ATTRIBUTION, LABELING AND TREATMENT

OF ENVIRONMENTALLY-RELATED MOOD AND BEHAVIOR CHANGES

by

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Abstract

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High rates of untreated affective disorders remain a concern in the United States. The degree to which seasonal depression (depressive episodes occurring predominantly during a specific time of year) contributes to this burden is unclear. Despite widely accepted and available treatments for these disorders, a substantial number of individuals do not obtain appropriate care for reasons that include cultural preferences and situational obstacles. In addition to these barriers to care, individuals' explanatory models influence treatment-seeking decisions. Causal attribution is one facet of this explanatory model. Identifying the characteristics of individuals who attribute mood change to environmental factors contributes to a better understanding of how people develop their causal models and whether causal models that include environmental factors are associated with treatment seeking.

This dissertation addressed three specific research aims, exploring (1) the conditions under which individuals make environmental attributions for recent mood change; (2) the relationship among depressive symptom severity, labeling, and attribution; and (3) the relationship of all of these factors with treatment seeking. A mixed-method study using a purposive national online sample was utilized.

The results of the study indicated that seasonality (highly variable mood and mood-related behavior across seasons) was associated with an increased likelihood of making environmental (i.e., photoperiod) vs. non-environmental (i.e., chemical imbalance) attributions. Further, environmental attributions were associated with clinically labeling symptoms, perceived control over natural light exposure, low perceived illness threat, and a decreased likelihood of seeking clinical treatment. As a whole, these findings indicate a complex relationship among environmental attribution, labeling, and treatment seeking for mood change that is strongly impacted by seasonality and symptom severity. The findings also reveal a need for future investigations of seasonality as a risk factor for depression.

Finding relationships between seasonality, environmental attribution, and illness behaviors in a community sample provides a solid foundation on which to launch future prospective studies regarding the role of environmental factors in causal models and treatment seeking patterns related to affective disorders. If heightened sensitivity to environmental factors places individuals at a greater risk for affective disorders, then understanding the etiology of seasonal mood change could mitigate future episodes.

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Table of Contents

CHAPTER I: LITERATURE REVIEW…….....1
Introduction……..1
Illness Perception……7
Seasonal Pattern Specifier……..17
Seasonal Sensitivity……...21
Light Hunger……..27
Assessment……35
Conclusion……38
Research Aims & Hypotheses……...39

CHAPTER II: RESEARCH METHODS……..42
Method of Administration……..42
Incentive structure……..45
Survey Construction……...48
Measures……50
Participants & Procedure……...62
Data Management……..69
Data Collection……..70
Quantitative Data Collection Procedures……...71
Qualitative Data collection Procedures……..72
Data Analysis……72
Qualitative Data Coding……74
Preliminary Quantitative Analysis……79

CHAPTER III: ANALYSIS & FINDINGS……...83
Descriptive Analyses…….....83
Hypothesis Testing……90
Research Aim I Analyses……...90
Aim I findings summary……..112
Research Aim II Analyses……...113
Aim II findings summary……121
Research Aim III Analyses……..122
Aim III findings summary……...142

CHAPTER IV: DISCUSSION……..143
Background Summary……143
Review of Findings……..144
Implications……..147
Reflections on Methodological Choices……..153
Plans for Future Research……161
Concluding Thoughts……...163

References……...228

List of Tables

Table 1 Scale Distributions……..166
Table 2 Frequency of Environmental Attribution……..81
Table 3 Characteristics of Eligible Participants by Survey Completion Status…….84
Table 4 Mean Number of Hours Online (Not Including Email) Per Week by Survey Completion Status…….85
Table 5 Characteristics of Research Sample vs. 2000 US Census……85
Table 6 Mean Number of Hours Online of Research Sample vs. General Social Survey (GSS)……87
Table 7 Ineligible Survey Respondents by Eligibility Criterion……87
Table 8 Characteristics by Eligibility Status……..88
Table 9 Mean Number of Hours Online (Not Including Email) Per Week by Eligibility Status……...89
Table 10 Seasonality Score as a Predictor of Environmental Attribution by Attribution Treatment……...91
Table 11 Seasonality Score (GSS) as a Linear and Non-Linear Predictor of Environmental Attribution by Attribution Treatment……...92
Table 12 Summary of Potential Covariates by Attribution Treatment and Method of Removal……94
Table 13 Seasonality Treated as a Clinically-Relevant Binary Variable Predicts Environmental Attribution……96
Table 14a Seasonality Treated as a Clinically-Relevant Binary Variable Predicts Quantitative Environmental Attribution, Covariate Model……..96
Table 14b Seasonality Treated as a Clinically-Relevant Binary Variable Predicts Qualitative Environmental Attribution, Covariate Model……96
Table 14c Seasonality Treated as a Clinically-Relevant Binary Variable Predicts Any Type of Environmental Attribution, Covariate Model…….96
Table 15 Seasonality (in Quintiles and Treated Continuously) Predicts Environmental Attribution, by Attribution Treatment……..97
Table 16a Seasonality (in Quintiles and Treated Continuously) Predicts Quantitative Environmental Attribution, Covariate Model……..97
Table 16b Seasonality (in Quintiles and Treated Continuously) Predicts Qualitative Environmental Attribution, Covariate Model……..98
Table 16c Seasonality (in Quintiles and Treated Continuously) Predicts Any Environmental Attribution, Covariate Model……..98
Table 17 Seasonality, (in Quintiles and Treated Categorically), Predicts Environmental Attribution by Attribution Treatment……..99
Table 18 Factor Analysis Structure Matrix for Light Questions, Two-Factor Solution……...100
Table 19 Factor Analysis Structure Matrix for Light Questions, Three-Factor Solution……...102
Table 20 Component Correlation Matrix, Three-Factor Solution…….102
Table 21 Z-Scores of Light Factors……...103
Table 22a Factors Related to Natural Light Exposure Associated with Quantitative Environmental Attribution……..104

Table 22b Factors Related to Natural Light Exposure Associated with Qualitative Environmental Attribution……..105
Table 22c Factors Related to Natural Light Exposure Associated with Any Environmental Attribution……..106
Table 23 Brief IPQ Factor Analysis Structure Matrix, Two-Factor Solution……107
Table 24 Brief IPQ Score Associated with Environmental Attribution, by Attribution Treatment……109
Table 25 Brief IPQ Factor Analysis Structure Matrix, Three-Factor Solution……..110
Table 26a Illness Perception "Control" Factor Does Not Predict Environmental Attribution……...111
Table 26b Responses to Brief IPQ item "How Much Control Do You Feel You Have Over Your Changes in Mood and/or Behavior?" Do Not Predict Environmental Attribution……..111
Table 27 Severity of Depressive Symptoms and General Psychological Distress Do Not Predict Use of Clinical Labeling……..115
Table 28 Severity of Depressive Symptoms and General Psychological Distress (Continuous) Do Not Predict Clinical Labeling with Quadratic……115
Table 29 Environmental Attribution, by Treatment, as a Predictor of Clinical Labeling……..116
Table 30a Quantitative Environmental Attribution Does Not Predict Clinical Labeling……..117
Table 30b Qualitative Environmental Attribution Predicts Clinical Labeling……117
Table 30c Any Type of Environmental Attribution Predicts Clinical Labeling……..117
Table 31a Quantitative Environmental Attribution Interacts with Distress to Predict Clinical Labeling……118
Table 31b Qualitative Environmental Attribution Does Not Interact with Distress to Predict Clinical Labeling……119
Table 31c Any Type of Environmental Attribution Interacts with Distress to Predict Clinical Labeling……119
Table 32a At the Highest Levels of Distress, Quantitative Environmental Attribution is Associated with Clinical Labeling……..120
Table 32b At the Lowest Levels of Distress, Quantitative Environmental Attribution is Associated with Clinical Labeling……..120
Table 33a At the Highest Levels of Distress, Any Type of Environmental Attribution is Associated with Clinical Labeling……..121
Table 33b At the Lowest Levels of Distress, Any Type of Environmental Attribution is Associated with Clinical Labeling……..121
Table 34 Socio-Demographic Characteristics Associated with Clinical Treatment Seeking……124
Table 35a Prior Psychiatric Diagnosis and Prescription Drug Use are Associated with Seeking Clinical Treatment……124
Table 35b Prior Psychiatric Diagnosis and Prescription Drug Use are Associated with Seeking Clinical Treatment, Covariate Model……124
Table 36a Clinical Labeling is Associated with Clinical Treatment Seeking……125
Table 36b Clinical Labeling is Associated with Clinical Treatment Seeking When Controlling for Prior Psychiatric Diagnosis and Prescription Drug Use……125

Table 37 Environmental Attribution is Not Associated with Clinical Treatment Seeking……125
Table 38a Clinical Labeling and Quantitative Environmental Attribution Interact to Decrease Likelihood of Clinical Help Seeking……...126
Table 38b Clinical Labeling and Quantitative Environmental Attribution Do Not Interact to Predict Clinical Help Seeking, Covariate Model……...126
Table 39a Clinical Labeling and Qualitative Environmental Attribution Do Not Interact to Predict Clinical Help Seeking…….127
Table 39b Clinical Labeling and Qualitative Environmental Attribution Do Not Interact to Predict Clinical Help Seeking, Covariate Model……127
Table 40a Clinical Labeling and Any Type of Environmental Attribution Do Not Interact to Predict Clinical Help Seeking……127
Table 40b Clinical Labeling and Any Type of Environmental Attribution Do Not Interact to Predict Clinical Help Seeking, Covariate Model……..127
Table 41 Psychological Distress and Depressive Symptom Severity Predict Clinical Treatment Seeking……..130
Table 42a Severity of Depressive Symptoms (Continuous) Slightly Associated with Clinical Help Seeking, Covariate Model……131
Table 42b Severity of Depressive Symptoms (Continuous) Not Associated with Clinical Help Seeking when Controlling for Psychological Distress…….131
Table 43a Severity of Depressive Symptoms (Cut-Point) Not Associated with Clinical Help Seeking, Covariate Model……..132
Table 43b Severity of Depressive Symptoms (Cut-Point) Not Associated with Clinical Help Seeking when Controlling for Psychological Distress……...132
Table 44 Psychological Distress (Continuous) Slightly Associated with Clinical Help Seeking, Covariate Model……...132
Table 45a Psychological Distress (Cut-Point) Associated with Clinical Help Seeking, Covariate Model……..133
Table 45b Psychological Distress (Cut-Point) is Not Associated with Clinical Help Seeking, When Controlling for Depressive Symptom Severity (Continuous)……...133
Table 45c Psychological Distress (Cut-Point) is Not Associated with Clinical Help Seeking, When Controlling for Depressive Symptom Severity (Cut-Point)……..133
Table 46a Depressive Symptom Severity Does Not Interact with Quantitative Environmental Attribution to Predict Clinical Help Seeking…….134
Table 46b Depressive Symptom Severity Does Not Interact with Qualitative Environmental Attribution to Predict Clinical Help Seeking…….134
Table 46c Depressive Symptom Severity Does Not Interact with Any Type of Environmental Attribution to Predict Clinical Help Seeking…….135
Table 47 Depressive Symptom Severity (Cut-Point) Does Not Interact with Environmental Attribution to Predict Clinical Help Seeking, by Attribution Treatment…….136
Table 48a Psychological Distress (K6) Does Not Interact with Quantitative Environmental Attribution to Predict Clinical Help Seeking…….137
Table 48b Psychological Distress Interacts with Qualitative Environmental

Attribution to Predict Clinical Help Seeking……..137
Table 48c Psychological Distress Interacts with Any Type of Environmental Attribution to Predict Clinical Help Seeking……..137
Table 49a At Higher Levels of Distress, Qualitative Environmental Attribution is Not Associated with Clinical Help Seeking……138
Table 49b At Lower Levels of Distress, Qualitative Environmental Attribution is Negatively Associated with Clinical Help Seeking……138
Table 50a At Higher Levels of Distress, Any Type of Environmental Attribution is Not Associated with Clinical Help Seeking……139
Table 50b At Lower Levels of Distress, Any Type of Environmental Attribution is Negatively Associated with Clinical Help Seeking……139
Table 51a Psychological Distress (Cut-Point) Interacts with Quantitative Environmental Attribution to Predict Clinical Help Seeking……..140
Table 51b Psychological Distress (Cut-Point) Interacts with Qualitative Environmental Attribution to Predict Clinical Help Seeking……..140
Table 51c Psychological Distress (Cut-Point) Interacts with Any Type of Environmental Attribution to Predict Clinical Help Seeking……..140
Table 52 Variables in Analysis……..167

Appendices

APPENDICES……169
Appendix A: Survey items……169
Appendix B: Recruitment Announcement……187
Appendix C: Recruitment message to online community group managers ……188
Appendix D: Recruitment Announcement posting locations by region ……189
Appendix E: Recruitment Announcement posting schedule ……190
Appendix F: Text of Informed Consent website……193
Appendix G: Data checking protocol……194
Appendix H: Raw data transfer protocol……195
Appendix I: Qualitative coding ……196
Appendix J: Attribution variables……210
Appendix K: Additional analyses related to hypothesis testing……212

CHAPTER 1: LITERATURE REVIEW

"To simply treat manifest symptoms and syndromes without addressing the conditions that contribute to their persistence or reoccurrence, is inefficient and perhaps even pointless (Mechanic, 1995, p. 1209)."

Definition

In determining terms of reference for this project, I struggled to balance a desire for stigma-free language with a need for definitional clarity. When discussing changes in mood and mood-related behavior (MRB) associated with season, one runs the risk of an immediate association with pathology when mood and MRB changes are labeled as Seasonal Affective Disorder (SAD). The colloquial use of depression is not equivalent to the clinical psychiatric definition of major depressive disorder and other affective disorders. For the purposes of this research, "seasonal depression" will be used to represent changes in mood and MRB that a person attributes to a specific time of year whether or not the overall experience meets *Diagnostic and Statistical Manual* (DSM-IV) clinical criteria. "Seasonal affective disorder" (SAD) will reference the DSM-sanctioned recurrent major depressive and bipolar disorders with a "seasonal pattern specifier" requiring that temporally-bounded depressive episodes must be more prevalent than non-seasonal episodes for a clinical diagnosis (APA: American Psychological Association, 1994).

Introduction

The field of environmental psychology situates the understanding of human phenomena within environmental contexts. From this perspective, "environment" can be conceived as

both context and a possible factor of influence. Environmental influences on human behavior can be separated into many inter-dependent categories ranging from physical space and the objects within it to the socio-cultural conditions in which we make meaning and choose to act. In turn, the moods and cognitions driving behavior are also shaped by factors of these environments. Everyday reactions to life experiences and environmental exposures taking place within these interwoven contexts represent a full spectrum of emotional and behavioral experiences. Environmental exposures have been attributed as causes for periods of psychological dysfunction (Young, Meaden, Fogg, Cherin, & Eastman, 1997) alongside the more commonly recognized causes such as physical illness, social stressors, and biochemical imbalances (APA, 1994). The relational complexities among environmental exposures and psychological and behavioral outcomes remain largely unknown. A better understanding of the degree to which exposure to environmental factors can impact mood and mood-related behavior (MRB) can be achieved through an investigation of psychological state, illness behavior, seasonal sensitivity, and light exposure behavior.

The World Health Organization estimates that major depression is the leading cause of disability for people aged 15-44 years (WHO, 2004). Annually 20.9 million (9.5%) people living in the United States experience a mood disorder (Kessler, Chiu, Demler, & Walters, 2005). Of this group, 14.8 million, (6.7% of the U.S. population), experience mood and behavior changes, which qualify for a major depressive disorder diagnosis. In addition to the personal hardships that accompany psychological dysfunction, mood disorders are associated with work-related impairments, (Lerner et al., 2004), high rates

of health care services utilization (Wang et al., 2005), and elevated morbidity and mortality in chronic illness (Evans & Charney, 2003).

Despite widely accepted and available treatments for many types of mood disorder, a substantial proportion of individuals do not obtain adequate treatment (Edlund, Unützer, & Curran, 2006; Jorm et al., 2000; Mojtabai, 2009). Along with the commonly cited reasons for this including lack of financial resources, situational barriers, cultural preferences, perceived need, and previous negative experiences with the health care system (Croyle, Sun, & Hart, 1997; Kessler et al., 2001; Mojtabai, Olfson, & Mechanic, 2002), a person's explanatory model associated with their mood and MRB changes may influence psychiatric treatment seeking behaviors. Because the burden of depression is wide sweeping, it is important to understand the role that seasonal mood and MRB change may play in individual-, community-, and national-level mental health processes.

It is difficult to determine definitively the number of people whose depressive episodes occur predominantly at a specific time of year because longitudinal data are required to chart course of illness. Seasonal depression is associated with classic depression symptoms, (i.e., low mood, lack of interest in typically engaging activities, and poor concentration), psychomotor complaints (i.e., feeling heavy and slow), as well as "atypical vegetative symptoms," (i.e., cravings for carbohydrate-rich food, difficulty waking, and weight gain) (Magnusson & Boivin, 2003). The etiology of seasonal depression has been associated with shifts in circadian rhythms (Wehr, Duncan, Sher, Aeschbach, Schwartz, et al., 2001); vulnerabilities to seasonality (Lam, Tam, Yatham,

Shiah, & Zis, 2001); latitude (Mersch, Middendorp, Bouhuys, Beersma, & van den Hoofdakker, 1999); photoperiod (Young, Meaden, Fogg, Cherin, & Eastman, 1997) and alternations to rod cell shape (Lee, Blashko, Janzen, Paterson, & Chan, 1997). Because etiology remains unclear, it is important to question the conceptualization of seasonal mood and MRB change as a clinical disorder.

Responses to emotionally challenging situations often result in expressions of grief, anxiety, or sadness that resemble psychological disorders without apparent contexts (Horwitz & Wakefield, 2007). When there is a "cause" for these episodes, brought on by identifiable events, the episodes are generally perceived as normal reactions. The APA maintains a symptom-centered, categorical diagnostic and treatment approach that takes cause into account inconsistently (Luyten & Blatt, 2007) providing caveats for depressive episodes related to general medical conditions, side effects of substance abuse or prescription medications, and bereavement but not for other identifiable causes (e.g. divorce or job loss; APA, 1994). If exposure to a decrease in natural light, an increase in rainy days, or other phenomena related to factors of the natural environment "cause" depression-related symptoms, this reaction (presuming it is proportionate to the cause) should be considered a "normal" reaction to an environmental stimulus and should not qualify as a depressive disorder diagnosis.

Mood and MRB changes associated with seasonal depression are naturally occurring. Prior to industrialization, shifts in physiology, (such as melatonin secretion levels), denoting changes in season likely served a protective function (Roenneberg & Aschoff,

1990; Wehr et al., 2001). For example, spending more time indoors during winter months could be a reasonable response to cold weather and difficult to navigate terrain. In psychiatry, the challenge of separating normative responses to life experiences from generally pathological behaviors may have increased in recent years. This may be especially true in the United States where the American Psychological Association (APA) as well as the healthcare and pharmaceutical industries pursue and maintain a symptom-centered diagnostic and treatment approach (Luyten & Blatt, 2007). The argument detailed in Horwitz and Wakefield's (2007) *Loss of Sadness* focusing on the conflation of normal, situation-appropriate sorrow with major depression, is applicable to this discussion of seasonal depression. Horwitz and Wakefield contend that failure to differentiate natural experiences from the pathologic evolved out of a desire for streamlined, replicable diagnostic categories that took the shape of the DSM-III (APA, 1987). While these guidelines facilitated psychiatric research, they created a reliance on classification through symptom identification completely eliminating cause and context of phenomena (Luyten & Blatt, 2007). Although arguments have been made in favor of a categorical approach that allows for differentiation within diagnostic categories (Ruscio, Brown & Ruscio, 2009), the current DSM structure does not achieve this. The current approach has led to a lumping of similarly appearing phenomena into categories of disorder ignoring comorbidity across categories (such as mood and personality disorders), and blurry boundaries (between disordered and non-disordered responses) to which measures of treatment and prevention are difficult to apply successfully (Parker 2000; Parker & Crawford, 2007; Widiger & Samuel, 2005).

I contend that the presence of broad, a-contextual DSM criteria for depression allows for the conflation of clinically significant depression and seasonally-related changes in mood and MRB that do not necessarily meet clinically dysfunctional levels. By extension, this conflation impacts research employed to validate these diagnoses – additionally challenging the calculation of prevalence rates and treatment response. Parker and Crawford (2007) argue for a conceptual restructuring of depression that would consider symptom experience and personality characteristics during the diagnostic process. After examining self-reported data related to depression, personality, and coping responses of 2,692 online participants claiming a recent depressive episode, the authors defined six unique symptom-response profiles. They posit an expansion of depression definition from a categorical to a dimensional model, which would include personality style, mood reactivity and symptom pattern and would allow treatments to better target individuals as multidimensional entities. Similarly, heralding a new dimensional approach to diagnosis, First (2005) acknowledges the challenges of implementing an alternative model. Abandoning a symptom-based diagnostic system would create difficulties integrating new conceptualizations into clinical practice, healthcare systems, and matching the results of research using the dimensional approach with previous outcomes.

Should mood and MRB changes be treated clinically instead of and/or in addition to addressing the exposure that is believed to have caused them? It is necessary to determine if individuals with seasonal mood and MRB change should be clinically distinct from those expressing symptoms classifiable as non-seasonal affective disorders. Following the tradition of critically examining the underlying conceptualizations of clinical

psychiatric disorders, this research seeks to better understand those who attribute changes in mood and/or MRB to seasonal changes in the environment, and the phenomenon's relationship to DSM-IV classification of major depressive episode, recurrent with seasonal pattern specifier related to major depressive disorder and bipolar disorders (APA, 1994), referred to here as seasonal affective disorder (SAD). Better insight into the characteristics of those formally or informally diagnosed with seasonal depression will allow for the development of behavioral, cognitive, and environmental alterations to lifestyle to reduce problematic changes in mood and/or mood-related behavior.

Illness Perception

What kinds of self-assessments eventuate in formal or informal diagnoses of seasonal depression? To explain how people cognitively represent somatic sensations and psychological changes as seasonal depression, Leventhal's (1970) model of self-regulation illustrating parallel stages of objective and subjective information processing can be applied. The model details cognitions ranging from assessments of stimuli for content and meaning using personal previous experiences and abstract knowledge, selection of possible coping responses, and overall appraisals of meaning to self. This model is especially useful because it acknowledges the existence of socio-cultural and individual influences embedded within emotional and cognitive evaluations of health threat. In this way "illness perceptions" reflect individual variations in social values and experiences (Leventhal, Diefenbach, & Leventhal, 1992). Cognitive feedback is acknowledged by the model as well. Appraisals are continually renewed as new information is gathered (i.e., doctor corroborates existence of a symptom), symptoms

change (i.e. inability to sleep worsens), and/or emotional response shifts (i.e. anxiety about selected a coping response causes a re-evaluation of response options).

