing adult attention-deficit/hyperactivity disorder: A Turkish version of the current symptoms scale. Psychopathology, 36, 160–167. [PubMed: 12845287]

Bagby RM, Ryder AG, Schuller DR, & Marshall MB (2004). The Hamilton Depression Rating Scale: Has the gold standard become a lead weight? American Journal of Psychiatry, 161, 2163–2177.

Barber JP, & DeRubeis RJ (2001). Change in compensatory skills in cognitive therapy for depression. Journal of Psychotherapy Practice Research, 10, 8–13.

Barkley RA, & Murphy KR (1998). Attention-Deficit Hyperactivity Disorder: A clinical workbook (2nd Ed.). New York, NY: Guilford Press.

Beck AT, Rush AJ, Shaw BF, & Emery G (1979). Cognitive therapy of depression. New York: Guilford Press.

Beck JS (2011). Cognitive behavior therapy: Basics and beyond (2nd ed.). New York, NY: The Guilford Press. ISBN 978-1-60918-504-6

Bentler PM, & Bonett DG (1980). Significance tests and goodness of fit in the analysis of covariance structures. Psychological Bulletin, 88, 588–606.

Bowers WA (1990). Treatment of depressed in-patients: Cognitive therapy plus medication, relaxation plus medication, and medication alone. British Journal of Psychiatry, 156, 73–78. 10.1192/bjp.156.1.73

Browne MW, & Cudeck R (1993). Alternative ways of assessing model fit. In Bollen KA & Long JS (Eds.), Testing structural equation models (pp. 136–162). Newbury Park, CA: Sage.

Carmines EG & McIver JP (1981). Analyzing models with unobserved variables: Analysis of covariance structures. In Bohrnstedt GW & Borgatta EF (Eds.), Social measurement: Current issues (pp. 65–115). Beverly Hills: Sage.

DeRubeis RJ, Hollon SD, Grove WM, Evans MD, Garvey MJ, Tuason VB, et al. (1990). How does cognitive therapy work? Cognitive change and symptom change in cognitive therapy and pharmacotherapy for depression. Journal of Consulting and Clinical Psychology, 58, 862–869. 10.1037//0022-006X.58.6.862 [PubMed: 2292637]

[3]The original phrasing of this item ("How I feel is irrelevant to the weather") was used in the current research studies. We recommend the new phrasing for dissemination of the scale because it improves clarity without changing the content of the original item.

Dingle GA, Oei TPS, & Young RM (2010). Mechanisms of change in negative thinking and urinary monoamines in depressed patients during acute treatment with group cognitive behavioral therapy and antidepressant medication. Psychiatry Research, 175, 82–88. 10.1016/j.psychres.2008.12.014 [PubMed: 19969377]

Dobson KS, & Breiter HJ (1983). Cognitive assessment of depression: Reliability and validity of three measures. Journal of Abnormal Psychology, 92, 107–109. [PubMed: 6833629]

Dozois DJA, Bieling PJ, Patelis-Siotis I, Hoar L, Chudzik S, McCabe K, et al. (2009). Changes in Self-Schema Structure in Cognitive Therapy for Major Depressive Disorder: A Randomized Clinical Trial. Journal of Consulting and Clinical Psychology, 77(6), 1078–1088. 10.1037/a0016886 [PubMed: 19968384]

First MB, Spitzer RL, Gibbon M, & Williams JBW (2002). Structured Clinical Interview for DSM-IV-TR Axis I Disorders, Research Version, Patient Edition with Psychotic Screen (SCID-I/P). New York State Psychiatric Institute.

Golden A-M, Dalgleish T, & Spinks H (2006). Dysfunctional attitudes in seasonal affective disorder. Behaviour Research and Therapy, 44, 1159–1164. [PubMed: 16290816]

Hodges S, & Marks M (1998). Cognitive characteristics of seasonal affective disorder: A preliminary investigation. Journal of Affective Disorders, 50, 59–64. [PubMed: 9716282]

Hollon SD, & Kendall PC (1980). Cognitive self-statements in depression: Development of an Automatic Thoughts Questionnaire. Cognitive Therapy and Research, 3, 383–396.