Over time, the explanatory model was expanded such that five specific dimensions of illness representation were conceived: *identity, timeline, consequence(s), perceived cause(s),* and *controllability* (Leventhal et al., 1997; Leventhal, Brissette, & Leventhal, 2003). The *identity* dimension corresponds to the label(s) people assign to their dysfunction along with the symptom and change indicators. Appraisal of acute, cyclical, or chronic course of illness comprises the *timeline* dimension. Perceptions of social, economic, physical, and emotional outcomes are included in the *consequences* dimension. Attribution (i.e., to isolated vs. global events, stress, genetic predisposition, or environmental change) of symptoms is seen in the *cause* dimension. Finally, the degree to which the symptoms or illness can be controlled and/or treated is represented in the *control* dimension. C*ause* and *controllability* dimensions are of particular interest to this research study. Identifying participants' perceived cause(s) of mood and MRB change will allow me to differentiate between those who attribute their changes to environmental factors versus those who do not. Subsequently between-group differences in psychological self-assessment, seasonal sensitivity, and other factors can be identified. The additional dimensions of participants' illness perception will be examined to determine if they are associated with environmentally-related attributions to mood and MRB change.

The value of illness perception theory is seen in Leventhal and colleagues' (1980) discussion of "common sense representation of illness danger" in which they note: "representing an illness as a concrete set of symptoms 'caused' by a salient, antecedent, environmental event is a major step toward generating a plan for coping. Indeed, if the representation has a purpose, it is to guide coping (p. 20)." Illness perceptions are conceptualized as cognitive models of illness guiding individuals' development of coping responses and decisions related to treatment. Negative illness perceptions have been correlated with longer periods of rehabilitation and poorer mental health (Frostholm, et al., 2007; Petrie & Weinman, 2006). These detrimental outcomes are partially attributed to the thoughts and beliefs comprising illness perceptions which "directly influence…emotional responses" (p. 536), and can reduce or increase the negative impacts of illness-related symptoms on well-being.

Dimensions of illness perception have been significantly associated with frequency of access to nationalized health care such that those perceiving their problems as serious and not easily resolved utilized physician services more frequently (Frostholm, Fink, Christensen, Toft, Oernboel, et al., 2005). Identification and treatment of mood disorders can reduce individual and social burdens related to mood disorders' psychologically and physically dysfunctional symptoms. Physicians' increased attention to and treatment continuation for depression in primary care patients has been found to not only increase patients' treatment compliance but also to reduce absenteeism rates (Rost, Smith, & Dickinson, 2004). Similarly, a positive association has been found between treatment for depression and improved quality of life self-assessments (Michalak et al., 2007).

Presumably, dimensions of illness perception coincide with variations in treatment decisions. The Leventhal model has been used to inform treatment plans for chronic illness (McAndrew et al., 2008) but not for depression. As treatment decisions of those attributing their changes in mood and MRB to environmental factors have yet to be reported in relation to illness perception, this research will add to the existing literature in an effort to understand how an individual's beliefs about their symptoms influences treatment seeking decisions.

Integrated model

To better understand how attribution of changes in mood and/or mood-related behavior impacts coping responses and treatment seeking behavior, Leventhal and colleagues' common sense model of self-regulation can be strengthened by Mechanic's (1995) concept of *illness behavior* that references:

> "the varying ways individuals respond to bodily indications, how they monitor internal states, define and interpret symptoms, make attributions, take remedial actions and utilize various sources of informal and formal care (p. 1208)."

The mechanisms through which people respond to bodily indications can be traced to developmental experiences, actual occurrences with physical dysfunction, psychological state, and a person's general sense of well-being (Mechanic, 1980). Essentially, the concept of illness behavior encapsulates how people integrate information regarding their physical sensations, thoughts, and contexts to form an explanation of how they are feeling. It is crucial to delineate the facets of illness behavior for those people claiming to experience seasonal depression because illness behavior:

> "shapes the recognition of illness, the selection of patients into care, the degree of compatibility between patient and physician attributions, patterns of health practice and adherence with medical advice and the course of illness and the treatment process (Mechanic, 1995, p. 1208)."

Viewing a psychiatric diagnosis of seasonal depression as the outcome of a multifaceted, multi-system process facilitates a conceptual re-analysis of the phenomenon that could lead to better understanding both that which is referenced by the formal diagnostic category and that which people informally identify with the term "seasonal depression." In conceptualizing illness behavior for this research, it is important to include both cognitive and behavioral responses because of their complex and cyclical bi-directional relationships. Similar to Mechanic (1980), the definition of "illness behavior" for this research study encompasses both cognitive and physical activities related to monitoring for, awareness of, and reaction to changes in mood and MRB that may or may not be attributed to a certain time of year. This framework guides the present research seeking to understand how and why illness behavior results in illness representations of seasonal depression where environmental factors are attributed causes of dysfunction.

This research perspective may be particularly salient in light of Rohan, Sigmon, and Dorhofer's (2003) finding that participants with DSM-IV defined seasonal depression vs. age-matched non-depressed controls more often expressed automatic negative thinking in the winter. As well, people with chronic illness compare previous experiences to current situations (Idler, Leventhal, McLaughlin, & Leventhal, 2004) informing their illness monitoring and evaluation of health threat. For individuals with depression, previous

depressive episodes during the winter may trigger the assumption that subsequent episodes are seasonally related. Therefore, people may prepare for re-occurring annual episodes skewing assessment of mood and MRB toward depression instead of normalization. With an eye toward the treatment and prevention of problematic seasonal mood and MRB change, the present research is particularly focused on the causal attribution component of illness behavior to illuminate processes resulting in environmental causal attributions.

Attribution

If people "with psychologic distress feel sicker and subjectively rate their physical health as less adequate" (Mechanic, Clearly, & Greenley, 1982, p. 362), understanding how individuals conceptualize problematic changes in mood and MRB as seasonally-related, is likely useful to managing or preventing their distress. The relationship between illness explanation and causal attribution has been investigated using attribution theory that identifies three dimensions of causal attributions: locus of control (internal vs. external); stability (stable vs. unstable); and specificity (global vs. specific) (for a review see Kelley & Michela, 1980). A link between a specific attribution style and depressive symptoms has been established in which negative events are internally, stably, and globally attributed (Calhoun, Peirce, & Dawes, 1973; Haaga et al., 1995; Peterson, Bettes, & Seligman, 1985; Peterson & Seligman, 1987; Raps, Peterson, Reinhard, Abramson, & Seligman, 1982). The propensity for individuals experiencing depressive symptoms to attribute internally contradicts the general tendency to exhibit a self-serving bias, such that people make external attributions whenever possible (Sensky, MacLeod, & Rigby,

1996) and is not associated with other psychopathologies (Peterson, Bettes, & Selgiman, 1985; Raps, Peterson, Reinhard, Abramson, & Seligman, 1982). The individuals making attributions to environmental factors in this study may be exhibiting the same or similar depressive attribution style.

Are people attributing their changes in mood and mood-related behavior to environmental factors because environmental factors are the cause, because environmental factors are easy targets, because it is a socially acceptable attribution, or because environmental factors take the causal onus of burden off the individual? Mechanic (1995) speaks to the social aspects of illness noting that certain patterns of illness behavior could be interpreted as a "mode[s] of coping" that free a person from negative consequences of poor or absent performance associated with their social roles. If, indeed, an environmental attribution removes the burden of social bias, explanation, or role fulfillment, the label of seasonal depression could be considered, for some people, as an acceptable "excuse" for an otherwise unremarkable depressive episode or a way to avoid addressing other factors. Yet, if unique factors of seasonal depression episodes or those experiencing them can be differentiated, targeted psychological, environmental, and behavioral responses can be developed for those susceptible to seasonally-isolated depression.

Mechanic (1980) determined that people differentially report distressing psychological and physical symptoms hypothesizing that this deviation is likely to be driven by personal experiences with symptoms and illness as well as exposure to varying socio-

cultural norms of illness definition. The way in which people convey their illness behavior (by describing symptoms, possible causes, past experiences, or self-directed changes in lifestyle) to healthcare providers directly influences how their experience is perceived and treated. When discussing treatment Leventhal, Musumeci, and Contrada (2007) specifically echo this idea:

> "How patients make sense of their experiences with disease and treatment can be observed in clinic and community settings and their experiences in these settings will affect their representations of diseases, treatments, and themselves and influence their behavior (p. 383)."

After examining the factors that impacted depressed participants' ability to engage in shared treatment decision-making regarding their current condition, Simon, Loh, Wills, and Härter (2006) found that perceptions of symptom severity impacted both *how* and *when* participants sought treatment. Seeking medical assistance was generally preceded by a self-assessment of severe symptoms or the decision that the symptoms were indicative of a serious mental health problem.

When seeking clinical assistance, comprehensive symptom presentations often are not communicated between patient and clinician (Christensen, Toft, Frostholm, Oernboel, Fink, et al., 2005). This may be due, in part, to functional impairments associated with the presence of mental disorder (Weissman et al., 1998). Because patients may not share all of their symptoms or details regarding the context of their symptoms with healthcare providers, potentially decreasing accuracy of diagnosis, it has been suggested that brief diagnostic screening questionnaires could be useful in detecting depression. Ideally, when

screeners indicate possible presence of disorder, clinicians will discuss symptoms and beliefs regarding cause with patients. Physicians demonstrating difficulties in discriminating depression in their patients were significantly aided by screening tests that focused on detecting alcohol abuse, depression, and somatization (Christensen, et al., 2005). Physician assessments in collaboration with screenings for indications of various psychiatric conditions have been found to uncover cases previously untreated and instigate physician-patient conversations regarding symptoms (Weissman et al., 1998).

Individuals perceiving themselves to have poor mental health utilize general and specialty medical services more frequently than those with positive assessments of their mental health (Leaf et al., 1988). This phenomenon may be particularly relevant to this research study because clinicians "are trained to use a model of differential diagnosis…to selectively attend to what patients say, directing dialogue along a trajectory leading to a diagnosis" (Mechanic, 1995, p. 1207). To more consistently differentiate clinical vs. non-clinical depression, the value in collecting comprehensive symptom profiles should be emphasized to clinicians and researchers. More information regarding individuals' symptoms, beliefs regarding cause, living conditions, and life event will assist in making more precise diagnoses (and more targeted treatment strategies). Gathered from this research study, information about how people come to label their experiences as "seasonal depression" and attribute their changes in mood and MRB to environmental factors may inform the development of a screening tool that can better elicit patients' symptoms, personality characteristics, and current life experiences not necessarily presented to medical or mental health clinicians.

Applying the concept of illness behavior to changes in mood and MRB and investigating their relationship with non-attributional factors (i.e., severity of depression) may elucidate a mildly disruptive, proportionate response to seasonal change that can be differentiated as a clinically relevant subtype of depression. Mechanic (1995) notes the existence of an "extraordinary overlap between symptoms commonly presented to doctors and comparable symptoms in the untreated population that are typically normalized" (p. 1207). Understanding what, if anything, separates those experiences labeled or treated as seasonal depression from seasonal changes in mood and MRB that are *not* pathologized may assist in determining whether or not seasonal depression should be defined as a unique psychological disorder. This differentiation may assist in better defining clinical vs. non-clinical phenomena, thus allowing researchers to recruit more precise participant samples to facilitate diagnostic characterizations, community prevalence rates, treatment recommendations, and prognosis projections with better accuracy.

An understanding of the cognitive process behind illness identification as outlined by Leventhal and colleagues (1970; 2003) and the coping responses enacted as part of illness behavior (Mechanic, 1980) informs the present research. Although the concept of illness perception is generally discussed in terms of physical disease and disorder, applying it to the changes in mood and behavior reported by this study's participants may uncover that the nature of psychological dysfunction invalidates the predictive value of illness perception due to the compromised nature of the cognitive processes underlying

perception. It is also possible that illness perceptions will more strongly predict recovery and rehabilitation outcomes because individuals' outlooks are more negative. The relationships among factors of illness perception, depression symptom severity, and seasonal sensitivity will be explored in this research study in an effort to determine the utility of applying illness perception to depression assessment and professional treatment.

Seasonal Pattern Specifier

The *seasonal pattern specifier* for mood disorders débuted in the DSM-III-R (APA, 1987) to modify the diagnoses of recurrent major depressive disorder and bipolar disorders and has remained unchanged in subsequent DSM editions. The addition of a seasonal pattern specifier to a mood disorder diagnosis is intended to indicate that a predictable cycle of episode onset and abatement occurs with a greater frequency than non-seasonal episodes. The specifier is not defined as a causal property of the disorder it modifies but rather a description of episode onset and abatement. Justification for the specifier stems from research led by a member of the DSM-III-R Mood Disorders Work Group. Norman Rosenthal and colleagues' (1984) paper initially identified a cluster of disordered behaviors and moods as "seasonal affective disorder," and subsequently the phenomenon was further legitimized by the Work Group (Bauer & Dunner, 1993). The specifier is intended only to represent the cyclical nature of depressive episodes. However, the label "seasonal affective disorder" (SAD) is used in the clinical, pharmaceutical, and lay communities as if it is a separable, distinct psychiatric disorder. I argue that this usage has popularized the medicalization of normally occurring variations in mood and mood-

related behavior conflating seasonal changes in somatic and psychological functioning with major depression.

Is this seasonal pattern specifier useful? The utility of the specifier can be judged by its ability to differentiate between seasonal and non-seasonal individuals over time but few studies examining its validity can be found in the literature. Ninety-three individuals with a DSM-III-R diagnosis of SAD (Thompson & Isaacs, 1988) were re-examined five to eight years post diagnosis (Thompson, Raheja, & King, 1995). At follow-up, many participants did not display seasonal patterns of pathology. Only 35 (38%) people maintained a SAD diagnosis while 30% met non-seasonal depression criteria, 18% criteria for remission, and 14% did not qualify for any of the three categories. Family history of depression, presence of co-morbid diagnoses, and previous treatment did not predict course of DSM-III-R SAD. Length of depressive episode appeared to predict future seasonality such that "the longer the duration of the depressive illness, the less likely were seasonal factors to influence the condition" (p.383). Five to eight year post-diagnostic follow-ups revealed that affective disorder diagnoses with the seasonal pattern specifier are likely to evolve into unspecified major depression or remit, which supports similar outcomes from three- and fifteen- year follow-ups of major depression (Angst, Sellaro, & Merikangas, 2000; Forsell, 2007). These data indicate that the presence or absence of the seasonal specifier at time one was not necessarily predictive of course of illness. There is a need to resolve the issue of seasonal depression diagnosis instability.

Through weekly self-assessments of depression, Leonhardt and colleagues (1994) tracked 26 participants with a SAD diagnosis for a minimum of two and a half years. Across the study duration, only nine people (35%) persisted with SAD, four met criteria for chronic depression, six had a "diffuse pattern of depression" and seven remitted. The authors note that "a nonseasonal prospective long-term pattern of depression does not indicate that the initial diagnosis was wrong" and that variations in course of non-seasonal depression also exist (p.463). However, the changeable nature of the symptom pattern in such a short period of time may indicate that diagnosis of SAD may not justifiably differentiate a phenomenon separate from non-seasonal major depression. Instead, a changeable symptom pattern may point to differing causes or triggers of dysfunction that is not differentiated with the current diagnostic criteria or poor initial diagnoses in part due to the reliance of retrospective reports to determine episode pattern.

Using a sample recruited from a general medical practice, Blacker, Thomas, and Thompson (1997) found that when time of symptom onset, not time of doctor's visit, was used to calculate onset, major depression prevalence peaked strongly during the winter and also during the fall months ($X^2=9.66$, $df=3$; $p<0.05$) while minor depressions did not elicit a significant seasonal variation. The researchers found that those experiencing minor depression in winter vs. summer months were more likely to have a history of depressive episodes ($X^2=9.67$, $df=3$; $p<0.05$). This finding suggests that winter symptom onset could be interpreted as an "attenuated form of major depression" (p. 45). Presence of "atypical" depressive symptoms (i.e., increased sleep and increased appetite) also predicted the development of winter depression, a factor previously linked to stability of

seasonal depression diagnoses over time (Sakamoto, Nakadaira, Kamo, Kamo, & Takahashi, 1995). Together, these findings support the idea that seasonal variation is present for all types of depressive disorders. Additionally, findings suggest that the seasonal pattern specifier associated with an affective disorder diagnosis may not adequately address fundamental differences in seasonal vs. nonseasonal episodes of mood and MRB change.

Grof (2002) argues that the unique feature of SAD, its temporal nature of episode onset and abatement, loses its cyclical pattern with time and notes that lifetime course of illness would need to be found to make "seasonal pattern" a viable diagnostic entity. For this reason, more research is needed to definitively determine the stability of the seasonal pattern specifier over time and the etiology of seasonal depression. In undertaking this cause, stringent guidelines should be used for participant inclusion and episode on/offset should be tracked longitudinally. If a consistent symptom pattern is not uncovered, it may provide further evidence that differentiation of seasonal and nonseasonal depressive episodes is not clinically useful. Labeling depression with a seasonal caveat may be problematic because it may cause people to associate their depression with a certain time of year. This is potentially harmful in light of the association between depression and negative explanatory style (Seligman, Abramson, Semmel, & von Baeyer, 1979). Severity of depression is related to global, stable views of negative events (Peterson & Villanova, 1988) such that people with depression could be more likely to anticipate recurrence of a "dysfunctional season" that is out of their control. Labeling episodes as seasonal may reinforce this attribution process and elevate risk for depression.

Seasonal Sensitivity

In pursuit of uncovering the characteristics of those claiming seasonally-related mood and MRB changes, a necessary, parallel exploration emerges related to seasonal sensitivity. Seasonality has been reported to be associated with psychiatric disorders other than affective disorders including alcoholism, pre-menstrual syndrome, schizoaffective disorder, dementia, and eating disorders (Suhail & Cochrane, 1998). Are there plausible relationships between environmental factors and evidence of seasonally-bound patterns of affective disorder? This section explores the concept of sensitivity to shifts in environmental factors (seasonality) and its relationship to affective disorders.

There is evidence to suggest that patterns of human behavior can be influenced by photoperiod (Bronson, 2004; Roenneberg & Aschoff, 1990; Young, Meaden, Fogg, Cherin & Eastman, 1997). Through a comprehensive collection of global climate data, Roenneberg and Aschoff (1990) examined the relationship between annual patterns of reproduction and environmental variables, concluding:

> "The influence of photoperiod is dominant before 1930, whereas the impact of temperature dominates in later years. With industrialization, people are increasingly shielded from both photoperiod (by indoor work) and temperature (by heating and air conditioning), which may explain the deseasonalization of the human conception rhythm (p. 217)."

By compiling evidence of human sensitivity to temporally-associated changes in environmental stimuli, Bronson (2004) determined that the human reproductive cycle can

be responsive to seasonal shifts in the photoperiod and that our decreased reliance on natural light has affected the ways in which and the degree to which our physiological processes respond to daily and seasonal variations in natural light. By extension, individuals who experience seasonal changes in mood and MRB may be less adaptive to the decrease in seasonal variability demonstrating vegetative behaviors that may have once facilitated survival. In essence, the seasonally sensitive may be responding to seasonal environmental changes no longer posing immediate threats to well-being.

Not everyone has marked seasonal photo-responsiveness. The experience of a seasonal pattern of mood and mood-related behavior dysfunction "can be viewed as a dimension ranging from those who show no seasonal changes to those who show more extreme changes with the seasons" (Sher, 2003, p.309). It is also viable that seasonal changes in various environmental factors impact health. For example, Postolache and colleagues (2005) speculate that a peak in female non-violent suicide may be associated with parallel peaks in tree pollen. Reid, Towell, and Golding's (2000) proposal that seasonality is a "continuum representing increasingly stronger entrainment" to seasonal fluctuations in natural light levels, directs interested parties towards more specific questions of how the body reacts to light. While these conceptualizations of seasonality do not explain the mechanisms leading to sensitivity; Young, Meaden, Fogg, Cherin, and Eastman's (1997) investigation into the relationship between seasonal depression and natural environmental change supports the notion that seasonal sensitivity represents one end of a range of responsiveness. During a seven year period, 190 participants meeting DSM-III-R criteria for current major depressive episode via clinical interview were recruited for a winter

depression treatment study. Between mid-November and mid-March, participants were asked to recall time of episode onset by placing symptom cards on the calendar week when an episode first started. For 74% of the participants living in the Chicago area (42 °N), episode onset occurred within an eight week period from mid-September through late October. Authors calculated a general pattern of risk and found that beginning in September, when risk for symptom onset was low, that individuals had increasing risk for seasonal depression onset up to nearly the end of November. Researchers attributed risk to continuous decreases in daily photoperiod. A replication of study methodology that does not recruit specifically for winter depression could yield results that can be generalized to a national sample.

An examination of over 900 hospital admission case notes from Birmingham, England led Suhail and Cochrane (1998) to determine that a seasonal admissions pattern occurred for depression in all patients, for depression in women alone, and for bipolar disorder in women alone. Coupled with evidence linking states of depression to neurotransmitter imbalance (Magnusson & Boivin, 2003), this overt pattern of hospital admissions hints at an environmentally-triggered physiological mechanism underlying recurrent depressive episodes. A multiple regression analysis using monthly weather (average temperature, hours of sunshine, and length of photoperiod) and hospital admissions data from the same sample uncovered a significant relationship between climatic data and monthly admissions rates for all affective disorders with 75% of variation accounted for by the weather factors (R=0.86). Regression models showed that average monthly temperature explained 46% of the variation in depression admissions (R=0.68) while length of

photoperiod and hours of sunshine together explained 68% of the variation in monthly mania-related admissions (R=0.82). Annual trends in affective disorder inpatient admissions suggest that winter peaks of depressive episode onset in the population are normal facets of the disorder and not necessarily symptomatic of a separable "seasonal" depression.

While rate of hospital admissions is a useful way to look at patterns of mental illness, it is likely that the available data represent only those in acute distress. Therefore, hospital admissions rates do not provide information about individuals who obtain outpatient or non-medical treatment, individuals unable to access medical care, or individuals whose changes in mood and MRB do not necessitate treatment. However, seasonal struggles for a portion of these groups may be represented by evidence of seasonal spikes in antidepressant prescription use (Skegg, Skegg, & McDonald, 1986). In tandem, increases in depression-related hospitalization and medication use leads to two conclusions. First, the number of people experiencing depression spikes during the winter. Second, severity of recurring depressive episodes or minor depression increases during the winter necessitating new or stronger levels of treatment.

The speculation that seasonal environmental factors impact mood and MRB is supported by findings of a drug industry study incorporating 1042 participants across 151 sites in the United States and Canada in which patients subjectively responded that January and February were their worst months (Modell, Rosenthal, Harriett, Krishen, Asgharian, et al., 2005). The researchers suggested that, although photoperiod is increasing during those

months, there may be a "cumulative effect of light reduction." This speculation may be viable in light of research demonstrating severe decreases in vitamin D production for those living in areas with reduced winter photoperiods (Holick, 1995). Skin exposure to ultraviolet light triggers the production of previtamin D3 that eventuates in the increase of circulating vitamin D (Holick, Chen, Lu, & Sauter, 2007). When exposure to natural light is compromised, so is vitamin D production. Deficient vitamin D levels have been significantly related to low bone density, obesity, fatigue, cancer, and depression among other health problems (Cannell & Hollis, 2008; Hoogendijk, et al., 2008). Although these relationships have been identified, it is difficult to isolate the effects of weather-related factors, such as photoperiod and sunlight access, because data collection requires fairly sophisticated monitoring systems. The cumulative impact of very low or no vitamin D production may be related to the emergences of symptoms in winter months.