Hu L & Bentler P (1999). Cutoff criteria for fit indices in covariance structure analysis: conventional criteria versus new alternatives. Structural Equation Modeling, 6, 1–55.

Imber SD, Pilkonis PA, Sotsky SM, Watkins JT, Shea MT, Elkin I, et al. (1990). Mode-specific effects among three treatments for depression. Journal of Consulting and Clinical Psychology, 58, 352–359. 10.1037//0022-006X.58.3.352 [PubMed: 2195085]

Jones NP, Siegle GJ, & Thase ME (2008). Effects of Rumination and Initial Severity on Remission to Cognitive Therapy for Depression. Cognitive Therapy and Research, 32, 591–604. 10.1007/s10608-008-9191-0

Kwon S, & Oei TPS (2003). Cognitive change processes in a group cognitive behavior therapy of depression. Journal of Behavior Therapy and Experimental Psychiatry, 34, 73–85. 10.1016/S0005-7916(03)00021-1 [PubMed: 12763394]

Levitan RD, Rector NA, & Bagby M (1998). Negative attributional style in seasonal affective disorder. American Journal of Psychiatry, 155, 428–430.

Magnusson A, Friis S, Opjordsmoen S (1997). Internal consistency of the seasonal pattern assessment questionnaire (SPAQ). Journal of Affective Disorders, 42, 113–116. [PubMed: 9105952]

National Institute of Mental Health (2015). Strategic Plan for Research. Retrieved from http://www.nimh.nih.gov/about/strategic-planning-reports/index.shtml

Oei TPS, Bullbeck K, & Campbell JM (2006). Cognitive change process during group cognitive behaviour therapy for depression. Jounal of Affective Disorders, 92, 231–241. 10.1016/j.jad.2006.02.004

Oei TPS, & Sullivan LM (1999). Cognitive changes following recovery from depression in a group cognitive-behaviour therapy program. Australian and New Zealand Journal of Psychiatry, 33, 407–415. 10.1046/j.1440-1614.1999.00562.x

Oei TPS & Yeoh AEO (1999). Pre-existing antidepressant medication and the outcome of group cognitive-behavioural therapy. Australian and New Zealand Journal of Psychiatry, 33, 70–76. 10.1046/j.1440-1614.1999.00520.x

Radloff LS (1977). The CES-D scale: A self report depression scale for research in the general population. Applied Psychological Measurement, 1(3), 385–401.

Radloff LS (1991). The use of the Center for Epidemiologic Studies Depression Scale in adolescents and young adults. Journal of Youth and Adolescence, 20, 149–165. [PubMed: 24265004]

Radloff LS, & Locke BZ (1986). The Community Mental Health Assessment Survey and the CES-D Scale. In Weissman M, Myers J & Ross C (Eds.), Community surveys. New Brunswick, NJ: Rutgers University Press.

Raheja SK, King EA, & Thompson C (1996). The seasonal pattern assessment questionnaire for identifying seasonal affective disorders. Journal of Affective Disorders, 41, 193–199. [PubMed: 8988451]

Rohan KJ (2008). Coping with the seasons: A cognitive-behavioral approach to seasonal affective disorder. Therapist guide. In the Treatments that Work™ Series. New York, NY: Oxford University Press.

Rohan KJ, Evans M, Mahon JN, Sitnikov L, Ho S, Nillni YI, Postolache TT, & Vacek PM (2013). Cognitive-behavioral therapy vs. light therapy for preventing winter depression recurrence: Study protocol for a randomized controlled trial. TRIALS, 14, 82. [PubMed: 23514124]

Rohan KJ, Mahon JN, Evans M, Ho S, Meyerhoff J, Postolache TT, & Vacek PM (2015). Randomized trial of cognitive-behavioral therapy vs. light therapy for seasonal affective disorder: Acute outcomes. American Journal of Psychiatry, 172, 862–869.