That said, Albert, Rosen, Alexander and Rosenthal (1991) attempted to disentangle the relationships among weather, mood, and energy by tracking daily weather factors (minimum temperature, sunshine, precipitation, barometric pressure, and relative humidity), mood, energy level, and sleep totals of ten outpatients with. While a few significant interactions were found in individual participants, individual reactions to daily variations in weather could not be extrapolated to assume population-level seasonal variations in mood and mood-related behavior. Denissen, Butalid, Penke, and van Aken (2008) concluded "people seem to differ in the effects of weather on mood in a way that cannot be explained by the Five Factor Model personality traits, age, or gender" (p. 666) after tracking the diary entries of 1,233 participants. Prior to keeping 25-day journal

entries that recorded affect and fatigue, participants completed a five-factor personality inventory (McCrae & Costa, 1987). To control for season, four participant groups began their journal entries at varying times of year. Individual weather factors had no main effects on positive affect. However, there were negative main effects of wind power and sunlight on negative affect as well as a positive main effect of temperature on negative affect. Level of fatigue was significantly negatively impacted by sunlight as well as precipitation and air pressure when mediated by sunlight. Factor analysis revealed three factor loadings, (i.e., "temperature," "sunlight," and "wind power"), for weather variables. Individual variance in the effect of weather variables on mood was demonstrated with random-effect analysis but variance could not be predicted by gender, age, or personality traits.

If "an individual difference variable" drives seasonal mood and MRB changes, it would be useful to know if seasonal responsiveness is heritable as suggested by Jang, Lam, Livesley, and Vernon (1997). Increased sensitivity to variable factors of the environment, which leads to stronger reactions to seasonal variations, could be the reason why many attribute their dysfunction to environmental factors (Lam, Tam, Yatham, Shiah, & Zis, 2001; Young, Meaden, Fogg, Cherin, & Eastman, 1997). Future investigations employing multi-year data collection would both assuage the issue of findings being unique to a specific year and give strength to found associations.

> "The inclination to cast social problems of patients into a disease framework offers potential efficiency in that any disease theory brings together a body of knowledge about symptoms, course, etiology and treatments and provides

> direction on how to proceed once a diagnosis is selected. The disadvantage is that it focuses attention on only part of the problem and often neglects a range of possibilities (Mechanic, 1995, p. 1209)."

It is likely that indiscriminate attribution of symptoms to seasonal depression by individuals and clinicians will, over time, create an ever-worsening and unnecessary dependence on clinical treatment - instead of focusing on creative changes to attitudes, environments, or lifestyles which are associated with symptom occurrence or attribution. By distinguishing seasonal sensitivity to environmental change from clinical depression; environmental, clinical, and social interventions can be designed to better manage dysfunction and prevent distress.

Light Hunger

Research investigating physiological reactions to light exposure overwhelmingly indicates the existence of significant circadian, neurochemical, and behavioral responses to experimental changes in photoperiod (Holick, 1995; Wehr, Giesen, Moul, Turner, & Schwartz, 1995). Tendencies toward seasonal variations in mood and MRB may be related to individual variations in photosensitivity. By extension, these photosensitivities may be overtly indicated by light preference thresholds. However, photosensitivities may emerge through other, more subtle behaviors. The relationship between light exposure behavior and depression is particularly interesting because exposure to natural light is generally accompanied by other outdoor exposures including natural vistas, fresh air, and social activities which have been identified as psychologically- restorative properties (Kaplan & Kaplan, 1989). Weather variables (including temperature and wind) have been

shown to impact mood (Denissen, Butalid, Penke & van Aken, 2008). Because environmental exposures are difficult to track, this research study focuses on participants' perceptions of their natural light exposure.

Heerwagen (1990) speculates that our "light hunger" needs are expressed in behaviors including altering light brightness in our surround, wearing sunglasses, and consciously accessing natural light. For some people, the cumulative effect of inadequate light exposure may create a foundation for seasonal periods of behavioral and mood dysfunction. Recruiting 105 participants from two newspaper advertisements, (one targeting individuals with perceived seasonal sensitivity, n=73, and one which did not), Heerwagen (1990) examined the possibility of seasonal variation in "light hunger." Recruits responded to the Seasonal Pattern Assessment Questionnaire (SPAQ: Rosenthal et al., 1987) that assesses variation in mood and behavior as well as other questionnaire items including "I prefer to be in well-lit rooms." The sample was divided into a control group (those native to the region without seasonal change on core SPAQ items: energy, mood, sleep, social activity, and weight) and a "SAD" group (those with at least moderate seasonal change in each of the five core items for at least two years). In the end, the groups were gender and age-matched (within five years). Seven times in eight months (October – June), participants completed mood indices, including a depression measure, and lighting tasks in a lighting simulation lab. Lighting tasks involved manipulating lighting elements to preferred and uncomfortable brightness levels. The SAD group *always* had statistically significant higher depression scores than controls. Analyses revealed that the SAD group selected significantly brighter light levels than the control

group across all sessions although the groups did not differ in the level at which light levels became uncomfortable (likely due to shared visual system physiology). For both groups, the threshold for discomfort due to light brightness changed across time with June sessions registering the highest tolerance.

These results suggest that light level tolerance varies during the year and individuals' sensitivities vary. It is probable that those with the greatest "light hunger" work and live within substandard luminance conditions. The long-term consequences of this person-environment incongruence may be the development or exacerbation of seasonal changes in mood and mood-related behavior. While the amount of light intensity inducing discomfort was similar for both groups, the threshold markedly shifted with time of year. This change could reflect the body's adaptation to seasonal changes in natural light intensity or to differences in the amount of time spent exposed to natural light. Inadequate light exposure could induce physiological dysfunction which presents as psychological or physical symptoms.

Alternatively, variation in affective state could provoke a change in "light hunger." This possibility is discussed in Friberg and Borrero (2000), who investigated the relationship between severity of depression and self-reported perception of light brightness. Later referred for both in- and out-patient services, 120 individuals receiving a psychiatric intake interview were also given a "DSM-IV-based questionnaire, which historically was used to assist interviewers in distinguishing between a major depression and a minor (reactive) depression" (p. 114). Researchers included an additional item to the standard

intake assessment: “I have noticed that the lights in my surroundings seem dimmer than usual since I have been depressed.” The authors categorized 50 participants as having severe depression, 48 with moderate depression, and 22 were classified with minor depression. A “yes” response to the supplemental light item was significantly more frequent for those with classified with severe depression as compared with those with minor depression (66% vs. 13.6%, $p < 0.05$). When severity of depression and percentage of patients with an altered perception of ambient light were plotted against one another a large and significant correlation emerged ($R = 0.87$, $p < 0.01$).

Although Friberg and Borrero (2000) could not determine if self-evaluated sensitivity was an outcome of depression onset or part of participants’ everyday lived experience, it is clear that severity of depression was significantly associated with self-reported light level perception. This finding is tangentially supported by data from Wesner and Tan (2006) which determined that, compared with non-depressed participants, those meeting DSM-IV criteria for unipolar and seasonal depression had high spatial contrast sensitivity, (an aspect of visual perception related to processing spatial information as a function of early retinal processing). Similarly evidence of hyposensitivity in the retina has been found in participants meeting DSM-III criteria for SAD who were tested in the winter (Hébert, Beattie, Tam, Yatham, & Lam, 2004). Participants with seasonal depression needed light of a greater intensity to activate rod cells at a specific threshold. Visual perception sensitivity may be expressed as a vulnerability to seasonal variations in natural light levels and photoperiod.

Light exposure behavior has been demonstrated to vary by season (Eastman, 1990; Guillemette, Hébert, Paquet, & Dumont, 1998) and by gender (Graw, Recker, Sand, Kräuchi, & Wirz-Justice, 1999). Findings in support of the hypothesis that seasonally variant light exposure behavior triggers depression could explain the previously discussed increases in depression-related hospitalization and prescription writing during the winter. Using portable wrist monitors to record the natural light exposure levels of 19 participants without psychiatric histories, Guillemette and colleagues (1998) found that summer exposures were significantly longer than winter. A similar outcome is reported in Eastman (1990) in which 12 participants with winter-type seasonal depression, (DSM-III-R and Rosenthal et al., 1984 criteria), recorded sunlight exposure and perceived dawn/dusk times in journals for five weeks in the winter and one week in the summer. Participants spent much more time outdoors in the summer than the winter (3.0 vs. 1.2 hrs, $p<0.001$). However, the study lacked a control group of non-depressives against which to compare the seasonal depression group's patterns of light exposure behavior so it is unclear whether this sample's exposure significantly varied from that of non-depressive individuals. Eastman noted that large portions of daylight exposure, during both seasons, occurred while participants were driving, indicating that those reliant upon "car time" to get their sunlight may be missing out on UV effects (such as vitamin D production triggered by skin exposure), filtered out by windshields and windows.

Graw, Recker, Sand, Kräuchi, and Wirz-Justice (1999) found that 22 women qualifying for a diagnosis of DSM-III-R SAD and 47 non-depressed controls had significantly different variations in summer-winter outdoor light exposure length (Chicago, USA 42°

N). A significant seasonal difference in exposure time was revealed between groups: in the winter, seasonal depressives had only 40% of their summer natural light exposure while non-depressed women had 67% of their summer exposure. During the winter months, the daily mood and alertness levels for the seasonal depressives were found to be markedly lower than summer baseline scores. Although these results do not indicate cause, the authors contend that this difference may begin to explain evidence indicating significant seasonal variation in mood, alertness, and sleep length between groups. While the study did not find a significant difference in winter light exposure time between seasonal depressives and healthy women, the relatively drastic variance between summer-winter natural light exposure seen in the seasonal depression group could be used as a hallmark for seasonally-related depression that is not yet included in the diagnostic criteria.

Latitude

To assess the possibility that latitude and light exposure are related, a year's worth of data was collected from participants in San Diego, California (33°N) and Rochester, Minnesota (44°N). Participants used head and wrist light monitors continuously for one week across the four seasons (Cole, et al., 1995). When measuring at 1000 lux (light intensity) and 10,000 lux light levels, the 30 participants from San Diego had significantly more exposure than the 24 participants in Minnesota at any time of year. A significant difference between winter and summer exposures for only the Minnesotans; summer exposure to 1000 lux light was six times greater than winter levels and exposure to 10,000 lux was 22 times greater than in the winter. That said, "…despite the

availability of artificial illumination, the duration of exposure to all levels of illumination was highly seasonal" for both groups (p.327). Study replication with a larger participant pool across multiple locations is warranted to generate these findings in a larger sample.

Epidemiological evidence indicating that population prevalence rates for seasonal depression parallel Northerly or Southerly increases in latitude have garnered support for the "latitude hypothesis;" whereby geographic distance from the equator indicates greater propensity for illness (Levitt & Boyle, 2002; Okawa, et al., 1996; Rosen, et al., 1990). However, Mersch, Middendorp, Bouhuys, Beersma and van Hoofdakker (1999) note that some studies of latitude and prevalence (including Rosen et al. 1990 and other earlier efforts) are fraught with methodological problems which decrease the predictive value of the work. Studies with solid methodologies controlling for potential problems with sampling bias, sample size, responder characteristics, and assessment tool validity have yet to demonstrate a positive correlation between latitude and risk for seasonal depression in either adults (Kasper et al., 1989) or children (Carskadon & Acebo, 1993). Further compromising the proposed relationship between latitude and seasonal depression risk is evidence demonstrating that certain homogenous communities living in the most northern countries do not have the exacerbated prevalence rates expected under the latitude hypothesis (Näyhä, Väisänen, & Hassi, 1994).

Migration has been hypothesized as a contributing factor to schizophrenia risk (McGrath, Selten & Chant, 2002) and migration may play a role in seasonality by exacerbating mismatches in the person-environment adaptation process. This argument is challenging

to assert because the act of moving may be a proxy for a whole host of other variables related to the physical environment or the individual, such as socio-economic status or educational achievement. Yet, tracking individuals' geographic movement to ascertain their familiarity with seasonal variations could uncover a person-place interaction that influences susceptibility to seasonal mood and MRB change. Suhail and Cochrane (1998) raise this point:

> "people who originally belong to lower latitudes may develop symptoms of depressive affect more frequently during winter in response to comparatively harsh weather conditions typical of higher latitudes" (p. 216).

This "latitude factor" may represent an *unintentional*, maladaptive consequence of moving out of an environmental "comfort zone;" where the body is optimally attuned to environmental factors, such as seasonal photoperiod. The opposite experience of relocation, due to a conscious dislike or discomfort of seasons, can be thought of as *intentional* migration. Individuals making a conscious decision to leave an area because of its associated weather and seasonal patterns may have more awareness of their seasonal sensitivity than those whose unintentional migration has brought on psychological and/or physical dysfunction. However, only bereavement is stipulated as an "appropriate" cause for depression, excluding those who are bereaved from clinical depression classification. Migration, light sensitivity, and seasonal variations in environmental factors are irrelevant to the diagnostic process. Yet, addressing these factors as primary or secondary causes for depression is appropriate to questions of etiology.

Assessment

While other measures have been used to assess the prevalence of Seasonal Affective Disorder (Levitt & Boyle, 2002; Shin, Schaffer, Levitt, & Boyle, 2005), epidemiological research has generally employed the SPAQ (Rosenthal et al., 1987) resulting in lifetime prevalence rates varying from less than 1% to greater than 10% (Magnusson & Partonen, 2005). Other measures assessing seasonal depression are available including the Structured Interview Guide for Atypical Depression (SIGH-ADS: Williams, 2001), the Inventory for Seasonal Variation (ISV: Spoont, Depue & Krauss, 1991), and the Seasonal Health Questionnaire (SHQ: Thompson & Cowan, 2001). Similar to non-seasonal depression, SAD is more frequently attributed to women and younger adults versus men and the elderly (Kessler, 2003; Magnusson & Boivin, 2003). SAD has also been found to be co-morbid with anxiety disorders and bulimia nervosa (Magnusson & Partonen, 2005) as well as the personality traits of openness (Jain et al., 1999) and neuroticism (Jang, Lam, Harris, Vernon, & Livesley, 1998).

Although Murray (2003, pp. 53-54) found that the "major strengths of the [SPAQ] are its brevity, high face validity and adequate psychometric properties" including its score distribution, factor structure, and test-retest reliability at a six month interval (Young, Blodgett, & Reardon, 2003), its psychometric properties have been criticized. The SPAQ has been shown to have very low discriminative capacity between previously diagnosed seasonal versus non-seasonal depression (Mersch, Vastenburg, Meesters, Bouhuys, Beersma, et al., 2004: Thompson, Thompson, & Smith, 2004). The wide variation in calculated prevalence could be explained by differences in survey methodology,

inconsistent selection criteria, and the psychometric weaknesses of the SPAQ (Mersch et al., 2004). The weaknesses indicate the presence of a number of issues: including that studies implementing the SPAQ have been asking the right questions to the wrong people, the wrong questions to the right people, or perhaps, that both the sampling criteria and the questionnaire content need to be examined. Concerns regarding psychometric strength have led researchers to implement the SPAQ only as a screening tool complemented by other evaluation measures (Michalak, Wilkinson, Dowrick, & Wilkinson, 2001). If the criteria used to define participant samples have been relying on problematic measures, (as previously suggested), research calculating prevalence and incidence rates may have little value.

A similar problem of validity exists for research focused on treatment "effectiveness" for the poorly defined construct of seasonal depression. Research examining treatment options for those with DSM SAD have included pharmaco-, photo-, and cognitive behavioral therapies (Rohan, Lindsey, Roecklein, & Lacy, 2004), treatment strategies similarly used for non-seasonal depression. Recently, and, for the first time, the U.S. Food and Drug Administration approved an antidepressant drug, *Wellbutrin XL*, with specific indications for DSM-IV SAD (USFDA, 2006); an announcement following on the coattails of a single multi-site study funded by the drug's manufacturer, GlaxoSmithKline (GSK, 2008; Modell et al., 2005). Recent data illustrate that people living in the United States, (especially those who are non-white, have less than twelve years of education, or severe depression), are likely to discontinue antidepressant use within 30 days (Olfson, Marcus, Tedeschi, & Wan, 2006). Although Brody and

colleagues (1995) suggest that enhanced compliance may occur when patients are involved in the development of their treatment plan and made aware of potential drug side effects, better integration of non-drug therapies into treatment plans may be more effective and less costly for individuals over time.

Research examining the relationship between SAD and phototherapy has demonstrated morning administration bright light therapy to be a viable way to moderate depressive episodes (Magnusson & Boivin, 2003) although ideal length, time of day, and intensity of treatment exposure remains contested in the literature (for a review see Terman & Terman, 2005). Morning phototherapy has also been demonstrated to quell distress associated with adult attention-deficit disorder, bulimia nervosa, and non-seasonal depression. Beauchemin and Hays (1996) found that for psychiatric inpatients with affective disorders, staying in sunny rooms had significantly shorter lengths of stay versus those in rooms without direct sunlight indicating that exposure to daily natural sunlight may be therapeutic. Benedetti and colleagues (2001) found hospital length of stay for individuals with some affective diagnoses (but not unipolar depression) to be significantly shorter when patient rooms received bright, morning sunlight. The ultraviolet (UV) properties of light may play a role in light exposure's therapeutic outcomes. Even UV exposure through indoor tanning beds has been associated with "relaxed and less tense" mood when compared with tanning in non-UV beds for participants *without* psychiatric illness (Feldman, et al., 2004).

Michalak and colleagues (2007) found that for nearly one hundred participants with SAD, quality of life outcomes increased after eight weeks of two different treatment regimes: daily 10,000 lux morning light therapy accompanied by a placebo "medication" or a daily dose of the antidepressant Fluoxetine and exposure to placebo levels of light. Researchers noted that quality of life improvements paralleled a decrease in depression scores. Low pre-treatment quality of life ratings related to perceived health status and the "degree of enjoyment and satisfaction in various areas of daily living" (p. 730) is reflected by reports of significant functional impairment and experiences of pain seen in primary care patients with DSM-III-R SAD. Impairment for those with SAD exceeded levels for patients with chronic physical problems such as arthritis, hypertension, diabetes, and heart disease (Schlager, Froom, & Jaffe, 1995). It is likely that increased impairment and pain motivate the elevated frequency of medical help seeking found in those with seasonal depression (Eagles, Howie, Cameron, Wileman, Andrew, et al., 2002).

Conclusion

"If qualitatively different and clinically meaningful depressive subtypes actually exist…it is likely there will be substantive treatment-specific implications" (Parker, 2000, p. 1201).

Gathering data regarding the individual factors that impact assessments of seasonal changes in mood and MRB could uncover relationships between illness perception and coping responses. Poorly managed seasonal dysfunction can lead to both prolonged tangible and intangible forms of distress (Michalak et al., 2004), problems with employment (Lerner et al., 2004) and frequent utilization of medical services (Eagles et

al., 2002). By better understanding the characteristics of individuals consistently experiencing seasonal changes in mood and mood-related behavior, more effective diagnostic and treatment strategies can be developed as to minimize individual impairment and social burden.

Research Aims & Hypotheses

To this end, data were collected with the intention of better understanding the illness behavior of those people who attribute their changes in mood and mood-related behavior (MRB) to environmental factors regardless of clinical diagnostic history. Specifically, this dissertation explored the following research aims and hypotheses:

Aim I: To explore the circumstances under which people with changes in mood and MRB attribute their changes to the physical environment.

> **Hypothesis 1**: Compared with participants with low seasonal sensitivity, participants with high seasonal sensitivity are more likely to attribute their changes in mood and/or MRB to factors in the physical environment such as temperature and photoperiod.

> **Hypothesis 2**: People with high natural light exposure and control, measured using five study-specific questions, are more likely to attribute mood and behavior change to the environment versus other factors compared with those having low natural light exposure and control. This follows from the hypothesis that those who seek natural light exposure are likely to have an increased awareness of their responses to factors of the natural environment.

Hypothesis 3: Compared with people ranking low on control over illness, using the Brief IPQ, people with high illness perception control are more likely to attribute mood and behavior change to the environment versus other factors.

Aim II: To explore the relationships among environmental attribution, severity of depression symptoms, and clinical self-labeling in people with recent changes in mood and mood-related behavior.

Hypothesis 4: People reporting severe depression symptoms, as measured by the CES-D, are more likely to use clinical labels to describe their changes in mood and MRB compared with people with mild depression symptoms. In people with severe depression symptoms, attribution of changes in mood and/or behavior to the environment does not affect labeling behavior. In people with mild depression, environmental attribution interacts with depression symptom severity such that those who attribute mood and behavior change to the environment are less likely to clinically label than those who attribute their changes to other factors.

Aim III: To explore whether attribution of mood and MRB changes to the environment, severity of depression symptoms, and clinical self-labeling are associated with clinical help seeking in people with recent changes in mood and mood-related behavior.

Hypothesis 5: Among people who use clinical labels to describe their recent changes in mood and behavior, their attribution behavior does not predict clinical help seeking. Among people who do *not* use clinical labels, those who make

environmental attributions are less likely to seek clinical treatment than those who attribute changes in mood and MRB to other causes.

Hypothesis 6: Among people with severe self-reported depressive symptoms, environmental attribution does not predict clinical help seeking. Among people with less severe depressive symptoms, those who make environmental attributions are less likely to seek clinical treatment than those who attribute their recent mood and MRB change to other causes

The following Research Methods chapter details how this research study was executed.

CHAPTER II: RESEARCH METHODS

Method of Administration

An internet-based questionnaire comprised of both pre-existing scales and new study-related questions was developed for this study and used to collect dissertation data. For those participants meeting eligibility criteria, the questionnaire was self-administered in approximately 15 minutes. The following chapter outlines decisions made regarding the questionnaire, participant recruitment, and other methodological issues.

Early in the development of this research study, I envisioned the implementation of an internet-based survey. Just as the telephone once facilitated a new, potentially more efficient means of data collection, the internet now permits an even faster and cost efficient way to communicate with large and far-reaching population samples (Cook, Heath, & Thompson, 2000). Birnbaum (2004) notes that web-based surveys often offer a less time-consuming, anonymous, and schedule-friendly participant experience than traditional paper-and-pencil surveys. Additionally, web administration may yield more accurate responses to survey items eliciting sensitive information. Pealer, Weiler, Pigg, Miller and Dorman (2001) found that college students were more likely to answer socially threatening health-related survey items (including items touched upon in this study such as suicidal ideation, dietary behavior, body weight, and physical activity) when questions were Web versus paper-and-pencil administered. The authors speculated that this outcome likely was due to increased participant anonymity and decreased response bias due to social desirability - both afforded by the online survey participation experience. However, other studies have failed to distinguish differences in response by

method of delivery (in-person vs. internet: Lewis, 1994; internet vs. telephone vs. paper: Knapp & Kirk, 2003).

Although internet administration allows for data collection from a large, diverse participant sample, two potential problems, multiple submissions and participant attrition, needed to be addressed during survey development. To counteract the possibility of individuals making multiple survey submissions, I opted to utilize the *SurveyMonkey.com* (Finley, 2008) survey construction feature that tracks respondents' Internet Protocol (IP) addresses. Enabling this feature allowed only one survey to be accepted per IP address and blocked subsequent submissions. Therefore individuals accessing the survey from a shared computer or group of networked computers could only supply one survey response, facilitating a more random sample.