Rohan KJ, Meyerhoff J, Ho S, Evans M, Postolache TT, & Vacek PM (2016). Outcomes one and two winters following cognitive-behavioral therapy or light therapy for seasonal affective disorder. American Journal of Psychiatry, 173, 244–251.

Rohan KJ Roecklein KA, & Haaga DAF (2009). Biological and psychological mechanisms of seasonal affective disorder: a review and integration. Current Psychiatry Reviews, 5, 37–47.

Rohan KJ, Roecklein KA, Lacy TM, & Vacek PM (2009). Winter depression recurrence one year after cognitive-behavioral therapy, light therapy, or combination treatment. Behavior Therapy, 40, 225–238. [PubMed: 19647524]

Rohan KJ, Roecklein KA, Tierney Lindsey K, Johnson LG, Lippy RD, Lacy TM, & Barton FB (2007). A randomized controlled trial of cognitive-behavioral therapy, light therapy, and their combination for seasonal affective disorder. Journal of Consulting and Clinical Psychology, 75, 489–500. [PubMed: 17563165]

Rohan KJ, Sigmon ST, & Dorhofer DM (2003). Cognitive-behavioral factors in seasonal affective disorder. Journal of Consulting and Clinical Psychology, 71(1), 22–30. [PubMed: 12602422]

Rohan KJ, Tierney Lindsey K, Roecklein KA, & Lacy TA (2004). Cognitive-behavioral therapy, light therapy, and their combination in treating seasonal affective disorder. Journal of Affective Disorders, 80, 273–283. [PubMed: 15207942]

Rosenthal NE, Bradt GH, & Wehr TA (1984). Seasonal Pattern Assessment Questionnaire. Bethesda, MD: National Institute of Mental Health.

Rosenthal NE, Sack DA, Gillin JC, Lewy AJ, Goodwin FK, Davenport Y et al. (1984). Seasonal affective disorder: A description of the syndrome and preliminary findings with light therapy. Archives of General Psychiatry, 41, 72–80. [PubMed: 6581756]

Schmaling KB, Dimidjian S, Katon W, & Sullivan M (2002). Response styles among patients with minor depression and dysthymia in primary care. Journal of Abnormal Psychology, 111(2), 350–356. 10.1037//0021-843X.111.2.350 [PubMed: 12003456]

Seligman MEP, Schulman P, DeRubeis RJ, & Hollon SD (1999). The prevention of depression and anxiety. Prevention & Treatment, 2 (1), np. 10.1037//1522-3736.2.1.28a

Sigmon ST, Rohan KJ, Boulard NE, Whitcomb SR, & Dorhofer DM (2000). Development and validation of the Seasonal Attitudes Scale. Paper presented at the meeting of the Association for the Advancement of Behavior Therapy, New Orleans, LA.

Sigmon ST, Whitcomb-Smith S, Boulard NE, Pells JP, Hermann BA, Edenfield TM, LaMattina SM, & Shartell JG (2007). Attentional bias and psychophysiological arousal in seasonal and nonseasonal depression. Cognitive Therapy and Research, 31, 619–638.

Simons AD, Garfield SL, & Murphy GE (1984). The process of change in cognitive therapy and pharmacotherapy for depression. Archives of General Psychiatry, 41, 45–51. 10.1097/00004714-198406000-00021 [PubMed: 6691784]

Stravynski A, Verreault R, Gaudette G, Langlois R, Gagnier S, Larose M, et al. (1994). The treatment of depression with group behavioural-cognitive therapy and Imipramine. Canadian Journal of Psychiatry, 39, 387–390. [PubMed: 7987780]

Tierney Lindsey K, Rohan KJ, Roecklein KA, & Mahon JN (2011). Surface facial electromyography, skin conductance, and self-reported emotional responses to light- and season-relevant stimuli in seasonal affective disorder. Journal of Affective Disorders, 133, 311–319. [PubMed: 21600661]

Weissman A, & Beck AT (1978). Development and validation of the Dysfunctional Attitude Scale: A preliminary investigation. Paper presented at the annual meeting of the American Educational Research Association, Toronto, Ontario, Canada.

Westra HA, Dozois DJA, & Boardman C (2002). Predictors of treatment change and engagement in cognitive-behavioral group therapy for depression. Journal of Cognitive Psychotherapy, 16(2), 227–241. 10.1891/088983902780906355

Whitcomb-Smith S, Sigmon S, & Kendrew J (2002). The development of an instrument to measure cognitions about seasonal changes. Poster presented at the meeting of the Association for the Advancement of Behavior Therapy, Reno, NV.

Williams JBW, Link MJ, Rosenthal NE, Amira L, & Terman M (1992). Structured Interview Guide for the Hamilton Depression Rating Scale—Seasonal Affective Disorder Version (SIGH-SAD). New York: New York State Psychiatric Institute.

Young MA (1999). Integrating psychological and physiological mechanisms of SAD: The dual-vulnerability model. Biological Rhythms Bulletin, 1, 4–6.

Young MA, & Azam O (2003). Ruminative response style and the severity of seasonal affective disorder. Cognitive Therapy and Research, 27, 223–233.

Public Significance Statement

This study developed and tested the Seasonal Beliefs Questionnaire (SBQ), a measure of maladaptive thoughts about the seasons, light availability, and weather conditions. Results suggest that the SBQ holds promise as a brief, self-report tool for assessing maladaptive thoughts that may constitute a unique cognitive vulnerability to winter depression and that are directly targeted in cognitive-behavioral therapy for seasonal affective disorder (CBT-SAD).

Table 1

Reliability estimates for exploratory and confirmatory factor analysis

SBQ Subscale	Exploratory FA α	Confirmatory FA α
Personal Deficiency Related to Winter (PD)	.94 (10 items)	.93 (8 items)
Global Summer Positivism (GS)	.81 (6 items)	.71 (3 items)
Global Winter Negativity (GW)	.93 (5 items)	.93 (5 items)
Lack of Perceived Seasonal or Weather Effect (LPSWE)	.66 (4 items)	.66 (4 items)
Effects from Lack of Light (ELL)	.91 (8 items)	.87 (6 items)

Note: Chronbach's alpha shown EFA subscales, and for CFA subscales which had a total of seven items removed from PD, GS, and ELL subscales after CFA refinement based on modification indices.

Table 2

Standardized factor loadings of items onto Seasonal Beliefs Questionnaire (SBQ) subscale factors, from confirmatory analysis results

Item	Content	Estimate
	Personal Deficiency Related to Winter (PD)	
SBQ61	There's something wrong with me in the winter.	.84
SBQ78	I'm stuck in a rut in the winter.	.87
SBQ68	I don't expect much of myself in the winter.	.77
SBQ93	I can't snap out of my winter funk.	.69
SBQ43	I'm in a fog all winter long.	.81
SBQ94	I'm ineffective in the winter.	.76
SBQ86	I am going to have the winter blues every year.	.78
SBQ76	I'm a failure in the winter.	.79
	Global Summer Positivism (GS)	
SBQ65	All is well if the sun is shining.	.43
SBQ89	I'm always happier when it's warmer.	.81
SBQ29	Everything is easier in the summertime.	.78
	Global Winter Negativity (GW)	
SBQ10	Winter is the best season of the year.	.81
SBQ51	I love winter.	.90
SBQ25	I look forward to winter.	.88
SBQ77	I welcome cold winter days.	.81
SBQ88	I'm not a winter person.	.86
	Effects from Lack of Light (ELL)	
SBQ70	Dark, dreary days exhaust me.	.79
SBQ40	It's difficult to feel good on dark, dreary days.	.87
SBQ12	I can't be productive on dark, dreary days.	.61
SBQ73	I can't seem to get going on dark, dreary mornings.	.75
SBQ14	Dark, gloomy days are depressing.	.83
SBQ50	It's hard to get up in the dark.	.61
	Lack of Perceived Seasonal or Weather Effect (LPSWE)	
SBQ85	The weather is irrelevant to how I feel.	.76
SBQ32	I don't pay much attention to the changing seasons.	.62
SBQ55	Sunlight doesn't affect my mood.	.64
SBQ37	Spring is no better than any other season.	.41

Note: Item numbers reflect the 94-item measure used in the psychometric study.