With the hope of minimizing participant attrition during the survey, I frontloaded the socio-demographic questions so that individuals more likely to drop out would be triggered by these questions to do so early on (O'Neil, Penrod, & Bornstein, 2003). This choice also allowed the characteristics of those who did drop out later to be captured for later analysis. A participant incentive was attached to study participation (discussed in detail below) in an effort to decrease dropout frequency (Musch & Reips, 2000; O'Neil, Penrod, & Bornstein, 2003).

Random internet sampling techniques do not yet exist (Kraut et al., 2004). Therefore, Web-based research is likely to yield samples that are biased toward those whose the

Internet most (currently skewed toward a young, White, and financially stable population). That said, recruiting diverse participant samples through Web-based research is possible. Gosling, Vazire, Srivastava, and John (2004) found the sample characteristics of over 350,000 respondents to two separate online questionnaires to reflect that of participants in 211 *Journal of Personality and Social Psychology* articles. Because a diverse sample is necessary to ensure external validity, the Call for Participants clearly identified a desire for diversity with the inclusion of the phrase "Diverse Group of Participants Needed." As seen in the Results chapter, socio-demographic data (including participant age, gender, race, ethnicity, state of residence, and education level) were analyzed to determine the extent to which the sample achieved the desired diversity.

Researchers have previously expressed concern regarding the small degree of control that they have over participants' behavior and testing environments during Web-based research participation (Kraut et al., 2004; Reips & Musch, 2002). Instead of perceiving this lack of control and oversight as being inherently negative, I suggest that the participants fully completing the survey are likely to be intrinsically motivated to do so *because* participation can be done at their convenience and without direct oversight. To indirectly communicate my presence as researcher during participation, I tried to construct an aesthetically pleasing and memorable survey, to write all explanations, directions, and reminders using a friendly and conversant tone, and to provide opportunities for feedback so that participants might feel that they were engaged in a conversation with a person asking important questions, not a computer.

Incentive Structure

Participants who completed the entire survey could enter into prize drawings for gift cards to an online retailer. Participation incentives were particularly salient in the development of this study's recruitment methods because a substantial portion of the participant sample needed to be individuals with significant variations in recent mood and mood-related behavior: changes that were likely to impact their willingness to participate in the study or their ability to carry through with participation. Tuten, Galesic and Bosnjak (2004) assert that presence of an incentive motivates participation by inducing generous feelings of reciprocity or negative feelings of guilt. At the time of my research, the literature surrounding incentivizing internet-based research spanned only a few years and had yet to reach agreement as to its utility (Bosnjak & Tuten, 2003; Cook, Heath, & Thompson, 2000; Porter & Whitcomb, 2004; Tuten, Galesic & Bosnjak, 2004). Using a meta-analysis of 68 published online surveys, Cook, Heath, and Thompson (2000, p.832) found that, compared to web surveys not offering participant incentives, those surveys using incentives had "more homogeneous [samples] and lower response rates." However, Cook and colleagues speculated that this outcome was likely the result of survey developer bias: towards affixing incentives onto those surveys likely to have a lower rate of response due to length and/or question content. I chose to incentivize participation because these findings did not compel me to abstain from this practice.

Subsequently, I evaluated the value of using per-participant payments (providing a specific amount of money for each person completing the survey) versus lottery incentives (where gaining the incentive is contingent upon both completing the survey

and winning a prize drawing). Although prepaid incentives have been found to have no significant advantage in recruiting participants (Bosnjak & Tuten, 2003), cash payments *in advance of* participation versus providing redeemable gift certificates to Internet vendors have induced higher participation rates (Birnholtz, Horn, Finholt, & Bae, 2004). Using cash payments was not an option for this research study because participants were not recruited from a previously targeted sample and therefore could not be located to be paid in advance. Deutskens, De Ruyter, Wetzels, and Oosterveld (2004) found that the rate and quality of responses for 730 online questionnaire participants did not significantly vary by incentive type when using a lottery or per-participant voucher system. The authors concluded that, in an online environment, lotteries vs. vouchers are cost effective and are related to useful response rates. While there is evidence that a lottery incentive yields better survey completion rates than either prepaid incentive or "no payment" conditions (Bosnjak & Tuten, 2003); others argue that payment "undermines participants' intrinsic motivation to complete" a survey (O'Neil & Penrod, 2001, p.232). And with these points in mind, I decided to use a lottery incentive that would reward participation while trying to mitigate possible de-motivational effects. Because participants would not be guaranteed payment, they were likely to have at least some intrinsic motivation driving their participation.

Immediate notification of prize drawing status has been associated with better participant response rates (Tuten, Galesic, & Bosnjak, 2004). Although immediate notification was not feasible, I included participants' estimated chances of winning within the Recruitment Announcement and informed consent in an effort to strengthen the incentivizing nature of

the lottery. The length of time between survey participation and incentive notification was minimized whenever possible.

To investigate the most effective lottery structure, I reviewed the literature. Deutskens and colleagues (2004) invited nearly 500 students to take a 44 question survey associated with one of three lotteries where participants had a chance to win: one of ten 25€ (≈$22.50) vouchers, one of five 50€ (≈$45) vouchers, or one DVD player. The rate of response for the ten 25€ voucher lotteries elicited a significantly higher rate of response than the other two lottery structures. The researchers speculated that the better chance of being a winner incentivized participation. Alternatively, participants may have felt the prize was more appropriate to the nature of their participation (25€ vs. 50€ or DVD player). This idea was tested in Porter and Whitcomb (2004) where researchers randomly assigned online survey participants to one of four incentive conditions (drawings for one $50, $100, $150, or $200 *Amazon.com* gift card). The researchers found that the response and question completion rate for those assigned to the $100 gift card condition was significantly higher than the rates for other monetary amounts. The authors concluded:

> "small amounts may have little impact because the respondent does not feel they are adequate to justify his or her expenditure of time…Alternatively, large amounts may be viewed as compensation rather than as a token benefit, thus transforming the relationship from one of reciprocity to an economic one (p. 56)."

This phenomenon has been described in terms of equity theory which suggests that incentives are most effective when they are perceived to be appropriate to the amount of time required to participate (Marcus, Bosnjak, Lindner, Pilischenko, & Schütz, 2007) and

that lotteries with an "uncertain chance to win" are appropriate incentives for a short survey, (such as the one associated with this research). I selected to use a lottery incentive structure with ten prize drawings for $30 Amazon.com gift cards available to eligible participants completing the survey and voluntarily providing a contact email address.

Survey Construction

Development

As I selected scales and other survey items, I developed survey diagrams to facilitate planning. Mapping survey questions prior to construction was incredibly useful because it helped me to organize the questions in a coherent order via question branching, to visualize the user experience, and to anticipate places where skip logic would need to be devised. For future studies, I suggest mapping in the planning stages because it is far less time consuming to revise maps than to alter the survey post-construction.

I hired a Web-design consultant, Mr. Kilrak Chung, to investigate the properties of a number of online survey construction websites and help realize the survey maps as an interactive research-gathering tool. Mr. Chung's knowledge of Web page construction and interaction-related features allowed me to identify software components necessary to implement the study. Because I was able to present him with the survey in diagram format, it was very easy to communicate what was required for the survey. In the end, I decided to construct the research survey using *SurveyMonkey.com* (Finley, 2008) because it offers an array of question and response formats, numerous data exporting options, IP tracking, and various ways to screen participant responses. The software also permits question-specific error messages to appear in the appropriate on-screen location when a participant fails to answer a question. After Mr. Chung drafted a survey prototype using

SurveyMonkey.com, I added the survey content, amended the layout and question formats, and added skip logic to facilitate question branching.

During survey development and construction, I found that *SurveyMonkey.com*, although a fairly flexible tool with strong online user support, had limitations regarding its support of question branching and skip logic, formatting, and HTML add-ons (for example, we couldn't create bolded text). In the future, I would like to build online data-gathering tools de novo to maximize the surveys' design capabilities and response formats.

Pilot

After CUNY Institutional Review Board approval was granted, an email was sent to fifteen people selected for assistance in piloting the survey. In an effort to ensure that the survey would be accessible to a wide variety of people, the pilot sample included committee members, colleagues, and people unaffiliated with the social sciences. I instructed them to look for problems, misspellings, and software glitches. Feedback from the pilot participants led to the inclusion of the response option "I don't know" for a few questions; the addition of examples to clarify some response options (i.e., "I have been diagnosed with a Mood disorder *such as Depression or Bipolar disorders*) and alteration of minor formatting and wording inconsistencies. One question seeking to acquire information about attribution behavior was reworded, from "*What is* the primary cause of your changes…?" to "*What do you believe* is the primary cause of your changes…?" to ensure that participants' responses reflected their beliefs and explanations. To clarify that the question "For how many years have you been experiencing *these changes* in mood and/or behavior?" could elicit possible annual reoccurrences of changes in mood and

mood-related behavior, the question was amended to "For how many years have you been experiencing *these periods of change* in mood and/or behavior?"

After discussion with the pilot participants, I decided to require responses to each survey question as to decrease the possibility that participants would purposefully skip large sections of the survey yet remain eligible for the lottery incentive. Changes to the survey were reported to and approved by the IRB prior to data collection. At the end of the piloting process, I also contacted the *SurveyMonkey.com* support center to test the survey for software glitches (of which there were none).

Measures

The internet-based research survey consisted of three eligibility criteria and 77 survey items (see Appendix A). The majority of the survey items were selected from previously used scales with established psychometric properties in samples similar to the study population. Scales and survey items are described in detail below.

Depressive Symptom Severity

After identifying specific aspects of their recent mood and MRB change, participants were asked "Are you experiencing these mood and behavior changes now?" To better evaluate participants' current psychological state, measures for both non-specific psychological distress (K6 as described in the next section) and depression-related symptom severity (CES-D) were included in this research survey. Not only do data from these instruments allow for the psychometric corroboration of participants' perceived state of being, but data also provide an additional lens with which to interpret their

responses to other measures. This idea is corroborated by Mechanic, Clearly, and Greenley (1982, p.154-155) who noted: "symptom reports are in part dependent on psychological state and may reflect to some extent an extra sensitivity to bodily sensations as a result of situational stress or prior learning."

The *Center for Epidemiologic Studies Depression scale* (CES-D) is a 20 item self-report measure developed to detect, but not diagnose, major or clinical depression in adolescent and adult populations (Radloff, 1977). Scale items represent four separate factors: depressive affect, positive affect, somatic symptoms, and interpersonal relations. Originally tested on a homogenous white sample, the factor structure has been confirmed various samples including psychiatric populations (Weissman, Sholomskas, Pottenger, Prusoff, & Locke, 1977), African-American women (Williams et al., 2007), people with rheumatoid arthritis (Rhee, et al., 1999), and individuals with traumatic brain injuries (McCauley et al., 2006). Radloff (1977) calculated the scale's internal consistency at α=0.85 in a general population sample and α=0.90 in a sample of psychiatric patients. Additionally, Radloff found that test-retest correlations were stronger when time between testing decreased such that retesting between 2 -52 weeks yielded moderate correlations ranging between R=0.70 and R=0.45. Recent use of the CES-D has produced strong one week test-retest correlations (R=0.93; Yang, Soong, Kuo, Chang, & Chen, 2004). While the CES-D was neither designed nor intended to make clinical assessments, it has been demonstrated to differentiate well between participants with and without clinical diagnoses of depression (Radloff, 1977) and to parallel severity of depression ratings from diagnostic depression measures (Foster, 2007).

Responses to the CES-D items (see Appendix A) were scored on a 4-point scale that range from 0-3, such that feelings or behaviors occurring *most or all of the time* were coded as 3, *occasionally or a moderate amount of time* as 2, *some or a little of the time* as 1, and *rarely or none of the time* as 0 points. Four questions required reverse coding. This scoring system results in a cumulative response range of 0-60. Arbitrarily placed at 16 in 1977 Radloff study, appropriate cut points for group discrimination between those whose response indicate the possible presence of major depression and those who do not have been shown to vary by participant population ethnicity (Cho, Moscicki, Narrow, Rae, Locke, et al., 1993). The cut-point of 16 was used in this study to categorize participant responses. Because the CES-D has demonstrated psychometric properties, the scale has been used repeatedly in large scale studies with a variety of populations (see Cho et al., 1993 and Huang, Wong, Ronzio, & Yu, 2007 for examples). The CES-D was selected for the purposes of this research study because it is a short, rigorously tested, self-report screening measure of depression symptom severity.

While data have not been published regarding possible effects of online CES-D administration, Swartz and colleagues (2007) did find some variability in responses to pen-and-paper versus personal digital assistant (PDA) administration. To explore clinical characteristics that may moderate aspects of illness behavior related to changes in mood and mood-related behavior, responses to the CES-D provide information regarding severity of depression symptoms at the time of research participation. These data along

with responses to the K6, which assessed a broader range of pathology, are used to discuss participants' severity of dysfunction.

General Psychological Distress

The K6 and K10 scales were developed to screen for "non-specific psychological distress" in general, national community samples (Kessler et al., 2002). The "most efficient screen for serious mental illness" (Kessler, Barker, Colpe, Epstein, Gfroerer, et al., 2003, p.188), the K6 is currently included within the U.S. National Health Interview Survey (NHIS) and was recently used in the National Comorbidity Survey – Revised (NCS-R; Harvard, 2005). Because inter-scale correlation between the K6 and K10 is high, ($r=0.97$) and both scales have demonstrated solid internal reliability, ($\alpha=.93$ K10; $\alpha=.89$ K6) (Kessler et al., 2003), I selected the more concise K6 scale. This selection is supported by Furukawa, Kessler, Slade, and Andrews (2003) who found the K6 vs. the K10 to better discriminate differences in pathology and distress within subsamples. Inclusion of this measure provides data regarding the non-depressive dimensions of psychological distress in addition to an item regarding depressed mood.

The six items comprising the K6 scale represent factors of depressed mood, motor agitation, anxiety, fatigue, and worthless guilt (see Appendix A). Items are framed by the stem "During the last 30 days, about how often did you feel…" such that respondents are retrospectively reporting the frequency of recent experiences by selecting one of the following response options: *all of the time, most of the time, some of the time, a little of the time,* and *none of the time*. Responses from U.S. samples have been scored on a five-point scale from 0 to 4 such that a score of 4 is associated with experiences occurring *all*

of the time and a score of 0 for experiences that occur *none of the time*. Cumulative scores range from 0 to 24 with a cut point established at 19+ (Harvard, 2005) intended to differentiate respondents with and without serious mental illness.

Illness Behavior

A number of questions were included within the survey for the purposes of eliciting participants' attributions, self-labels, and help seeking behaviors regarding their changes in mood and mood-related behavior (illness behaviors). The way in which participants labeled their mood and MRB changes was communicated via narrative responses to the question "Do you have a name for your changes in mood and behavior?" and follow-up questions asking "If yes, what is it?" and "How did you come by that name?" Information regarding participants' treatment seeking behavior was gathered through participants' selection of prescribed response options related to survey items "When you experience these changes in mood and MRB what do you do about them?" and "When you experience these changes in mood and MRB do you do any of the following?" Other survey items asked participants to describe the characteristics and frequency of their changes in mood and mood-related behavior. Two items addressing the time of year that the changes begin and end were taken from the *Seasonal Health Questionnaire* (SHQ: Thompson & Cowan, 2001). These questions were intended to assist with the characterization of participants' changes as cyclical or seasonally-related.

Mechanic and colleagues (1982) found that a psychiatric sub-sample of their participants more frequently consulted a doctor for psychological and physical complaints than those participants who did not access mental healthcare services. This finding was echoed in

Mojtabai and Olfson (2006) who found that Canadian and U.S. participants with depression were more likely to seek treatment from a family doctor or medical practitioner than those without depression. Participants from the present research study, who perceive more frequent changes in their mood and mood-related behavior, have symptoms of severe depression, and/or rate high for seasonality, may be more likely to have a primary care physician. Consistent care by a physician or mental health clinician could foster a relationship in which patients are more likely to disclose problematic feelings that could impact diagnosis or subsequent courses of treatment. To understand the pattern of care accessed by participants, they were asked whether or not they consistently interact with the same doctor or mental health clinician regarding their changes (if seeking clinical care was indicated as a coping response). In general, participants' illness behaviors are likely related to their perceptions of overall well-being. For that reason, I included two Likert-style questions to elicit participants' perceptions of overall physical and mental health.

Illness Perception

The *Illness Perception Questionnaire* (IPQ) was devised as a way to translate Leventhal's theory of illness representation (Leventhal, Nerenz, & Steele, 1984) into a quantitative assessment. The factors represented in the IPQ include *cause*, *consequences*, *control/cure*, *identity*, and *timeline* (Weinman, Petrie, Moss-Morris, & Horne, 1996). Although a useful tool for subsequent research, weakness within the IPQ's *timeline* and *cure/control* subscales became apparent (Moss-Morris et al., 2002). To address problems with the subscales' internal consistencies, to include emotional representation of illness, and to

better understand if participants held "coherent understandings" of their illness; the IPQ was revised. (IPQ-R: Moss-Morris et al., 2002).

Participants responded to questions within each IPQ-R subscale using a five-point scale. Moss-Morris et al. (2002) found the IPQ-R to have good test-retest reliability at both three and 24 weeks and that responses to the measure were different for various illness groups. The core of the revised measure consists of eight subscales of illness representation all of which have good internal reliability (Cronbach's alpha ranging from 0.79 to 0.89): *consequences, emotional representations, illness consequences, personal control, psychological attributions, timeline - acute, timeline – cyclical* and *treatment control*.

A brief version of the IPQ-R, (Brief IPQ) was devised by Broadbent, Petrie, Main, and Weinman (2006). With one new question to represent each of the eight IPQ-R subscales specified above, the Brief IPQ accomplishes a similar assessment of illness perception through participants' responses on a 0-10 likert-style scale. To determine if the Brief IPQ was a valid measure of the original IPQ-R constructs, Broadbent et al. (2006) asked participants with various types of illness (e.g., asthma, colds, diabetes, and renal disease) to take both the IPQ-R and the Brief IPQ. Good concurrent validity between measures was found with all subscales demonstrating significant correlations. Strength of association, as measured with Pearson correlations, was strong ($r>0.4$) for the *identity* ($r= 0.48$), *timeline* ($r= 0.53$), *emotional response* ($r= 0.63$), and *coherence* ($r= 0.46$) subscales. The *consequences* ($r= 0.17$), *personal control* ($r= -0.22$), *treatment control* ($r= 0.22$), and

concern (r= -0.16) subscales were not strong. The Brief IPQ was found to discriminate between different illnesses such that responses to each subscale were significantly unique among groups. The measure was also found to have significant test-retest reliability at both three and six weeks when using within-illness group data.

Rief, Ihle, and Pilger (2003) developed an alternative measure to the IPQ-R, the Illness Behavior Questionnaire, but the 58-item scale has not been validated in other research and was not considered for use in this study. Because the Brief IPQ demonstrates solid psychometric properties and provides a quick means of assessing illness perception it was included in this study (see Appendix A). I was specifically interested to know if participants' who perceived control over their changes would be differentiated from those who did not.

Causal Attribution

Following the eight likert-style questions of the Brief IPQ, participants were asked to "List in rank-order the three most important factors that you believe caused your illness." Broadbent and colleagues (2006) suggest that the qualitative responses to this question can be coded into categories using both the entire group of responses (to observe range of response) and only the first-ranked response (to scrutinize primacy of perceived causes). Because this research study's primary aim was to understand how people attribute their changes in mood and mood-related behavior, the Brief IPQ's free response rank-order question was followed by a similarly-focused, study-specific question, "What do you believe is the primary cause of your changes in mood and/or behavior?," requiring the selection of one close-ended response, with six pre-determined response options (changes

in the seasons; changes in the weather; stress; chemical imbalance; poor health; genes and/or family history) and an "other" option that required additional narrative input (see Appendix I). Comparative data analyses for these questions are discussed in the Analysis chapter.

Seasonal Sensitivity

There are few measures available to assess seasonal variations in mood and mood-related behavior: *Seasonal Pattern Assessment Questionnaire* (SPAQ: Rosenthal et al., 1987); *Inventory for Seasonal Variation* (ISV: Spoont, Depue & Krauss, 1991); and the *Seasonal Health Questionnaire* (SHQ: Thompson & Cowan, 2001). As shown in Theeman (2006), each of these measures rely on retrospective reports of experiences with psychological or physical "symptoms" associated with seasonal depression such as changes in sleep pattern, fatigue, and desire to socialize.

The SPAQ has been heavily implemented as a self-response questionnaire in research studies seeking to calculate prevalence rates of Seasonal Affective Disorder (Shin, Schaffer, Levitt, & Boyle, 2005), although many researchers now use the SPAQ only as a screening tool complemented by other evaluation measures (Michalak, Wilkinson, Dowrick, & Wilkinson, 2001). Murray (2003, pp. 53-54) found that the instrument's strengths were its "brevity, high face validity and adequate psychometric properties," which included score distribution, factor structure, and test-retest reliability at a six month interval (Cohen's Kappa = 0.76, $p<0.001$; Young, Blodgett & Reardon, 2003). However, the psychometric properties of the SPAQ have been criticized. The SPAQ has been found to have a very low discriminative capacity between participants previously

diagnosed with seasonal and non-seasonal depression (Magnusson, 1996; Mersch, et al., 2004; Thompson, Thompson, & Smith, 2004). Because the SPAQ appears to have difficulties regarding validity and discrimination, I have used only one unique scale within the measure, the Global Seasonality Scale (GSS: Rosenthal et al., 1987) that has demonstrated strong psychometric properties.

Participants' sensitivity to seasonal changes (seasonality) was assessed with the SPAQ's six-item GSS. Participants rated the degree to which their *sleep length*, *social activity*, *mood, weight, appetite,* and *energy level* change with the seasons by assigning a value of 0 to 4 to each item (Appendix A). Responses were coded such that a score of 0 indicated *no change,* 1 a *slight change,* 2 indicated a *moderate change,* 3 a *marked change* and a score of 4 indicated an *extremely marked change* for each item. Participants' composite GSS scores ranged from 0 to 24.

Magnusson, Friis, and Opjordsmoen (1997) ran a factor analysis (N = 558) on the six GSS items and found that the *weight* and *appetite* items were strongly inter-correlated (0.63) as were *energy* and *mood* dimensions (0.65). Of the two factors revealed to explain 52.4% and 17.7% of the calculated variance, *weight* and *appetite* appeared to load heavily on the second factor. The authors indicate that the low eigenvalue of the second factor (1.06 compared with 3.14 for first factor) suggests that a two-factor solution is unlikely. However, this eigenvalue may be reasonable considering the small number of items loading on this factor. A factor analysis in Mersch et al. (2004) determined a two-factor solution with a "psychological" factor explaining 58.3% of variance, (*energy, mood,* and

social activity items loaded) and a "food" factor explaining 18.5% of total variance, (*appetite* and *weight* items). Young, Blodgett, and Reardon (2003) also ran a factor analysis on the GSS revealing only one dimension with an eigenvalue greater than one. *Energy* loaded strongly on the factor which explained 51.8% of score variance. The analysis could not be replicated to discover other calculated dimensions because the correlation matrices were not published (a situation not unique to these authors).

In a community sample of 1605, assessed by telephone interview, the SPAQ revealed participants with seasonal bipolar disorder (SBD) to have significantly higher GSS ratings than those with non-seasonal bipolar disorder (NSBD) and seasonal depression (SD). Those with seasonal depression had higher GSS scores than those diagnosed with non-seasonal depression (NSD) [such that mean GSS scores respectively 13.4 SBD >10.5 NSBD and SD >8.0 NSD, $p<0.001$] (Shin, Schaffer, Levitt, & Boyle, 2005). Differentiating scores and treatment outcomes by participants' affective disorder diagnosis may be a useful step in determining unique attributes of seasonal depression. Seasonality scores may also be related to individual mood variability (Reid, Towell, & Golding, 2000). After examining 56 consecutive daily entries in a mood journal for 53 participants, (timeline shorter and sample size smaller than ideal), the authors noted that those with higher GSS scores had stronger weekly mood cycles than those with lower seasonal sensitivity ratings. Reid, Towell, and Golding speculated that this finding could indicate a relationship between sensitivity to environmental (light, temperature) and social (calendar) entrainment cues.

Internal consistency of the six GSS items has been reported to be high (Cronbach's α = 0.85: Mersch et al., 2004; and $\alpha = 0.81$; Young, Blodgett, & Reardon, 2003) indicating that the GSS is a consistent measure of seasonal changes in mood and mood-related behavior. High consistency is important because the GSS is the most frequently implemented dimensional measure of seasonality (Young, Blodgett, & Reardon, 2003). Correlations assessing the relationship of GSS responses made six months apart indicated an association of moderate strength ($r=.66$, $p<0.001$) (Murray, 2003). Mersch et al. (2004) found that people meeting DSM-III-R criteria for seasonal depression had significantly higher mean scores on *appetite, mood, sleep, social activity,* and *weight* than non-seasonal depressives, those with other non-seasonal disorders, and controls. A high GSS score may complement other personality measures postulated to predict response to treatment (Geerts, Kouwert, Bouhuys, Meesters, & Jansen, 2000; Goel, Terman, & Terman, 2003). In the Analysis chapter, some of these relationships are explored.

Light Exposure Behavior

Discrepancies between participants' actual and desired natural light exposure levels may relate to how they attribute their changes in mood and mod-related behavior. Although Heerwagen (1990) describes this "light hunger" phenomenon, a scale to quantify the phenomenon has yet to be published in the psychological literature. To gauge the discrepancy, if any, between participants' average daily natural light exposure and their desired exposure level, five questions regarding light exposure and control were developed (Appendix A). By responding to the questions using a five-point scale from 0 to 4, participants provided information regarding their attitude towards natural light exposure, sensitivity to bright light, actual and desired amounts of daily light exposure,

and control over their exposure. It was intended that greater scores would represent larger discrepancies between desired and actual natural light exposure. Wording of questions and response options was developed with the assistance of colleagues to improve clarity and communication of ideas prior to implementation. Additionally, a factor analysis was conducted to determine if these five questions constitute a single theoretical construct (see Analysis & Findings chapter).

Sample Characteristics

A number of socio-demographic questions are included within the survey to characterize the participant population. To determine if this study's participant sample reflects the variation of the national population, data regarding participants' age, gender, race/ethnicity, state of residence, region of habitation, educational attainment, and access to health insurance were compared with 2000 Census data (U.S. CENSUS, 2009). Time spent on the internet was compared to 2006 *General Social Survey* data (GSS: Davis, Smith, & Marsden, 2007). Information regarding participants' history of psychiatric diagnosis, current treatment for psychiatric disorder, and chronic conditions were gathered to further describe the sample.

Participants and Procedure

Sample

The target participant sample was 300 English-speaking adults (18 years and older) living in the United States who reported perceived changes in mood and MRB lasting at least two weeks in the last twelve months regardless of ever having received a clinical psychiatric diagnosis. It was intended that the targeted 300 participants living in the United States would be equally comprised of males and females as well as those

previously diagnosed with a psychological disorder and those without diagnosis. To achieve this sample, a Recruitment Announcement (see Appendix B) asking "In the last two years, have you experienced changes in your mood and/or behavior that lasted at least two weeks?" was placed in one of three types of online location. After nine weeks of participant recruitment and data collection beginning September 08, 2008 and ending November 10, 2008, 580 of participants responded to the survey. Of the 580 participants, 399 (76.6%) meet eligibility requirements and 81.2 % (N=324) of this group completed the survey in its entirety. Of the 324 people completing the survey, 263 (81%) were female and 180 (55.6%) had histories of psychiatric disorder diagnosis. The sample is described in detail in the Analysis chapter.

Recruitment

When I considered how to best advertize this study online, I wanted to ensure that the Recruitment Announcement would reach people living across the country, especially those living in areas of the country with marked seasonal changes in weather, light exposure, and temperature. Selection of posting locations was also guided by the need to access both people with and without psychiatric disorder diagnoses.

I sought permission to post the Recruitment Announcement on the message boards of online communities related to affective disorders, health, well-being, psychology, and alternative medicines as to gather participants with a range of depression symptom severities. Excepting three smaller groups associated with *MSN.com* that had high user activity, I only contacted *Craigslist.com*, *Google.com* and *Yahoo.com* U.S.-based sites/chat rooms with minimum memberships of 300 people that had recent and frequent

user activity. To post on a group's message board, I sometimes had to register as a member of the group. Often, this required me to explain why I wanted to join. In these circumstances, and anytime a group manager's email was available, I directly contacted the manager(s) via email to seek permission to post the Recruitment Announcement (email content appears in Appendix C). Otherwise, I posted the Recruitment Announcement freely. Of the 39 groups contacted for permission to post the survey, I know that 12 complied with my request. It is possible that other group leaders posted the Recruitment Announcement but did not email me a response.

The study link was also posted on two websites that maintain organized lists of Web-based psychology-related experiments, *Psychology Research on the Net* (Krantz, 2009) and *Social Psychology Network* (Plous, 2009). Posting the study to these sites allowed me access to a population not specifically affiliated with affective disorders. It was intended that individuals accessing the survey in this manner would be more likely to represent the general population and, thus, produce data that would complement data skewed toward more drastic changes in mood and mood-related behavior.

While posts to chat groups and online forums had the advantage of having cross-country membership, posts to the "volunteers" section of the multi-use site *Craigslist.com* were location-specific (Craigslist, 1995). Potential participants were recruited from Recruitment Announcement posts placed in 29 free *Craigslist.com* message boards across the country with heavy, multi-purpose traffic that do not specifically target users by gender, age, race/ethnicity, or health characteristics. I determined Craigslist.com venues

associated with the largest population for every state or metro area (Ex. “Houston” venue for the state of Texas, “South Florida” for the Miami and South Florida region, and “Maine” for the entire state). Using the categories for U.S. region applied in the *General Social Survey* (Davis, Smith, & Marsden, 2007), I organized the *Craigslist.com* venues into region (as seen in Appendix D). Because Craigslist.com restricts creating similar posts in multiple locations, forcing a 48-hour window between reposting, I created a rotating posting schedule such that the Recruitment Announcement would be posted in a new region every two days, rotating through the nine regions every 18 days until ample responses were collected (schedule delineated in Appendix E).

Eligibility

After reading the Recruitment Announcement, interested individuals could select a link that connected them directly to the study’s Informed Consent Form (see Appendix F) outlining research goals, participant rights, degree of anonymity, confidentiality of data, and participation tasks (as suggested in Kraut et al., 2004). By selecting “YES, I understand and agree to participate” at the bottom of the consent screen, participants communicated consent and were automatically transferred to the survey’s eligibility and socio-demographic questions (all items listed in Appendix A). Individuals selecting “NO, I do not wish to participate at this time” were routed to the final survey screen that read “Thank you for your interest” and allowed for immediate user feedback through a dialogue box embedded in the page before exiting the survey’s browser window.

Participants’ responses to three screening questions determined study eligibility. Eligibility criteria specified that, at the time of participation, individuals must: be over the

age of 18 years, reside in the United States, and be experiencing/have experienced changes in mood and MRB lasting at least two weeks within the last twelve months. Potential participants were excluded if they were under the age of 18 years, did not reside in the United States, and/or had not experienced changes in mood and MRB lasting at least two weeks in the last twelve months. Screening questions were mixed in with questions gathering socio-demographic information so that they would be difficult to identify as eligibility criteria. Socio-demographic questions gathering information, (regarding age, gender, race, Latino ethnicity, state of residence, and education achievement), were included as to best classify the research sample and to identify any possible differences in the population interested in participating but not eligible for the study versus individuals whose responses to the screening criteria made them eligible for research participation.

Participants were asked "In the past twelve months, have you experienced changes in your mood and/or behavior that lasted at least two weeks?" as to eliminate potential participants who hadn't recently experienced changes in mood and mood-related behavior. The stipulation of "at least two weeks" is used as a DSM-IV standard (APA, 1994) and was applied to the screening criteria to solicit a participant sample with changes that are more persistent than daily or incidental mood changes. Individuals who were not eligible for the survey were first routed to five pilot questions related to natural exposure, then to a screen informing them of their ineligibility, and, finally, to a screen thanking them for their interest and time. Eligible individuals were transferred directly to the remainder of the survey after completing the screening criteria. By voluntarily

supplying an email address, individuals completing the survey in its entirety could enter themselves into an incentive lottery for one of ten $30 *Amazon.com* gift cards. The online retailer was selected because it was successfully used in previous research (Birnholtz, Horn, Finholt, & Bae, 2004; Porter & Whitcomb, 2004), and because it sells an array of goods likely to appeal to a wide variety of potential participants.

Confidentiality

All responses were kept confidential. While currently inaccessible to the public, the questionnaire is housed on *SurveyMonkey.com*'s secure server to which only I have access (Finley, 2008). Access to the survey is password protected for further security. Housing the survey on a third party server is recommended by Fraley (2004), a frequently cited resource for conducting social psychological research online. Features of the survey construction software, *SurveyMonkey.com*, are similar to those offered by other online questionnaire software companies (Wright, 2005).

Participants' names, phone numbers, and addresses were not collected in this study. Participants' IP addresses were monitored to ensure that multiple submissions were not made by the same persons but IP addresses were not collected as part of the survey data and were not matched to survey responses. If voluntarily provided, email addresses were used specifically for two purposes: to contact eligible participants who won one of ten prize drawings for a $30 *Amazon.com* gift card and/or to send a copy of a summary report of the study outcomes. Email addresses were separated from survey data, recorded in an Excel spreadsheet accessible only to me and destroyed after the gift card redemption codes and/or summary reports were delivered via email to participants.

Planning for Bias

The approach to participant recruitment could result in a biased sample (Wright, 2005). One that is self-selected for interest in mood, has the time and motivation to answer the questionnaire, and/or has access to an online computer. To characterize this research sample's time spent online in relation to a national sample, one question regarding time spent online, from the 2006 *General Social Survey* was included in the study. This also allowed for a comparison to be made between samples, reported in the Analysis & Findings chapter (Davis, Smith, & Marsden, 2007). Because this research acts as an exploratory study to test hypotheses and study instruments, recruiting techniques that favored eligible participants were deemed necessary. These may have resulted in a sample more interested in their mood states than that of the general population leading to non-representative findings such that it may be less likely to find relationships between variables because participants were hyper-aware of various factors. This means that any effects found are likely to be real and significant.

I recognize that this recruitment process was likely to produce a sample that is not representative of the general population as it only included individuals with Internet access, likely to visit the targeted sites or already have membership in online support communities. Thus, the sample is likely to under represent individuals living within lower socioeconomic strata. By extension, the sample may under represent individuals with lower reading levels and less stable computer access as well as elderly people who access the internet less frequently. When interpreting study results, attempting to generalize findings, and drawing conclusions regarding the data, I have been mindful of the sample

population and how it differs from the general U.S. population. Thus, I may be able to generalize results only to those demographic strata represented in the study's participant population.

By recruiting people who perceived changes in their mood and MRB across the year regardless of their diagnostic status, this study attempted to include participants with both clinically diagnosed and undiagnosed mood disorders as well as those with non-clinical seasonal and non-seasonal mood and MRB variations. It was intended that sampling from these populations would allow me to examine differences in illness behavior, especially attribution and labeling behaviors, as to better understand how, when, and why changes in environmental factors are attributed as cause. However, the recruitment strategy and survey content may result in a biased participant sample because people who have an interest vs. no interest in mood, mood-related behavior, or environmental influences on well-being may have been more likely to complete the survey. This may have influenced the findings in specific ways. For one, if the sampling strategy resulted in an over sampling of participants with depression who are sensitive to negative environmental exposures, an assessment of the association between these two factors would exaggerate the true association. However, if this problem is severe enough, I may have only a limited number of people without depression and/or negative environmental exposures limiting the power of the study to detect an association, if one exists. To identify these potential problems, I incorporated the CES-D, a measure of depressive symptom severity, and the K6, a measure of general psychological distress, so that the participant sample can be assessed for over sampling on these factors.

Data Management Procedures

Data Collection

Data collection began with the survey's online launch September 08, 2008. I screened new data approximately every two days by combing each new survey with the *SurveyMonkey.com* "Browse Results" feature. This was performed in an effort to observe if surveys were being completed, how people found the survey, and if the participant had made any comments that needed to be addressed. Each time I screened the data, I recorded the number of new surveys opened in the previous 48 hours, the number of dropouts, number of ineligible participants, and the number of completed surveys (see Appendix G). Recording this information allowed me to track participation and completion rates.

Biweekly, the accrued data were downloaded from *SurveyMonkey.com* to SPSS so that sample characteristics and irregular patterns of response could be identified. Frequency analyses of demographic data (i.e., gender, age, race, and geographic location) were run. Patterns of response were tracked to ensure that survey participants were paying attention and generating thoughtful responses to each question (i.e., not repeatedly marking the same answer to similar questions). If response variation was less than 10% for established measures within the survey, such as the CES-D, the survey was flagged for later consideration. Another method used to monitor participant attention was the examination of variables designed to be concordant (such as the CES-D score and response to "Are you experiencing these changes in mood and behavior now?"). I also documented the places where participants dropped out of the survey to determine if attrition was triggered by a problematic question. Frequency analysis was run on the survey access question to

understand which posting venues were most effective in generating participants. A brief summary of the biweekly data management procedures, with tables illustrating outcomes of analyses, were emailed to committee members for feedback.

Quantitative Data Cleaning Procedures

In order to analyze the survey data, the raw data housed on the *SurveyMonkey.com* server was downloaded to an Excel spreadsheet. Saved as an Excel data file, raw data (including qualitative responses) were then uploaded into SPSS statistical software. To efficiently provide variable names, labels, data values, and other variable properties to the raw data, the information was transferred from a dummy variable properties file designed as an ideal model of data format for working data files. The complete procedure used to transfer the raw data from *SurveyMonkey.com* into SPSS can be found in Appendix H. Because raw data were not analysis-ready when downloaded from *SurveyMonkey.com*, a data-cleaning syntax was written to remove ghost variables created by SurveyMonkey, recode responses with a 0/1 binary structure, identify and code missing data, and parse responses to questions with a "select all that apply" style. For a quick reference of variables used in this analysis, see Table 52 located in the Tables appendix.

Qualitative Data Cleaning Procedures

Only a few questions in the survey elicited qualitative data. These open-ended items were included in the survey so that participants could share experiences that I did not predict, could add additional information, and/or could further specify their responses to close-ended questions. To facilitate analysis, narrative responses were siphoned from the SPSS database along with corresponding participant ID numbers and downloaded into an Excel

spreadsheet. After an initial examination of the data, I developed coding categories appropriate to the narrative responses provided to "Do you have a name for your changes in mood and/or behavior?", "How did you come by this name?", and "Please list in rank order the most important factors that you believe caused your changes in mood and/or behavior." All responses were coded both by me and a second coder, (whose services were retained for that purpose). The second coder was familiarized with the project and trained on the coding categories using 20% of the data. Inter-rater agreement was strong with an average Cohen's k=87.7. On occasions when coders disagreed, they explained their rationale, and disagreements were resolved as to achieve coding consensus. Results of these coding processes can be found in the "Qualitative Coding" section of the Analysis & Findings chapter (as well as Appendix I).

In some instances, participants selected "other, please describe" in response to a "select all that apply" close-ended question. These responses were dealt with in one of four ways: the response was recoded into a pre-existing response option; the response was coded into a new category because it frequently appeared as an "other" explanation; the response was left coded as "other"; or the response was not included in the analysis because it did not relate to the question. This process is explained in more detail in the "Qualitative Coding" section of the Results chapter (as well as Appendix I).

Data Analysis

Power Analysis

Power analyses (Cohen, 1992) for testing main hypotheses are presented as follows. I applied assumptions that would lead to conservative power estimates; therefore the power

to detect differences is likely to be higher than reported here. Although my target sample size was 300, I was generally confident that within a more conservative participant sample of 200 that I would have sufficient power to detect large main effects, and perhaps medium effects. Power to detect interaction effects is smaller, and I based my interpretation of the data on the direction and size of estimate effects rather than strictly on statistical significance testing.

First, I demonstrated power to detect a difference between those who attribute changes to the physical environment and those who do not attribute to the physical environment on the control questions of the Brief Illness Perception Questionnaire as background data on this scale is readily available. In one population sample of people with physical illness, the reported average IPQ control score was 3.38, out of five, with a standard deviation of 0.61 (Groake, Curtis, Coughlan, & Gsel, 2005). This estimate is similar to other published reports. Using an alpha level of 5% and a sample size of 200 (in which 20% of the sample attribute their depression symptoms and behaviors to the environment), I would have 99% power to detect a large effect size (a difference in means of 0.49), 88% power to detect a medium effect size (a difference in means of 0.31), and 30% power to detect a small sample size (a difference in means of 0.12). If the sample size increased to 300, the power to detect medium and large effects remained sufficient and the power to detect a small effect increased to 0.46.

Second, power was calculated to detect a difference between those who self-label their illness in clinical or medical terms and those who do not on attribution to the physical

environment. Based on published studies of the number of people with clinical labels of depression and seasonal affective labels (Kasper & Kano, 1990; Magnusson & Partonen, 2005) I estimated power as follows. When using an alpha level of 5% and a sample size of 200, I would have 82% power to detect a large effect, 45% power to detect a medium effect, and 14% power to detect a small effect. If the sample size is increased to 300, the power to detect medium and small effects increased to 69% and 22%, respectively.

Finally, power was demonstrated to detect a difference between those who seek help in a clinical setting and those who do not on self-labeling behavior. The frequency with which people with a SAD diagnosis seek treatment in a clinical setting is unknown. Based on data demonstrating that approximately 52% of people with major depression seek treatment in a clinical setting (Mojtabai & Olfson, 2006) and the data cited above, I estimated power as follows. With an alpha level of 5% and a sample size of 200, I would have 85% power to detect a large effect, 20% power to detect a medium effect, and 5% power to detect a small effect. If the sample size is increased to 300, the power to detect medium and small effects is increased to 36% and 7%, respectively.

Qualitative Data Coding

Recoding "other, please specify" responses

This section describes decisions made regarding participant responses to five survey questions with an "other, please specify" response option. I recoded responses to four questions alone because the recoding procedure did not involve the generation of new coding categories. For one question coding decisions were made by the primary investigator and a second coder. The coding was reviewed by one of two committee

members (GW and NS). Coding procedures have been broken down by question here and are also delineated in Appendix I.

Prior diagnosis

Have you ever been diagnosed with a major psychological disorder by a doctor, psychiatrist, or other mental health clinician?

Participants selected one of the following five response options:

- Yes, an Anxiety disorder
- Yes, a Mood disorder
- Yes, Schizophrenia or other psychotic disorder
- No, I have never been diagnosed with a major psychological disorder
- Other (please specify)

The majority of responses to this question fell into one of three pre-existing survey response categories: anxiety, mood, and schizophrenia. Some responses (n=31) were made in the "other, please specify" response category. Of the 31 "other" responses, submissions that could be included within a pre-existing category were coded as such (n=5). Many "other" responses (n=17) indicated previous psychiatric diagnoses not falling into the prescribed responses options (i.e., ADHD or eating disorders). These remained in the "other" category. Two responses provided information indicating that the participant did not have a prior diagnosis. These were recoded into the "never diagnosed" category. In some instances, a participant's "other" response was provided in addition to the selection of another response category and information given did not necessitate a recode (n=7). A detailed list of participant "other" responses and related coding decisions are located in Appendix I.

Chronic condition

Do you have any of the following chronic conditions?

Participants selected one or multiple conditions from a prescribed list of 17 common chronic conditions (Appendix A). Any conditions not listed were explained by participants in the "other, please specify" response option. Participants without chronic conditions selected the item "No chronic conditions."

Forty-six participants selected "other, please specify" responses to the chronic condition question. "Other" responses indicating presence of a chronic condition already listed (n=7) was recoded as such (e.g., "migraines" recoded into Chronic Headache category). Many responses indicated presence of a chronic condition not listed as a response option (n=33) and remained coded as "other condition." Three participants acknowledged that they were not aware of any chronic conditions, perhaps not seeing the "No chronic conditions" response option, and were recoded. In some instances the information provided did not necessitate a recode (n=9). A detailed list of participant "other" responses and related coding decisions are located in Appendix I.

Changes in mood and mood-related behavior

You said that within the last year that you experienced changes in mood and/or behavior lasting at least two weeks – what are these changes?

Participants selected one or multiple changes in mood and MRB from a prescribed list of 17 symptoms often associated with clinical depression, anxiety, and psychological distress (Appendix A). Any mood and MRB changes not listed were explained by participants in the "other, please specify" response option.

Twenty-eight participants made "other" responses to the changes in mood and behavior question. Sometimes, the "other" entries could be included in pre-existing survey

response categories (n=6) and were coded as such. When a unique "other" response was made, the cumulative number of changes in mood/behavior was increased by one (or if multiple "other" responses were made, the cumulative number of changes score was adjusted accordingly; n=24). In some instances information given did not necessitate a recode (n=4). A detailed list of participant "other" responses and related coding decisions are located in Appendix I.

Primary cause of mood and mood-related behavior change

What do you believe is the primary cause of your changes in mood and/or behavior?

Participants selected one of the following seven options:

- Changes in the seasons
- Changes in the weather
- Chemical imbalance
- Genes and/or family history
- Poor health
- Stress
- Other (please specify)

Forty-four participants selected "other, please specify" to name the primary cause of their mood and MRB change. Many of the "other" responses were recoded into one of the pre-existing response categories (e.g., "family socioeconomic situations" recoded as Stress; n=29). Nine "other" responses remained coded as Other because a unique cause was given (e.g., "impending menopause"). One "other" response contained a comment regarding a previous question and was not retained. Surprisingly, a few "other" responses expressed bewilderment (e.g., "I don't really know") and thus, I created an "I Don't Know" category (n=5). A detailed list of participant "other" responses and related coding decisions are located in Appendix I.

Treatment

When you experience these changes in mood and/or behavior do you do any of the

following?
Participants selected one or more of the 30 response options listed including "I don't do any of these" (Appendix A). Additionally, participants could select "Other, please specify" if they enacted an activity not listed.

This question was recoded similarly to the previous four questions. However, for these responses, an additional coder (AMT) was utilized because of the complexity of the coding. The content of these responses varied so greatly, that 12 new responses categories were created as to best represent participants' "other" responses. There were 76 "other, please specify" entries, often with multiple pieces embedded within them such that the "other" responses garnered 111 codes. Raters agreed on 90.1% of the codes. Upon instances of disagreement (n=11), the raters discussed their reasoning until a consensus was achieved.