Table 3

Pearson's correlations between the Seasonal Beliefs Questionnaire (SBQ) and other measures

Seasonal Measures	**SBQ**	**SAS**	**SATS**	**SPAQ GSS**	**SIGH-SAD-SR**
Seasonal Beliefs Questionnaire (SBQ)	1	.767*	.596*	.453*	.367*
Seasonal Attitudes Scale (SAS)		1	.614*	.542*	.456*
Seasonal Automatic Thoughts Survey (SATS)			1	.619*	.698*
Seasonal Pattern Assessment Questionnaire global seasonality score (SPAQ GSS)				1	.534*
Nonseasonal Measures	**SBQ**	**DAS**	**ATQ**	**CES-D**	**CSS**
Seasonal Beliefs Questionnaire (SBQ)	1	.346*	.348*	.403*	.282*
Dysfunctional Attitudes Scale (DAS)		1	.547*	.515*	.367*
Automatic Thoughts Questionnaire (ATQ)			1	.742*	.609*
Center for Epidemiological Studies – Depression Scale (CES-D)				1	.397*
Current Symptoms Scale (CSS)					1

Note.

* $p < 0.001$, * (2-tailed).

Table 4

Known groups comparisons between SAD patients, patients with nonseasonal Major Depressive Disorder, and never-depressed controls on Seasonal Beliefs Questionnaire (SBQ) and Dysfunctional Attitudes Scale (DAS) scores

Measure	n	Mean	SD	Statistic for Group Comparison	Cohen's d [95% CI]
SBQ				$F(2, 277) = 190.60$, $p < .001$	2.21 [1.91, 2.50]
SAD[b,c]	114	146.42	17.81		
MDD[a,c]	35	120.97	24.81		
Control[a,b]	134	93.34	23.09		
SBQ-PD				$F(2, 280) = 240.86$, $p < .001$	2.49 [2.18, 2.80]
SAD[b,c]	114	39.69	8.67		
MDD[a,c]	35	28.66	10.57		
Control[a,b]	134	15.98	7.7		
SBQ-GS				$F(2, 280) = 33.51$, $p < .001$	0.86 [0.62, 1.11]
SAD[b,c]	114	17.43	2.87		
MDD[a]	35	14.89	4.82		
Control[a]	134	13.85	3.49		
SBQ-GW				$F(2, 280) = 39.67$, $p < .001$	1.01 [0.77, 1.26]
SAD[b,c]	114	24.93	4.12		
MDD[a,c]	35	22.43	4.98		
Control[a,b]	134	19.36	5.5		
SBQ-ELL				$F(2, 280) = 116.10$, $p < .001$	1.75 [1.47, 2.02]
SAD[b,c]	114	34.03	5.47		
MDD[a,c]	35	28.63	7.34		
Control[a,b]	134	20.78	7.73		
SBQ-LPSWE				$F(2, 280) = 58.34$, $p < .001$	1.18 [0.93, 1.43]
SAD[b,c]	114	24.53	2.63		