Fifty "other" responses were recoded into one of the 31 pre-existing response options (e.g., "physical activity" or "yoga" coded as Exercise). The remaining remarks were assigned new categories (detailed in Appendix I).

Coding ranked attribution
Please list in rank-order the three most important factors that you believe caused your changes in mood and/or behavior.
Each participant listed a minimum of one and maximum of three factors that they believed caused their recent changes in mood and MRB in rank-order. The qualitative responses (N=1092) were divided into categories derived from a thematic analysis that eventuated in 11 coding categories representing attributions to various types of stressors,

seasonal change, psychiatric illness, chemical imbalance, genetic predisposition, physical health, and negative worldview. A table illustrating the frequency with which these causes were claimed can be found in Appendix I.

The second coder (AMT) was trained on 20% of the data (n=219). Of the remaining 80% of the data (n=873), raters agreed on 88.9% of the codes necessitating only 97 coding decisions for discrepant codes. Upon instances of disagreement, the raters discussed their reasoning until a consensus was achieved (see Appendix I for details). Inter-rater reliability for coding participants' first-ranked factor (Cohen's $k=0.93$, $p<0.001$), second-ranked factor ($k=0.85$, $p<0.001$), and third-ranked factor ($k=0.85$, $p<0.001$) was high.

Preliminary Quantitative Analysis

Univariate distributions were examined for outliers and multicollinearity to determine whether they conformed to assumptions of normality. Responses to each of the scales were normally distributed (Table 1). Because questions could not be skipped, missing data indicated that the participant dropped out of the survey prior to completion. For this reason, missing data were not replaced for analyses. To determine if cell sizes were sufficient to warrants tests of interaction (>5), I ran a series of bivariate analyses. For a quick reference of variables used in this analysis, see Table 52 located in the Tables appendix.

Treatment of Attribution Data

Attribution was treated three different ways in the analysis as to determine the best method with which to gather participants' perceptions regarding cause (see Table 2). Variables were constructed as follows:

1. Qualitative responses to the question "Please list in rank-order the three most important factors that you believe caused your changes in mood and/or behavior" were coded using thematic analysis (for further details see Appendices I and J). Derived themes such as Attribution to the Environment were then transformed into binary variables. In the case of qualitative attribution to the environment, the value of 1 referred to qualitative attribution to the physical environment and the value of 0 to qualitative attribution to other causes. Because environmental attributions were made infrequently, rank order was ignored and all instances of qualitative environmental attributions were collapsed into a single qualitative variable.
2. Attribution data were also gathered through categorical responses to the quantitative question "What is the primary cause of your changes in mood and/or behavior?" (Appendices I and J for further details). Categorical responses were transformed into binary variables for each of the response options. To analyze this hypothesis, the quantitative environmental attribution response option was transformed into a binary variable such that a value of 1 indicates participants' attribution of their changes in mood and MRB to the physical environment and a value of 0 indicates attribution to other causes.
3. A summary binary variable was constructed to represent any attribution to the environment regardless of qualitative or quantitative source. The collapsed

variable represents making an environmental attribution versus not making an environmental attribution in one binary variable such that one equals "yes" to either attribution question and that zero equals "no" to both.

Table 2 *Frequency of Attributing Cause of Mood and Mood-Related Behavior Change to Environmental Factors*

	Environmental Attribution	
	n	*% n*
Qualitative Reports	51	15.7
Quantitative Reports	24	7.4
All Environmental Reports [a]	64	19.8

[a] Participants could, but did not usually, report environmental factors as cause in response to both attribution questions. Thus, the All Environmental Reports category is greater than either the Qualitative or Quantitative category.

I computed correlations between the response types in an effort to understand whether the way participants reported environmental attributions indicates an underlying conceptually different interpretations of the questions. The correlation between qualitative and quantitative responses was statistically significant ($p<0.001$) with a moderate correlation of 0.23 (see Appendix J). Chi-square analyses indicated that there were no significant group differences in gender, age, race, Latino ethnicity, education, psychiatric diagnosis, health insurance, region of residence, or urbanicity between those who did and did not make environmental attributions.

Plans for Hypothesis Testing

The overarching goal of this research was to determine in what ways, if any, people who attribute their changes in mood and MRB to environmental factors differ from those attributing their changes to other causes. I approached this question with six specific hypotheses. Although each stage of this research survey's development was carefully

considered such that method of administration, format, content, recruitment, and incentive was justified by previously published research; it was unclear if the data will support these hypotheses. It was possible that outcomes of hypothesis testing would conflict and if this occurred, each result was weighed as a piece of information within the broader investigation. If there was not an association between factors, this was also meaningful. Because relationships between many of these factors have not been explored, all outcomes are useful in the quest to more clearly understand the characteristics of individuals formally or informally diagnosed with seasonal depression.

As described in the Analysis Chapter, Research Aim I, exploring the circumstances under which people with changes in mood and MRB attribute their changes to environmental factors, used factor analyses and logistic regression to analyze three hypotheses. For Research Aim II, logistic regressions were conducted to explore the relationship among attribution of changes in mood and MRB to environmental factors, severity of depression symptoms and clinical self-labeling. Research Aim III explored whether attribution of mood and MRB change to environmental factors, severity of depression symptoms, and clinical self-labeling are associated with clinical help seeking and treatment through univariate and multivariate logistic regression.

CHAPTER III: ANALYSIS & FINDINGS

Descriptive Analyses

Who comprises the final research sample?

Three hundred ninety-nine (76.58%) survey respondents met eligibility requirements and 324 (81.20%) of this group completed the survey in its entirety. The final sample included the 324 eligible people who completed the survey (Table 3). The sample was approximately 74% white, 8% Black/African-American, 5% multi-cultural/ethnic, 4% Asian-American, and 9% other race/ethnicity (including Native American and Pacific Islander); 81% women; and had a mean age of 33 years. Eleven percent of the sample identified as Latino (n=36 distributed as 9 white, 2 Black/African-American, 6 multi-cultural/ethnic, 1 Asian-American, 18 other race/ethnicity). Participants represented 42 states and the District of Columbia with 76% living in "medium" to "big" size cities, 12% in "small" cities, and 10.5% in "rural" areas. Approximately 2.5% of the sample had some high school education, 13% high school diploma/GED, 38% some college or technical training, 23% college degree/technical certification, 9.5% some graduate education, and 14% achieved graduate degrees. While, most had private health insurance (67%), 12% had Medicare or Medicaid coverage, and nearly 20% reported lack of healthcare coverage. Just over half of the sample (55.6%) had a prior psychiatric diagnosis. Participants in the sample spent an average of 20.7 hours a week online.

Did eligible participants completing and not completing the survey differ?

Ideally, participants who completed the survey (the research sample) were representative of the target population. I conducted chi-square analyses to determine whether the

demographic characteristics of eligible participants with incomplete surveys differed from those completing the survey. Table 3 illustrates that distribution of gender (X^2=2.31, df=1, p=0.13), age (X^2=3.35, df=6, p=0.76), race/ethnicity (X^2=7.89, df=4, p=0.10), Latino heritage (X^2=0.01, df=1, p=0.91), U.S. region of residence (X^2=8.07, df=9, p=0.53), urbanicity (X^2=5.51, df=6, p=0.48), level of educational achievement (X^2=6.91, df=5, p=0.23), healthcare insurance coverage (X^2=2.89, df=4, p=0.58), and proportion with prior psychiatric diagnosis (X^2=0.93, df=1, p=0.42), did not vary by survey completion status. The result of an independent samples t-test (see Table 4) indicates that participants' average number of hours spent online also did not vary by survey completion status (t=0.19, df=397, p=0.85). Overall, results indicate that socio-demographic characteristics for eligible respondents did not vary by survey completion status.

Table 3 *Characteristics of Eligible Participants by Survey Completion Status*

	Incomplete Survey (n=75)	Complete Survey (n=324)	X^2, df, p-value
Gender			2.31, 1, 0.13
Female	55 (73.3) [a]	263 (81.2)	
Male	20 (16.7)	61 (18.8)	
Age			3.35, 6, 0.76
18-29	35 (46.7)	150 (46.3)	
30-39	22 (29.3)	77 (23.8)	
40-49	8 (10.7)	54 (16.7)	
50-59	8 (10.7)	27 (08.3)	
60 and older	2 (02.7)	16 (04.9)	
Race/Ethnicity			7.89, 4, 0.10
Asian	7 (09.3)	12 (03.7)	
Black/African-American	5 (06.7)	26 (08.0)	
Multi-cultural/-ethnic	8 (10.7)	17 (05.2)	
Other (including American Indian and Pacific Islander)	5 (06.7)	29 (08.9)	
White	50 (66.7)	240 (74.1)	
Latin Heritage			0.01, 1, 0.91
Latino	8 (10.7)	36 (11.1)	
Non-Latino	67 (89.3)	288 (88.9)	
Education			6.91, 5, 0.23

Some high school	2 (02.7)	8 (02.5)	
High school diploma/GED	11 (14.7)	41 (12.7)	
Some college/technical training	18 (24.0)	124 (38.3)	
College degree/technical certification	26 (48.0)	75 (23.1)	
Some graduate school	7 (09.3)	31 (09.6)	
Graduate degree	11 (14.7)	45 (13.9)	
Region of Residence [b, c]			8.07, 9, 0.53
New England	6 (08.0)	26 (08.0)	
Middle Atlantic	18 (24.0)	66 (20.4)	
South Atlantic	11 (14.7)	34 (10.5)	
East North central	12 (16.0)	56 (17.3)	
West North central	6 (08.0)	24 (07.4)	
East South central	1 (01.3)	10 (03.1)	
West South central	7 (09.3)	18 (05.6)	
Mountain	1 (01.3)	23 (07.1)	
Pacific	13 (17.3)	67 (20.7)	
Self-Reported Level of Urbanicity			5.51, 6, 0.48
Rural town/farm	4 (05.4)	34 (10.4)	
Small city	7 (09.3)	40 (12.3)	
Medium size city	17 (22.7)	66 (20.4)	
Suburbs of a big city	21 (28.0)	99 (30.6)	
Big city	26 (34.7)	81 (25.0)	
"I don't know"	0 (00.0)	4 (01.2)	
Health Insurance			2.89, 4, 0.58
Private insurance	55 (73.3)	218 (67.3)	
Medicare/Medicaid	8 (10.7)	39 (12.0)	
Uninsured	10 (13.3)	61 (18.8)	
"I don't know"	2 (02.7)	6 (01.9)	
Prior Psychiatric Diagnosis			0.93, 1, 0.42
Yes	19 (47.5) [d]	180 (55.6)	
No	21 (52.5)	144 (44.4)	

[a] Columns represent number of participants in the category (n) and percent of participants in category (%n) classified

[b] Number of states/areas in sample: 27 incomplete survey, 43 completed survey

[c] See Appendix D for explanation of regions

[d] For column decreased group size (n=40) because 35 participants dropped out prior to question

Table 4 *Mean Number of Hours Online (Not Including Email) Per Week by Survey Completion Status*

	Incomplete Survey (n=75)	Complete Survey (n=324)	t, df, p-value
Hours spent online	21.19	20.69	0.19, 397, 0.85

Is the research sample reflective of the general population?

To ensure that the research sample represented the target population, my research sample was compared with 2000 U.S. Census data on gender, age, and race (U.S Census: Population Division, 2009). Results in Table 5 indicate that when compared to the composition of the U.S. population, this study sample is younger, more female, and more racially diverse (but with fewer Latinos).

Table 5 *Characteristics of Research Sample vs. 2000 U.S. Census*

	Study Sample %	2000 U.S. Census %
Gender		
Female	81.2	50.7
Male	18.8	49.3
Age [a]		
18 -29	46.3	13.6 [b]
30-39	23.8	15.4
40-49	16.7	15.1
50-59	08.3	11.0
60 +	04.9	16.3
Race/Ethnicity		
Asian	04.0	4.4
Black/African-American	08.0	12.8
Multi-cultural/-ethnic	05.2	1.6
Other (including American Indian, Hawaiian, and Pacific Islander)	08.6	1.2
White	74.1	80.0
Latin Descent		
Yes	11.1	15.1
No	88.9	84.9

[a] Median age for research sample was 33 years; U.S. Census 35.3 years
[b] U.S. Census sampled individuals aged 20-29 years

The study sample's average number of hours spent online was compared to the nationally representative sample of the 2006 General Social Survey (GSS: Davis, Smith, & Marsden, 2007). The study sample reported much more frequent online activity than that of the GSS sample, an outcome expected when accounting for the online nature of participant recruitment and survey delivery (Table 6). This observation is supported by results of an

independent samples t-test demonstrating statistically significant differences between group means.

Table 6 *Mean Number of Hours Spent Online of Research Sample vs. General Social Survey (GSS)*

	Study Sample (n=324)	GSS (n=6600)	t, df, p-value
Hours spent online	20.69	6.68	22.72, 6922, <0.001

Why were survey respondents ineligible?

Of the 580 surveys begun during data collection, 59 were excluded from analysis because data were incomplete or problematic. Of the remaining 521 survey respondents, 122 (23.42%) were ineligible because they did not meet one *or more* of the following inclusion criteria: age over 18 (N=17), residing in the United States (N=11), and recent self-assessed changes in mood and MRB lasting at least two weeks (N=110) (Table 7).

Table 7 *Ineligible Survey Respondents by Eligibility Criterion* [a]

	Respondents Not Meeting Eligibility Criterion N (% of ineligible)
Mood Criterion: *Perceived mood and/or behavior change lasting at least two weeks at some time in the last twelve months?*	110 (90.2)
Age Criterion: *At least eighteen years of age?*	17 (13.9)
Residency Criterion: *Live within the United States and Territories?*	11 (9.0)

[a] Respondents could be ineligible based on responses to multiple criteria, therefore combined n>122

Did eligible and ineligible survey respondents differ?

Three hundred ninety-nine (76.58%) survey respondents met eligibility requirements. To test whether ineligible survey respondents differed from the larger pool of eligible participants, I compared the groups on various socio-demographic characteristics. As

most variables were categorical, comparisons were made using chi-square statistics. Table 8 indicates that these two groups differed on several characteristics. Compared with ineligible respondents, eligible respondents were more likely to be older (X^2=14.45, df=6, p<0.05), white (X^2=24.36, df=4, p<0.001), less educated (X^2= 33.26, df=6, p<0.001), and uninsured (X^2= 33.52, df=4, p<0.001). An independent samples' t-test indicated that the two groups did not vary on the average number of hours spent online (t=1.58, df=519, p=0.12; Table 9). Most of the ineligible individuals failed to meet the mood criterion. The elimination of these individuals likely impacted the age and education distribution of the eligible sample. It can also be inferred that eligibility criteria also altered the composition of the final research sample with regard to race/ethnicity and health insurance status – resulting in a sample with a greater proportion of white participants, Medicare/Medicaid recipients, and individuals without health coverage as compared with the entire respondent sample.

Table 8 *Characteristics by Eligibility Status*

	Ineligible (n=122)	Eligible (n=399)	X^2, df, p-value
Gender			1.03, 1, 0.31
Female	92 (75.4) [a]	318 (79.7)	
Male	30 (24.6)	81 (20.3)	
Age			14.45, 6, 0.025
18-29	66 (54.9)	185 (46.4)	
30-39	21 (17.2)	99 (24.8)	
40-49	7 (05.7)	62 (15.5)	
50-59	8 (06.6)	35 (08.8)	
60 +	2 (01.6)	18 (04.6)	
Race/Ethnicity			24.36, 4, <0.001
Asian	20 (16.4)	19 (04.8)	
Black/African-American	9 (07.4)	31 (07.8)	
Multi-cultural/-ethnic	1 (00.8)	25 (06.3)	
Other (including American Indian and Pacific Islander)	14 (11.4)	34 (08.6)	
White	78 (63.9)	290 (72.7)	
Latin Heritage			1.24, 1, 0.27
Latino	17 (14.8)	44 (11.0)	
Non-Latino	104 (85.2)	355 (89.0)	

Education			33.26, 6, <0.001
8th grade or less	1 (00.8)	0 (00.0)	
Some high school	14 (11.5)	10 (02.5)	
High school diploma/GED	11 (09.0)	52 (13.0)	
Some college/technical training	28 (23.0)	142 (35.6)	
College degree/technical certification	31 (25.4)	101 (25.3)	
Some graduate school	7 (05.7)	38 (09.5)	
Graduate degree	30 (24.6)	56 (14.0)	
Region of Residence [b, c]			7.25, 9, 0.61
New England	10 (08.2)	32 (08.0)	
Middle Atlantic	29 (23.8)	84 (21.1)	
South Atlantic	14 (11.4)	45 (11.3)	
East North central	10 (08.2)	68 (17.0)	
West North central	7 (05.7)	30 (07.5)	
East South central	6 (04.9)	11 (02.8)	
West South central	8 (06.6)	25 (06.3)	
Mountain	6 (04.9)	24 (06.0)	
Pacific	21 (17.2)	80 (20.1)	
Outside of U.S. [d]	11 (09.0)	N/A	
Self-Reported Level of Urbanicity			7.01, 6, 0.32
Rural town/farm	9 (7.4)	38 (09.6)	
Small city	23 (18.9)	47 (11.8)	
Medium size city	23 (18.9)	83 (20.8)	
Suburbs/Outskirts of a big city	31 (25.4)	120 (30.1)	
Big city	33 (27.0)	107 (26.8)	
"I don't know"	3 (02.5)	4 (01.0)	
Health Insurance			33.52, 4, <0.001
Private insurance	91 (74.5)	273 (69.4)	
Medicare/Medicaid	4 (03.3)	47 (11.8)	
Uninsured	13 (10.7)	71 (17.8)	
"I don't know"	14 (11.5)	8 (02.0)	

[a] Columns represent number of participants in the category (n) and percent of participants in category (%n) classified
[b] Number of States/areas in sample: 35 ineligible, 45 eligible
[c] See Appendix D for explanation of regions
[d] Not included in calculation of Chi-square

Table 9 *Mean Hours Spent Online (Not Including Email) Per Week by Eligibility Status*

	Ineligible (n=122)	Eligible (n=399)	t, df, p-value
Hours spent online	17.57	20.78	1.58, 519, 0.12

Hypothesis Testing

RESEARCH AIM I: To explore the circumstances under which people with recent changes in mood and mood-related behavior (MRB) attribute their changes to the physical environment.

Analyses related to Hypothesis I:

Compared to participants with low seasonal sensitivity, participants with high seasonal sensitivity are more likely to attribute their changes in mood and mood-related behavior to factors in the physical environment such as temperature and photoperiod.

To determine if the degree to which individuals experience seasonally variant mood and MRB is associated with attribution to environmental factors, a logistic regressions were conducted. Data for the dependent attribution outcomes were derived from three sources. Analyses were run implementing the three treatments of environmental attribution data: *qualitative*, *quantitative*, and *any environmental*. *Qualitative* data was gathered in response to an open-ended question asking for participants' attribution of their recent mood and MRB change. *Quantitative* data was gathered in response to a forced choice asking for participants' primary attribution. *Any environmental* refers to a binary variable created to represent if participants' made an environmental attribution either through qualitative and quantitative responses (1=environmental attribution and 0=never made an environmental attribution).

A seasonal sensitivity measure (Global Seasonality Scale as described in the Methods chapter) was used as the primary predictor in the model. Participants responded to the

six-item scale and their GSS score was calculated as a continuous variable with values ranging from 0 to 24 in which a low score indicates that behavior does not vary over the year and a high score indicates that one's behavior is extremely variant. Descriptive analysis indicated the seasonal scores were normally distributed (see Table 1). Cronbach's $\alpha = 0.90$ for the scale. Factor analysis revealed that each of the six items loaded strongly onto one component that explained 66.8% of the total item variance. For a quick reference of variables used in this analysis, see Table 52 located in the Tables appendix.

Treating seasonality as a continuous variable

As shown in Table 10, degree of seasonal sensitivity was found to significantly ($p<0.05$) predict environmental attribution regardless of attribution reporting style. As seasonal sensitivity scores increase, the likelihood of making an environmental attribution slightly, but significantly, increases (OR=1.10).

Table 10 *Seasonality Score as a Predictor of Environmental Attribution by Attribution Treatment (N=324)*

	ß	S.E.	Wald	df	p	OR	95% CI
Quantitative Attribution	0.09	0.04	6.25	1	.012	1.10	1.02-1.18
constant	-3.60	0.53	46.48	1	.000	0.03	
Qualitative Attribution	0.10	0.03	12.81	1	.000	1.10	1.05-1.16
constant	-2.80	0.38	55.27	1	.000	0.06	
Any Attribution	0.10	0.03	14.98	1	.000	1.10	1.05-1.16
constant	-2.50	0.34	54.34	1	.000	0.08	

In addition to the seasonality score, a quadratic variable (calculated by squaring the seasonality score) was entered stepwise into the binary logistic regression models. The

quadratic variable was utilized to better determine if seasonality scores were linear in the logit, (if seasonality had a non-linear relationship with attribution). If a quadratic variable is significant as a predictor in a regression model, data indicate that the relationship between variables is non-linear.

Table 11 illustrates outcomes of logistic regression models in which seasonality scores and quadratic transformations of seasonality scores are associated with the various treatments of environmental attribution. Transformed GSS scores significantly predicted making environmental attributions qualitatively (or when reporting style was irrelevant) indicating that the relationships were non-linear. Transformed GSS scores did not significantly predict quantitative-style reports of environmental attribution indicating that the relationship between seasonality and quantitative reporting is linear.

Table 11 *Seasonality Score (GSS) as a Linear and Non-Linear Predictor of Environmental Attribution by Attribution Treatment*

	ß	S.E.	Wald	df	p	OR	95% CI
			Quantitative				
GSS	0.42	0.20	4.37	1	.037	1.53	1.03-2.28
Quadratic GSS	-0.01	0.01	2.91	1	.088	0.99	0.97-1.00
Constant	-5.36	1.29	17.16	1	.000	0.01	
			Qualitative				
GSS	0.41	0.14	8.84	1	.003	1.50	1.15-1.96
Quadratic GSS	-0.01	0.01	5.62	1	.018	0.99	0.98-1.00
Constant	-4.36	0.85	26.38	1	.000	0.01	
			Any				
GSS	0.36	0.12	9.56	1	.002	1.43	1.14-1.79
Quadratic GSS	-0.01	0.00	5.60	1	.018	0.99	0.98-1.00
constant	-3.76	0.70	28.92	1	.000	0.02	

Selecting covariates

Covariates were selected on the basis of two reduction techniques: backwards entry logistic regression and manual removal (detailed in Appendix K: Section H1). While the backwards entry method has a reasonable likelihood of coming up with the best predictor

model, manually extracting socio-demographic variables from the predictor model allowed me to see how each variable's presence or absence impacted the model overall (see summary Table 12). By reducing predictor models two ways, I was able to make an informed decision as to which covariates should remain in the final analyses.

Backwards entry

Seasonality significantly predicted environmental attributions of mood and MRB change even when gender, race, Latino heritage, insurance coverage, region of residence, and urbanicity were included as binary covariates in the logistic regression models. Age and education were included as continuous ordinal variables. The initial model included these eight socio-demographic variables. Non-significant variables were dropped from the model using backwards Wald regression appropriate for large samples (entry significance was increased from 0.05 to 0.15 to accept more potential covariates into the model) to determine if they influenced the predictive power of seasonality. In these models female gender, age group 18-29 years, white race, non-Hispanic heritage, private health insurance, having a graduate degree, Pacific region of residence, and living in a big city were used as reference categories. No hypotheses were made regarding confounders. The few "I don't know" responses to the health insurance (n=6) and level of urbanicity (n= 4) questions were removed from analysis (sample size N=314). The quantitative regression was conducted with only the untransformed seasonality variable because it was shown to have a linear relationship with environmental attribution (Table 11). The other regressions utilized the quadratic variable. Tables in Appendix K: Section H1 display the significant covariates remaining in each model.

Manual removal

Seasonality remained a significant predictor of environmental attribution, regardless of reporting style, when covariates were added to the models. Manual removal produced outcomes similar to those generated by the backwards regression analyses (Table 12).

Because significant socio-demographic predictors of environmental attribution varied by attribution reporting style, I looked at bivariate analyses between the variables and environmental attribution. Analyses revealed that Latin heritage was not significant at the $p<0.05$ level and that it produced very small cell sizes. For these reasons and because I was not interested in isolating ethnicity-based group differences, I removed it from future analyses. All models investigating the association between seasonality and attribution included the following: age, education, living in a small city and Mountain region of residence.

Table 12 *Summary of Potential Covariates by Attribution Treatment and Method of Removal*

	Backwards Wald	Manual
Quantitative	Age 50-59 years	Age 50-59 years
	Latin heritage [a]	Latin heritage [a]
	Mountain region of residence	Mountain region of residence ($p<0.10$)
Qualitative	Education	Education
	Latin heritage [a]	Latin heritage [a]
	Living in a small city	Living in a small city
Any attribution	Education	Education

[a] Covariate retained in model at $p<0.01$. All other covariates retained at the $p<0.05$ level.

Treating seasonality as a binary variable

By treating a covariate continuously and computing the Odds Ratio, risk is the same for each unit of change of the covariate because linearity in the logit is assumed. Therefore, in this analysis, where the likelihood of attributing changes in mood and MRB to the environment is compared at different degrees of seasonal sensitivity, the likelihood of making an environmental attribution is the same across the range of seasonality scores.

However, this is not always a reasonable assumption, (i.e., assuming a linear relationship between the covariate and outcome). The significant quadratic predictor variable indicated that this is not a defensible assumption except in the case of the quantitative attribution. Therefore, it is sometimes preferable to categorize such variables. For this reason, the seasonality variable was converted into a binary variable; representing whether a participant scored above and below the mean. A value of one was assigned to seasonality scores equaling 11 or greater and a value of zero was assigned to scores below 11. The relationships between the binary seasonality (cut-point) and environmental attribution were significant (Table 13) such that individuals scoring above the clinically-relevant threshold were about four times more likely to make environmental attributions versus non-environmental attributions. When controlling for age, educational achievement, region of residence and living in a small city, individuals with high seasonality scores were about five times more likely to make an environmental attribution versus individuals with low seasonality scores ($p<0.01$) (Table 14a, b, & c).

Table 13 *Seasonality Treated as a Clinically-Relevant Binary Variable Predicts Environmental Attribution* (*N*=324)

	ß	S.E.	Wald	df	p	OR	95% CI
			Quantitative				
GSS	1.43	0.52	7.67	1	.006	4.17	1.52-11.46
Constant	-3.45	0.45	57.57	1	.000	0.03	
			Qualitative				
GSS	1.38	0.35	15.32	1	.000	3.96	1.99-7.90
Constant	-2.53	0.30	70.88	1	.000	0.08	
			Any Env.				
GSS	1.35	0.32	18.31	1	.000	3.84	2.07-7.12
constant	-2.21	0.26	70.49	1	.000	0.11	

Table 14a *Seasonality Treated as a Clinically-Relevant Binary Variable Predicts Quantitative Environmental Attribution, Covariate Model*

	ß	S.E.	Wald	df	p	OR	95% CI
Seasonality	1.51	0.53	8.11	1	.004	4.53	1.60-12.79
Age	0.16	0.17	0.79	1	.373	1.17	0.83-1.64
Education	0.00	0.17	0.00	1	.980	1.00	0.71-1.40
Mountain Region of Residence	0.97	0.69	1.97	1	.161	2.63	0.68-10.13
Small City	-0.61	0.77	0.61	1	.434	0.55	0.12-2.49
constant	-3.84	0.88	19.09	1	.000	0.02	

Table 14b *Seasonality Treated as a Clinically-Relevant Binary Variable Predicts Qualitative Environmental Attribution, Covariate Model*

	ß	S.E.	Wald	df	p	OR	95% CI
Seasonality	1.65	0.38	18.87	1	.000	5.21	2.47-10.98
Age	0.06	0.13	0.21	1	.646	1.06	0.82-1.38
Education	0.48	0.13	13.33	1	.000	1.61	1.25-2.08
Mountain Region of Residence	0.88	0.59	2.25	1	.133	2.41	0.77-7.57
Small City	1.08	0.42	6.51	1	.011	2.94	1.28-6.74
constant	-4.91	0.72	46.40	1	.000	0.01	

Table 14c *Seasonality Treated as a Clinically-Relevant Binary Variable Predicts Any Type of Environmental Attribution, Covariate Model*

	ß	S.E.	Wald	df	p	OR	95% CI
Seasonality	1.57	0.34	21.85	1	.000	4.79	2.48-9.24
Age	0.00	0.12	0.00	1	.977	1.00	0.79-1.28
Education	0.39	0.12	10.84	1	.001	1.48	1.17-1.86
Mountain Region of Residence	0.78	0.54	2.08	1	.150	2.18	0.76-6.31
Small City	0.68	0.41	2.78	1	.095	1.97	0.89-4.39
constant	-3.99	0.62	41.14	1	.000	0.02	

Treating seasonality as an ordinal variable

Seasonality scores were also converted into an ordinal variable by breaking the 0-24 score range into quintiles such that category one represented scores 0-4, two represented scores 5-9, group three represented scores 10-14, group four represented scores 15-19, and group five represented scores 20-24. The ordinal variable was entered continuously into the regression to determine if participants with low versus high seasonality scores display clinically meaningful differences in their odds of making environmental attributions (Table 15). When controlling for age, educational achievement, region of residence and living in a small city, individuals with high seasonality scores were almost two times more likely to make an environmental attribution compared to individuals with low seasonality scores ($p<0.01$) (Table 16a, b, & c).

Table 15 *Seasonality (in Quintiles and Treated Continuously) Predicts Environmental Attribution, by Attribution Treatment* (*N* = 324)

	ß	S.E.	Wald	df	p	OR	95% CI
			Quantitative				
GSS	0.54	0.19	7.61	1	.006	1.71	1.17-2.50
Constant	-4.13	0.67	37.72	1	.000	0.02	
			Qualitative				
GSS	0.46	0.14	11.13	1	.001	1.59	1.21-2.08
Constant	-3.02	0.46	43.72	1	.000	0.05	
			Any Env.				
GSS	0.50	0.13	14.95	1	.000	1.64	1.28-2.11
constant	-2.83	0.42	45.68	1	.000	0.06	

Table 16a *Seasonality (in Quintiles and Treated Continuously) Predicts Quantitative Environmental Attribution, Covariate Model*

	ß	S.E.	Wald	df	p	OR	95% CI
Seasonality	0.61	0.21	8.71	1	.003	1.84	1.23-2.75
Age	0.16	0.18	0.85	1	.358	1.18	0.83-1.66
Education	0.02	0.18	0.02	1	.898	1.02	0.72-1.45
Mountain Region of Residence	1.11	0.70	2.55	1	.110	3.04	0.78-11.89
Small City	-0.67	0.77	0.75	1	.388	0.51	0.01-2.34
constant	-4.81	1.09	19.49	1	.000	0.01	

Table 16b *Seasonality (in Quintiles and Treated Continuously) Predicts Qualitative Environmental Attribution, Covariate Model*

	ß	S.E.	Wald	df	p	OR	95% CI
Seasonality	0.63	0.15	15.81	1	.000	1.87	1.37-2.55
Age	0.08	0.13	0.36	1	.549	1.08	0.84-1.40
Education	0.50	0.13	14.29	1	.000	1.64	1.27-2.12
Mountain Region of Residence	0.95	0.59	2.59	1	.108	2.59	0.81-8.24
Small City	0.99	0.41	5.81	1	.016	2.70	1.20-6.06
constant	-5.82	0.88	43.29	1	.000	0.00	

Table 16c *Seasonality (in Quintiles and Treated Continuously) Predicts Any Environmental Attribution, Covariate Model*

	ß	S.E.	Wald	df	p	OR	95% CI
Seasonality	0.64	0.14	19.99	1	.000	1.89	1.43-2.50
Age	0.02	0.12	0.03	1	.870	1.02	0.80-1.30
Education	0.42	0.12	12.18	1	.000	1.52	1.20-1.91
Mountain Region of Residence	0.90	0.55	2.68	1	.102	2.45	0.84-7.15
Small City	0.60	0.40	2.21	1	.137	1.81	0.83-3.97
constant	-5.02	0.78	41.85	1	.000	0.01	

Next, the ordinal seasonality variable was entered as categorically. Group one (*n*=61), representing the least seasonally sensitive participants, was used as the baseline reference group to best understand the impact increased sensitivity had on the odds of making an environmental attribution (Table 17). When looking at the qualitative and quantitative attribution styles separately, reports of the most extreme level of seasonality (n=18) did not significantly predict environmental attribution, possibly due to small cell sizes. However, when reporting style is ignored (i.e. any environmental attribution), individuals having high seasonality scores were significantly more likely (5.5 times) to make an environmental attribution versus those with lowest seasonality scores.

Table 17 *Seasonality, (in Quintiles and Treated Categorically), Predicts Environmental Attribution*[a] *by Attribution Treatment* (*N*=324)

	ß	S.E.	Wald	df	p	OR	95% CI
			Quantitative				
5-9	-0.30	1.42	0.04	1	.833	0.74	0.05-12.08
10-14	2.24	1.05	4.54	1	.033	9.40	1.20-73.80
15-19	1.95	1.09	3.22	1	.073	7.00	0.84-58.65
20-24	2.02	1.26	2.57	1	.109	7.50	0.64-88.05
constant	-4.09	1.01	16.49	1	.000	0.02	
			Qualitative				
5-9	0.74	0.70	1.11	1	.292	2.09	0.53-8.23
10-14	1.56	0.65	5.87	1	.015	4.77	1.35-16.89
15-19	1.96	0.65	9.01	1	.003	7.10	1.98-25.55
20-24	1.35	0.87	2.44	1	.119	3.87	0.71-21.12
constant	-2.96	0.59	25.02	1	.000	0.05	
			Any Env.				
5-9	0.56	0.63	0.81	1	.368	1.76	0.52-6.00
10-14	1.67	0.57	8.67	1	.003	5.29	1.75-16.05
15-19	1.80	0.58	9.59	1	.002	6.06	1.94-19.98
20-24	1.70	0.74	5.32	1	.021	5.48	1.29-23.28
constant	-2.66	0.52	26.38	1	.000	0.07	

[a] in reference to lowest GSS scores

Hypothesis I results summary

As hypothesized, self-reported seasonal sensitivity is significantly associated with an increased likelihood of attributing recent mood and MRB change to environmental factors. This relationship is demonstrated when seasonality is conceptualized as an extreme point on a continuum of behavior or as above a clinical threshold.

Analyses related to Hypothesis II:

People with high natural light exposure and control, measured using five study-specific questions, are more likely to attribute mood and mood-related behavior change to the environment versus other factors compared to those having low natural light exposure and control.

Bivariate correlations were conducted to determine if responses to the five natural light exposure behavior items (described in the Methods chapter) were related. Correlations revealed significant relationships among four of the five items (Appendix K: Section H2). The item related to perceived bright light sensitivity was not significantly correlated with the other items.

To further understand how responses to the five light behavior items related to one another, a principal components factor analysis with promax rotation was conducted. This rotation method was selected because it allows for the possibility that factors are correlated. Following the criterion of eigenvalues >1 for factor extraction, the resulting structure matrix indicates a two-factor solution (Table 18) explaining 63.5% of the total item variance.

Table 18 *Factor Analysis Structure Matrix for Light Questions, Two-Factor Solution*[a]

	Component 1 "Exposure"	Component 2 "Control/Sensitivity"
How important is it for you to be exposed to natural light each day?	.797	-.143
On an average day, how much time do you spend exposed to natural light?	.791	.329
If you could choose, how much of your day would you prefer to be exposed to natural light?	.880	-.074
How much control do you have over your natural light exposure?	-.043	.841
How sensitive are you to bright light?	.037	.544

[a] Extraction Method: Principal Component Analysis. Rotation Method: Promax with Kaiser Normalization

Factor one, labeled "exposure," loaded items related to the importance of and experiences with natural light exposure. The second factor "control/sensitivity" was associated with control over light exposure and sensitivity to bright light. Correlation between the

components of the five-item, two-factor solution was 0.03. I removed the light sensitivity item from the analysis because it did not correlate significantly with the other items and I thought it might meaningfully influence the outcome of the analysis. However, a two-factor solution still emerged and correlation between the four-item, two-factors was also extremely negligible at 0.02.

Examination of the five-item Scree plot indicated that a three factor model might be more appropriate and conceptually interesting. I forced a three-factor solution in which the new factor, with an eigenvalue of 0.963, contained only the bright light sensitivity item. The composition of the "exposure" factor remained unchanged. The item related to control over natural light exposure "control" loaded separately on a new factor (Table 19). Together, the three factors explained 82.7% of the variance, 20% more than the two-factor solution. Factor inter-correlations were very low (Table 20). The three-factor model indicates that control and sensitivity items are unique factors representing different conceptual domains.

Table 19 *Factor Analysis Structure Matrix for Light Questions, Three-Factor Solution* [a]

	Component		
	1 "Exposure"	2 "Control"	3 "Sensitivity"
How important is it for you to be exposed to natural light each day?	0.79	-0.23	0.08
On an average day, how much time do you spend exposed to natural light?	0.80	0.34	0.08
If you could choose, how much of your day would you prefer to be exposed to natural light?	0.88	-0.06	-0.07
How much control do you have over your natural light exposure?	-0.03	0.96	0.07
How sensitive are you to bright light?	0.02	0.07	0.997

[a] Extraction Method: Principal Component Analysis. Rotation Method: Promax with Kaiser Normalization

Table 20 *Component Correlation Matrix, Three-Factor Solution*

	Component		
	1	2	3
1	---	0.02**	0.03**
2		---	0.07**
3			---

The second research hypothesis is derived from the idea that those who seek natural light exposure are likely to have an increased awareness of their responses to environmental factors. Results from the three-factor model suggest that an expansion of the hypothesis, to include light sensitivity as a separate factor, is warranted and analyses proceeded accordingly. I developed a hierarchical model in which I first examined the univariate contribution of each predictor. A multivariate model was then developed. For this model, an "exposure" variable was generated by creating a summary score for three questions (*How important is it for you to be exposed to natural light each day?*, *On an average day, how much time do you spend exposed to natural light?*, and *If you could choose, how*

much of your day would you prefer to be exposed to natural light?) with scores ranging from 3-15. The three exposure items had a Cronbach's $\alpha = 0.76$.

Variables representing the three factors were then standardized into Z-scores (Table 21). Pearson's correlations between standardized factors were not significant. Logistic regressions used standardized light factors as predictor variables for the dependent attribution outcome (as described above). Since environmental attribution may predict light exposure behavior, analyses indicating significant predictive relationships were run in the opposite direction to assist in interpreting results.

Table 21 *Z-Scores of Light Factors*

	Mean [a]	SD	Skewness	Kurtosis
Exposure	2.67	1.03	0.46	-0.61
Control	2.77	1.07	0.03	-0.59
Sensitivity	3.30	1.30	-0.21	-1.05

[a] Component scores ranged from 1-5

Treating environmental attribution as quantitative

Reports of exposure to or control over natural light exposure did not predict likelihood of making a quantitative report of environmental attribution to explain the cause of recent mood and MRB changes (Table 22a). However, perceived bright light sensitivity significantly predicted a decreased likelihood of making a quantitative environmental attribution (Table 22a).

Table 22a *Factors Related to Natural Light Exposure Associated with Quantitative Environmental Attribution* (*N* = 324)

	ß	S.E.	Wald	df	p	OR	95% CI
Exposure	-0.23	0.22	1.07	1	.301	0.80	0.52-1.23
constant	-1.94	0.58	11.15	1	.001	0.14	
Control	-0.30	0.20	2.22	1	.137	0.74	0.50-1.10
constant	-1.73	0.55	9.86	1	.000	0.18	
Sensitivity	-0.35	0.17	4.45	1	.035	0.70	0.51-0.98
constant	-1.46	0.51	8.10	1	.004	0.23	

I conducted a linear regression model to understand the direction of the relationship and found that quantitatively reported environmental attribution was significantly but slightly negatively associated with bright light sensitivity (ß=-0.12, $p<0.05$). To evaluate the strength of the negative association between self-reported bright light sensitivity and environmental attribution, I conducted a logistic regression with backward Wald entry and removal methods (explained in detail earlier in H1) that included socio-demographic variables. The reduced model included light sensitivity, gender, and Latin heritage. Light sensitivity remained a significant negative predictor of environmental attribution (ß =-0.41; df=1; $p<0.05$). Stepwise regression with the same variables revealed that light sensitivity remained significant in the presence of the covariates (ß=-0.44; df=1; $p<0.05$). In summary, the data indicate that light sensitivity is a significant negative predictor of quantitative environmental attribution independent of age, race, gender, and other socio-demographic characteristics.

Treating environmental attribution as qualitative

Logistic regression models using qualitative reports of environmental attribution did not reveal a significant relationship with the exposure or sensitivity factors (Table 22b). The

control factor positively but weakly predicted likelihood of making a qualitative attribution ($p<0.10$).

Table 22b *Factors Related to Natural Light Exposure Associated with Qualitative Environmental Attribution*

	ß	S.E.	Wald	df	p	OR	95% CI
Exposure	-0.21	0.16	1.80	1	.180	0.81	0.60-1.10
constant	-1.14	0.42	7.28	1	.007	0.32	
Control	0.26	0.15	3.25	1	.072	1.30	0.98-1.73
constant	-2.43	0.50	28.08	1	.000	0.09	
Sensitivity	-0.03	0.12	0.06	1	.804	0.97	0.77-1.22
constant	-1.58	0.41	14.70	1	.000	0.21	

I conducted a reverse model using linear regression to determine if qualitative environmental attribution is associated with control. Again, a weak association was found between qualitative environmental attribution and control (ß=0.10, $p<0.10$). However, the overall regression model was not significant.

Environmental attribution regardless of reporting style

Control and sensitivity factors did not predict environmental attribution when reporting style was not differentiated. However, the exposure factor was weakly and negatively associated with environmental attribution at the $p<0.10$ level (Table 22c). The reverse model using linear regression indicates a weakly significant and negative association between the variables (ß=-0.10; $p<0.10$).

Table 22c *Factors Related to Natural Light Exposure Associated with Any Environmental Attribution*

	ß	S.E.	Wald	df	P	OR	95% CI
Exposure	-0.25	0.14	2.97	1	.085	0.78	0.59-1.03
constant	-0.76	0.39	3.90	1	.048	0.47	
Control	0.10	0.13	0.54	1	.462	1.10	0.85-1.43
constant	-1.67	0.40	17.67	1	.000	0.19	
Sensitivity	-0.09	0.11	0.73	1	.392	0.91	0.74-1.13
constant	-1.10	0.37	8.83	1	.003	0.33	

Hypothesis II results summary

In summary, the data do not entirely support the second hypothesis. The data indicate that the five light-related items did not represent a cohesive scale. Perceived bright light sensitivity was not related to reports of exposure to and control over natural light. Light sensitivity is a significant negative predictor of quantitative environmental attribution. Exposure and control items had weak associations with environmental attribution which varied by treatment of the attribution variable. Control over light exposure did predict qualitative environmental attributions marginally and in the direction indicated by the hypothesis.

Analyses related to Hypothesis III:

Compared with people ranking low on control over illness, using the Brief IPQ, people with high illness perception control are more likely to attribute mood and mood-related behavior change to the environment versus other factors.

Eight items, comprising the Brief Illness Perception Questionnaire (Brief IPQ), were included as predictors of the dependent environmental attribution variables (Appendix A).

A bivariate correlation revealed significant relationships among many of the items as well as significant relationships between some items and environmental attribution (Appendix K: Section H3). To better understand the psychometric properties of the Brief IPQ, a factor analysis of the eight items was conducted. Using principal components analysis and Promax with Kaiser Normalization rotation because of the possibility that the factors were not mutually independent, 59.5% of the variance was explained by a two-factor model. The component correlation matrix revealed a -0.09 correlation between components. As seen in Table 23, the first component contained five items (1, 2, 5, 6, and 8) related to participants' perceptions of the impact that their changes in mood and MRB have on their lives. The second component is comprised of three items (3, 4, and 7) and is related to participant perceptions of control over and understanding of these changes.

Table 23 *Brief IPQ Factor Analysis Structure Matrix, Two-Factor Solution* [a]

	Component 1 "Impact"	Component 2 "Control"
How much do your changes in mood and/or behavior affect your life?	.835	-.031
How long do you think your changes in mood and/or behavior will continue?	.642	-.332
How much control do you feel you have over your changes in mood and/or behavior?	-.407	.668
How much do you think your treatment can help your changes in mood and/or behavior?	.164	.719
How much do you experience symptoms from your changes in mood and/or behavior?	.824	-.026
How concerned are you about your changes in mood and/or behavior?	.793	.004
How well do you feel you understand your changes in mood and/or behavior?	.004	.711
How much do your changes in mood and/or behavior affect you emotionally	.770	.049

[a] Extraction Method: Principal Component Analysis. Rotation Method: Promax with Kaiser Normalization

The two factor model corresponds with the instrument authors' method of scoring the measure. They generated a single Brief IPQ score calculated by reverse scoring items on factor two (3, 4, and 7) and summing these with items that loaded on factor one (1, 2, 5, 6, and 8). Calculated this way, Brief IPQ scores for this sample were normally distributed with a mean of 43.39 (range 0-72; SD=11.06) in which a high score indicates greater perceived illness threat. The scale's inter-item reliability was solid (α=0.70).

Although the hypothesis specifically focuses on the control dimension of illness behavior, I felt it was important to understand how the Brief IPQ scale as a whole related to environmental attribution. A series of bivariate logistic regressions revealed that higher Brief IPQ scores significantly predicted a decreased likelihood of environmental attribution when environmental causes for mood and MRB changes were selected from a list (quantitative report). Conversely, low perceived illness threat score was associated with an increase in quantitative environmental attributions. I interpret this result as indication that stronger perceived illness threat is related to developing other, non-environmental, causal attributions. When causes were generated by participants (qualitatively), illness threat did not predict environmental attribution (Table 24). Brief IPQ score was not significantly related to age (R=-0.09; p=0.10), gender (R=0.03; p=0.56), or race (R=-0.02; p=0.76).