Measure	n	Mean	SD	Statistic for Group Comparison	Cohen's d [95% CI]
MDD[a,c]	35	21.34	4.28		
Control[a,b]	134	19.23	4.55		
DAS				$F(2, 278) = 21.18$, $p < .001$	0.69 [0.45, 0.93]
SAD[b,c]	114	126.31	40.48		
MDD[a,c]	35	149.2	48.56		
Control[a,b]	132	104.48	35.66		
SIGH-SAD				$F(2, 271) = 464.32$, $p < .001$	3.49 [3.12, 3.87]
SAD[b,c]	109	30.04	7.32		
MDD[a,c]	34	17.59	10.19		
Control[a,b]	131	4.23	4.26		
BDI-II				$F(2, 269) = 263.84$, $p < .001$	2.75 [2.42, 3.08]
SAD[b,c]	108	22.21	8.39		
MDD[a,c]	34	16.76	11.87		
Control[a,b]	130	1.73	2.69		

Note. Superscripts indicate paired contrast results:

[a]significantly different from SAD group,

[b]significantly different from MDD group,

[c]significantly different from Control group. SAD = Seasonal affective disorder patients, MDD = Patients with non-seasonal Major Depressive Disorder, Control = control participants with no history of Major Depressive Disorder and global seasonality scores in the normal range. ES = effect size, expressed as Cohen's d. See Table 1 for Seasonal Beliefs Questionnaire (SBQ) subscale names and abbreviations. DAS = Dysfunctional Attitudes Scale-Form A. SIGH-SAD = Structured Interview Guide for the Hamilton Rating Scale for Depression-Seasonal Affective Disorder Version. BDI-II = Beck Depression Inventory-Second Edition.

Psychol Assess. Author manuscript; available in PMC 2021 March 24.

Table 5

Seasonal Beliefs Questionnaire (SBQ) scores at pre-, mid-, and post-treatment in CBT-SAD and Light Therapy

Measure	LS-Mean (SE)		Cohen's d [95% CI]	*F*	LS-Mean (SE)		Cohen's d [95% CI]	*F*	LS-Mean (SE)		Cohen's d [95% CI]	*F*
	CBT-SAD (n = 88)	LT (n = 87)			CBT-SAD (n = 77)	LT (n = 86)			CBT-SAD (n = 84)	LT (n = 87)		
SBQ	142.72 (1.94)	140.02 (1.94)	0.15 [−0.15, 0.45]	0.97	134.54 (2.01)	133.75 (1.95)	0.05 [−0.26, 0.35]	0.08	124.67 (1.97)	130.88 (1.94)	0.35 [0.04, 0.65]	5.06*
GW	24.53 (0.52)	23.71 (0.52)	0.17 [− 0.13, 0.487]	1.26	23.82 (0.54)	23.00 (0.52)	0.17 [−0.14, 0.48]	1.2	22.48 (0.53)	22.7 (0.52)	0.05 [−0.25, 0.35]	0.09
GS	17.24 (0.32)	17.03 (0.32)	0.07 [−0.23, 0.37]	0.21	16.88 (0.33)	17.01 (0.32)	0.05 [−0.26, 0.35]	0.09	16.09 (0.33)	17.14 (0.32)	0.35 [0.05, 0.65]	5.31*
PD	40.25 (0.86)	39.05 (0.86)	0.15 [− 0.15, 0.45]	0.97	35.25 (0.90)	35.52 (0.87)	0.03 [−0.27, 0.34]	0.05	31.41 (0.88)	34.33 (0.86)	0.37 [0.06, 0.67]	5.64*
ELL	35.78 (0.60)	35.38 (0.59)	0.07 [−0.22, 0.37]	0.23	33.47 (0.62)	33.25 (0.60)	0.04 [−0.27, 0.35]	0.06	30.79 (0.61)	31.95 (0.60)	0.21 [−0.09, 0.51]	1.86
LPSWE	19.22 (0.27)	19.48 (0.27)	0.10 [−0.19, 0.40]	0.5	19.64 (0.28)	19.45 (0.27)	0.08 [−0.23, 0.38]	0.24	18.71 (0.27)	19.4 (0.27)	0.28 [−0.02, 0.58]	3.23

Note. LS-Mean = Least Squared Mean. CBT-SAD = SAD-tailored cognitive-behavioral therapy. LT = light therapy. See Table 1 for subscale names and abbreviations,

*$p < .05$.