Table 24 *Brief IPQ Score Associated with Environmental Attribution, by Attribution Treatment* (*N*=324)

	ß	S.E.	Wald	df	p	OR	95% CI
			Quantitative				
Brief IPQ	-0.04	0.02	4.56	1	.033	0.96	0.93-1.00
Constant	-0.53	0.92	0.32	1	.569	0.59	
			Qualitative				
Brief IPQ	-0.01	0.01	0.32	1	.573	0.99	0.97-1.02
Constant	-1.28	0.71	3.22	1	.073	0.28	
			Any Env.				
Brief IPQ	-0.02	0.01	2.24	1	.134	0.98	0.96-1.01
constant	-0.45	0.65	0.48	1	.491	0.64	

Because the factor analysis revealed a component loaded with items that could be conceptually separate; I thought it might be useful to investigate a broader model. An additional factor analysis expanded on the previous two-factor model by allowing for the extraction of three factors. The three factor extraction explained 69.6% of the item variance with the first and second factors having eigenvalues greater than one. Table 25 illustrates this forced three-factor structure matrix. The first factor "impact" was unchanged from the previous model with five items related to impact on life (1, 2, 5, 6, and 8 loading on the first factor). The second factor "control" contained two items (3 and 7) related to control and understanding of changes in mood and mood-related behavior. The third factor "treatment" contained items related to the perception of treatment efficacy (3 and 4). While contrary to the instrument authors' conceptual division of the measure, it appears that the three factor model may reflect a more useful conceptualization of the Brief IPQ items with components relating to the impact of changes in mood and MRB on well-being, participants' control over the changes, and perceptions of treatment efficacy.

Table 25 *Brief IPQ Factor Analysis Structure Matrix, Three-Factor Solution* [a]

	1 "Impact"	2 "Control"	3 "Treatment"
How much do your changes in mood and/or behavior affect your life?	.836	-.052	-.050
How long do you think your changes in mood and/or behavior will continue?	.656	-.075	-.478
How much control do you feel you have over your changes in mood and/or behavior?	-.412	.591	.486
How much do you think your treatment can help your changes in mood and/or behavior?	.140	.239	.866
How much do you experience symptoms from your changes in mood and/or behavior?	.825	-.059	-.034
How concerned are you about your changes in mood and/or behavior?	.782	-.241	.188
How well do you feel you understand your changes in mood and/or behavior?	.015	.918	.213
How much do your changes in mood and/or behavior affect you emotionally	.768	-.010	.037

[a] Extraction Method: Principal Component Analysis. Rotation Method: Promax with Kaiser Normalization

Hypothesis III specifically questions the predictive value of the control items for environmental attribution. Using the three-factor solution to determine if control-related illness perceptions predict attribution to the environment, bivariate logistic regressions analyses were conducted using a summary score of the "control" items (reverse coded items 3 and 7) as a predictor variable. The control factor did not predict attribution to the environment (Table 26a).

Table 26a *Illness Perception "Control" Factor Does Not Predict Environmental Attribution (N=324)*

	ß	S.E.	Wald	df	p	OR	95% CI
			Quantitative				
Control Factor	-0.07	0.05	1.58	1	.208	0.93	0.84-1.04
Constant	-1.80	0.59	9.24	1	.002	0.17	
			Qualitative				
Control Factor	-0.00	0.04	0.01	1	.923	1.00	0.92-1.07
Constant	-1.64	0.45	13.08	1	.000	0.20	
			Any Env.				
Control Factor	-0.02	0.04	0.24	1	.624	0.98	0.92-1.05
constant	-1.21	0.41	8.72	1	.003	0.30	

Examination of the Brief IPQ items and the way in which they loaded onto components in the factor analysis led me to question its conceptual validity. Do responses to the items "How much control do you feel you have over your changes in mood and/or behavior?" (IPQ3) and "How well do you feel you understand your changes in mood and/or behavior?" (IPQ7) evoke conceptually similar responses? To increase the conceptual clarity of the model, I conducted a logistic regression model using only the question that directly asks about control, (IPQ3), as the predictor of environmental attribution. IPQ3 was reverse coded in the model for ease of interpretation such that a higher item score represent greater perceived control over changes in mood and mood-related behavior. As seen in Table 26b, perceived control did not predict the likelihood of making an environmental attribution (additional analyses in Appendix K: Section H3).

Table 26b *Responses to Brief IPQ item "How Much Control Do You Feel You Have Over Your Changes in Mood and/or Behavior?" Do Not Predict Environmental Attribution*

	ß	S.E.	Wald	df	p	OR	95% CI
			Quantitative				
Control Item	-0.02	0.09	0.03	1	.862	0.99	0.83-1.17
Constant	-2.43	0.60	16.42	1	.000	0.09	
			Qualitative				
Control Item	0.07	0.07	1.23	1	.268	1.08	0.95-1.23
Constant	-2.15	0.47	21.46	1	.000	0.12	
			Any Env.				
Control Item	0.04	0.06	0.41	1	.520	1.04	0.92-1.17
constant	-1.65	0.41	16.06	1	.000	0.19	

Hypothesis III results summary

Contrary to Hypothesis III, level of perceived illness threat did not predict the likelihood of making an environmental attribution. The scoring of the Brief IPQ is structured around a two-factor model, yet I found that a three-factor model was better suited to the content of the scale items. Outcomes of the analyses lead me to question utility of the Brief IPQ's scoring schema.

Research Aim I findings summary

- Environmental attribution of recent mood and MRB change are associated with higher levels of self-reported seasonality, lower levels of perceived bright light sensitivity, and less perceived illness threat.
- Seasonal sensitivity scores and environmental attribution were significantly associated such that greater seasonality was associated with an increased likelihood of attributing to environmental factors.
- Light exposure behavior did not uniformly predict likelihood of making environmental attributions.
- Perceived control over bright light exposure did predict qualitative attributions to the environment, but only marginally. Self-assessed bright light sensitivity did predict likelihood of making environmental attributions when factors of the environment were selected from a list of possible causes for mood and MRB change (quantitatively) but in a direction opposite to the hypothesis. The significant and negative predictive relationship remained when socio-demographic characteristics were included in the model strongly suggesting that

as self-reported bright light sensitivity increases the likelihood of making an environmental attribution decreases.

- Greater perceived illness threat, indicated by a higher Brief IPQ score, predicted a decreased likelihood of making an environmental attribution when selecting environmental factors from a prescribed list of possible causes. When broken down by conceptual components, only those items on the Brief IPQ related to impact of changes in mood and MRB on well-being predicted quantitative environmental attributions.

RESEARCH AIM II: To explore the relationships among environmental attribution, severity of depression symptoms, and clinical self-labeling in people with recent changes in mood and mood-related behavior

Analyses related to Hypothesis IV:

People reporting severe depression symptoms, as measured by the CES-D, are more likely to use clinical labels to describe their changes in mood and mood-related behavior compared to people with mild depression symptoms. In people with severe depression symptoms, attribution of changes in mood and mood-related behavior to the environment does not affect labeling behavior. In people with mild depression, environmental attribution interacts with depression symptom severity such that those who attribute their changes to the environment are less likely to clinically label than those who attribute their changes to other factors.

Bivariate logistic regression analyses were conducted to determine if self-reported severity of depression symptoms and environmental attribution interact to predict labeling behavior. In these moderation models, attribution to environmental factors served as a binary predictor variable along with depression symptom severity, a continuous predictor variable created from responses to the twenty-question CES-D (Appendix A). The regression outcome was clinical labeling, represented by a binary variable where 0 is associated with labeling changes in mood and MRB in non-clinical terms (e.g., "feeling down") and 1 is associated with labeling changes in clinical terms (e.g., "Bipolar Disorder" or "depression").

The K6 scale served as a covariate in the analyses because responses to the CES-D were significantly related to normally distributed responses to the K6 ($r = 0.73$, $p=0.01$) and the measures assessed different types of psychological distress (severity of depression-related symptoms versus general psychological distress). In univariate logistic regressions, self-assessed severity of depressive symptoms (CES-D) and general psychological distress (K6) did not predict the likelihood of using clinical language to label recent changes in mood and MRB (Table 27). When CES-D and K6 scores were recoded into binary variables in which scores indicate being above or below a clinical cut-point, the absence of any relationship between labeling and the psychiatric scales remained.

Table 27 *Severity of Depressive Symptoms and General Psychological Distress Do Not Predict Use of Clinical Labeling*

	ß	S.E.	Wald	df	p	OR	95% CI
Severity of Depressive Symptoms							
Continuous	0.01	0.01	0.15	1	.702	1.01	0.98-1.03
constant	-1.84	0.39	22.62	1	.000	0.16	
Binary	-0.03	0.40	0.01	1	.946	0.97	0.44-2.14
Constant	-1.59	0.37	18.82	1	.000	0.21	
Psychological Distress							
Continuous	0.03	0.03	0.79	1	.376	1.03	0.97-1.08
constant	-1.90	0.37	26.90	1	.000	0.15	
Binary	0.32	0.30	1.12	1	.291	1.37	0.76-2.47
Constant	-1.75	0.21	72.98	1	.000	0.17	

Quadratic transformations of the CES-D and K6 scores were calculated by squaring the scores. The transformed scores were then entered stepwise into binary logistic regressions. The quadratic variables were utilized to investigate whether the scale scores were linear in the logit, (i.e. if the score had a non-linear relationship with labeling behavior). When quadratic variables are significant predictors in regression models, the results indicate that the relationship between predictor and outcomes variables is non-linear. The log transformed CES-D and K6 scores were not significant (Table 28) indicating that the scores are linear in the logit.

Table 28 *Severity of Depressive Symptoms and General Psychological Distress* (*Continuous) Do Not Predict Clinical Labeling with Quadratic*

	ß	S.E.	Wald	df	P	OR	95% CI
Severity of Depressive Symptoms							
CES-D score	0.03	0.06	0.33	1	.568	1.03	0.93-1.15
Quadratic	0.00	0.00	0.19	1	.664	1.00	0.998-1.001
constant	-2.12	0.76	7.82	1	.005	0.12	
Psychological Distress							
K6 score	0.03	0.11	0.07	1	.799	1.03	0.82-1.29
Quadratic	0.00	0.00	0.00	1	.971	1.00	0.99-1.01
constant	-1.92	0.66	8.55	1	.003	0.15	

To determine the best predictor model for clinical labeling, it was necessary to explore the relationships among possible covariates using bivariate and regression analyses.

Variables representing presence of previous psychiatric diagnosis, clinical treatment seeking, and clinical labeling were significantly correlated suggesting multicollinearity (Tables displayed in Appendix K: Section H4). I decided to use only previous psychiatric diagnosis as a covariate because it most likely precedes treatment for a psychological disorder that accounts for a large proportion of clinical treatment seeking as the sole treatment-related covariate. Previous psychiatric diagnosis was a significant univariate predictor of clinical labeling (OR=4.06, df=1, p<0.001, 95%CI 2.02-8.17). Other potential covariates were tested as univariate predictors of clinical labeling. Only age, entered as an ordinal variable, significantly predicted clinical labeling (OR=1.49, df=1, p<0.001, 95%CI 1.19-1.87) and therefore used in subsequent analyses.

To test the hypothesized moderation model, the three attribution variables were tested as univariate predictors of clinical labeling. When picked from a list (quantitatively), environmental attribution did *not* predict use of clinical labeling (Table 29) but, when made qualitatively (or when reporting style was not differentiated), environmental attributions predicted clinical labeling.

Table 29 *Environmental Attribution, by Treatment, as a Predictor of Clinical Labeling*

	ß	S.E.	Wald	df	P	OR	95% CI
Quantitative	0.30	0.53	0.32	1	.570	1.35	0.48-3.78
Constant	-1.34	0.50	7.06	1	.000	0.26	
Qualitative	1.04	0.35	8.88	1	.003	2.83	1.43-5.60
Constant	-1.82	0.18	108.59	1	.000	0.16	
Any Env.	0.78	0.33	5.44	1	.020	2.18	1.13-4.20
constant	-1.80	0.18	102.39	1	.000	0.17	

I expanded the models reported in Table 29 to control for previous psychiatric diagnosis, age, severity of depression symptoms (CES-D), and general psychological distress (K6)

(Tables 30a, 30b & 30c). As seen in Table 30b, making unprompted environmental attributions, (qualitative), significantly predicted clinical labeling such that individuals making environmental attributions versus non-environmental attributions were nearly three times more likely to use clinical language to label their recent changes ($p<0.01$). When reporting style was collapsed (any environmental attribution), environmental attributors versus non-environmental attributors were more than two times more likely to use clinical labels ($p<0.05$).

Table 30a *Quantitative Environmental Attribution Does Not Predict Clinical Labeling*

	ß	S.E.	Wald	df	p	OR	95% CI
Quantitative Attribution	0.25	0.57	0.19	1	.663	1.28	0.42-3.92
Prev. Psych. Diag.	1.65	0.41	15.90	1	.000	5.22	2.32-11.75
Age	0.33	0.13	6.97	1	.008	1.39	1.09-1.78
Severity of depressive symp.	0.00	0.02	0.00	1	.992	1.00	0.97-1.04
Distress (K6)	0.00	0.04	0.00	1	.970	1.00	0.92-1.09
constant	-3.52	0.60	35.01	1	.000	0.03	

Table 30b *Qualitative Environmental Attribution Predicts Clinical Labeling*

	ß	S.E.	Wald	df	p	OR	95% CI
Qualitative Attribution	1.05	0.38	7.67	1	.006	2.87	1.36-6.05
Prev. Psych. Diag.	1.63	0.42	15.13	1	.000	5.09	2.24-11.56
Age	0.34	0.13	6.99	1	.008	1.40	1.09-1.80
Severity of depressive symp.	0.00	0.02	0.01	1	.927	1.00	0.97-1.04
Distress (K6)	0.01	0.04	0.08	1	.780	1.01	0.93-1.10
constant	-3.89	0.63	37.78	1	.000	0.02	

Table 30c *Any Type of Environmental Attribution Predicts Clinical Labeling*

	ß	S.E.	Wald	df	p	OR	95% CI
Any Env. Attribution	0.78	0.36	4.61	1	.032	2.17	1.07-4.40
Prev. Psych. Diag.	1.63	0.42	15.26	1	.000	5.10	2.25-11.54
Age	0.33	0.13	6.97	1	.008	1.40	1.09-1.79
Severity of depressive symp.	0.00	0.02	0.03	1	.860	1.00	0.97-1.04
Distress (K6)	0.00	0.04	0.00	1	.958	1.00	0.92-1.09
constant	-3.78	0.62	37.37	1	.000	0.02	

Interactions between self-reported severity of depressive symptoms (CES-D) and environmental attribution did *not* predict use of clinical labels to describe changes in mood and MRB (Appendix K: Section H4). Because CES-D scores did not predict clinical labeling in univariate models or within interaction models, I thought it might be valuable to run similar models with K6 scores to see if clinical labeling was significantly related to psychological distress after controlling for depression.

Post-hoc analysis

As seen in Tables 31a, 31b, and 31c, the interaction models predicted clinical labeling (at the $p<0.10$ level), when any environmental attribution was made or when environmental attribution was selected from a list (quantitatively).

Table 31a *Quantitative Environmental Attribution Interacts with Distress to Predict Clinical Labeling*

	ß	S.E.	Wald	df	p	OR	95% CI
Quantitative Env. Attribution	2.18	1.11	3.88	1	.049	8.82	1.01-76.96
Distress (K6)	0.03	0.05	0.51	1	.477	1.03	0.95-1.13
K6*Quantitative Attribution	-0.19	0.11	3.16	1	.075	0.83	0.67-1.02
Severity of Depressive Symp.	-0.01	0.02	0.06	1	.807	1.00	0.96-1.03
Prev. Psych. Diag.	1.67	0.42	15.99	1	.000	5.32	2.35-12.08
Age	0.34	0.13	7.36	1	.007	1.41	1.10-1.80
constant	-3.81	0.63	36.80	1	.000	0.02	

Table 31b *Qualitative Environmental Attribution Does Not Interact with Distress to Predict Clinical Labeling*

	ß	S.E.	Wald	df	p	OR	95% CI
Qualitative Env. Attribution	1.59	0.91	3.05	1	.081	4.89	0.82-29.01
Distress (K6)	0.02	0.05	0.21	1	.645	1.02	0.94-1.11
K6*Qualitative Attribution	-0.05	0.08	0.41	1	.520	0.95	0.82-1.11
Severity of Depressive Symp.	0.00	0.02	0.01	1	.907	1.00	0.97-1.04
Prev. Psych. Diag.	1.64	0.42	15.19	1	.000	5.16	2.26-11.76
Age	0.33	0.13	6.80	1	.009	1.40	1.09-1.79
constant	-4.02	0.67	35.96	1	.000	0.02	

Table 31c *Any Type of Environmental Attribution Interacts with Distress to Predict Clinical Labeling*

	ß	S.E.	Wald	df	p	OR	95% CI
Qualitative Env. Attribution	2.20	0.84	6.89	1	.009	9.00	1.75-46.42
Distress (K6)	0.04	0.05	0.87	1	.352	1.05	0.95-1.15
K6*Any Env. Attribution	-0.13	0.07	3.44	1	.064	0.88	0.77-1.01
Severity of Depressive Symp.	0.00	0.01	0.00	1	.971	1.00	0.96-1.04
Prev. Psych. Diag.	1.68	0.42	15.63	1	.000	5.34	2.33-12.27
Age	0.34	0.13	6.99	1	.008	1.40	1.09-1.81
constant	-4.25	0.69	37.94	1	.000	0.01	

To better understand the interaction between distress (K6) and attribution, I explored the effect of environmental attribution on labeling when distress scores were one standard deviation (S.D.) above and below the mean since the interaction effect demonstrates that the effect of environmental attribution on labeling is different at different levels of K6. At one S.D. above the mean on distress (K6ABOVE), the use of quantitative environmental attributions is not associated with clinical labeling (Table 32a); although the parameter estimate for the main effect of quantitative environmental attribution is positive but not significant using conventional significance criteria (i.e., $p<0.05$). The parameter estimate for the main effect of quantitative environmental attribution is positive and just barely significant. At one S.D. below the mean on distress (K6BELOW), quantitative

environmental attribution is significantly more likely to be associated with clinical labeling (Table 32b).

Table 32a *At the Highest Levels of Distress, Quantitative Environmental Attribution is Associated with Clinical Labeling*

	ß	S.E.	Wald	df	p	OR	95% CI
Quantitative Attribution	1.16	0.71	2.70	1	.100	3.20	0.80-12.79
K6ABOVE	0.03	0.05	0.51	1	.477	1.03	0.95-1.13
K6AQN	-0.19	0.11	3.16	1	.075	0.83	0.67-1.02
Severity of depressive symp.	-0.01	0.02	0.06	1	.807	1.00	0.96-1.03
Prev. Psych. Diag.	1.67	0.42	15.99	1	.000	5.32	2.35-12.08
Age	0.34	0.13	7.36	1	.007	1.41	1.10-1.80
constant	-3.63	0.61	35.79	1	.000	0.03	

Table 32b *At the Lowest Levels of Distress, Quantitative Environmental Attribution is Associated with Clinical Labeling*

	ß	S.E.	Wald	df	p	OR	95% CI
Quantitative Attribution	3.19	1.61	3.93	1	.048	24.33	1.04-571.81
K6BELOW	0.03	0.05	0.51	1	.477	1.03	0.95-1.13
K6BQN	-0.19	0.11	3.16	1	.075	0.83	0.67-1.02
Severity of Depressive Symp.	-0.01	0.02	0.06	1	.807	1.00	0.96-1.03
Prev. Psych. Diag.	1.67	0.42	15.99	1	.000	5.32	2.35-12.08
Age	0.34	0.13	7.36	1	.007	1.41	1.10-1.80
constant	-3.98	0.73	29.66	1	.000	0.02	

The parameter estimate for the main effect of *any* environmental attribution is positive and significant. At one S.D. above the mean on distress (K6ABOVE), environmental attribution (reported either way) is significantly more likely to be associated with clinical labeling (Table 33a). As well, at one S.D. below the mean on distress (K6BELOW), environmental attribution is significantly more likely to be associated with clinical labeling (Table 33b). At one S.D. below the mean, the odds ratio is much greater than the odds ratio for the effect one S.D. (17.63 vs. 4.60). This indicates that at both higher and lower levels of distress, environmental attribution is associated with an increased

likelihood of clinical labeling, although the strength of the relationship is stronger at milder levels of distress.

Table 33a *At the Highest Levels of Distress, Any Type of Environmental Attribution is Associated with Clinical Labeling*

	ß	S.E.	Wald	df	p	OR	95% CI
Any Env. Attribution	1.53	0.54	8.07	1	.005	4.60	1.60-13.16
K6ABOVE	0.04	0.05	0.87	1	.352	1.05	0.95-1.15
K6AQ2	-0.13	0.07	3.44	1	.064	0.88	0.77-1.01
Severity of Depressive Symp.	0.00	0.02	0.00	1	.971	1.00	0.96-1.04
Prev. Psych. Diag.	1.68	0.42	15.63	1	.000	5.34	2.33-12.27
Age	0.34	0.13	6.99	1	.008	1.40	1.09-1.81
constant	-4.02	0.65	38.80	1	.000	0.02	

Table 33b *At the Lowest Levels of Distress, Any Type of Environmental Attribution is Associated with Clinical Labeling*

	ß	S.E.	Wald	df	p	OR	95% CI
Any Env. Attribution	2.87	1.17	5.99	1	.014	17.63	1.77-175.66
K6BELOW	0.04	0.05	0.87	1	.352	1.05	0.95-1.15
K6BQ2	-0.13	0.07	3.44	1	.064	0.88	0.77-1.01
Severity of Depressive Symp.	0.00	0.02	0.00	1	.971	1.00	0.96-1.04
Prev. Psych. Diag.	1.68	0.42	15.63	1	.000	5.34	2.33-12.27
Age	0.34	0.13	6.99	1	.008	1.40	1.09-1.81
constant	-4.49	0.82	30.26	1	0000	0.01	

Environmental attribution and psychological distress (K6) when treated as a binary variable did not significantly interact to predict clinical labeling except when environmental attribution was treated as a collapsed variable (ignoring reporting style) (Appendix K: Section H4). Participants attributing their recent changes to environmental factors scoring high for general psychological distress were less likely to use clinical labels (OR=0.89, $p<0.10$) when controlling for previous diagnosis, age, and depressive symptoms.

Research Aim II findings summary

- Unprompted environmental attributions of recent mood and MRB change are associated with an increased the likelihood of utilizing clinical language to label changes, even after controlling for presence of depressive symptoms and general psychological distress.
- Severity of depressive symptoms did not predict clinical labeling contrary to Hypothesis IV. However, distress interacted with quantitative environmental attribution to predict use of clinical labels. When self-reported distress was low, attribution to environmental factors was associated with an increased likelihood of clinical labeling.

RESEARCH AIM III: To explore whether attribution of mood and mood-related behavior changes to the environment, severity of depression symptoms, and clinical self-labeling are associated with clinical help seeking in people with recent changes in mood and mood-related behavior.

Analyses related to Hypothesis V:

Among people who use clinical labels to describe their recent changes in mood and mood-related behavior, their attribution behavior does not predict clinical help seeking. Among people who do not use clinical labels, those who make environmental attributions are less likely to seek clinical treatment than those who attribute changes in mood and mood-related behavior to other causes.

A conditional logistic regression was conducted to examine the interaction of two main predictors, labeling (L) and attribution behaviors (A), in predicting treatment seeking

behavior. Analyses tested this relationship using the following four categories for the main predictors: A+/L+; A+/L-; A-/L+; and A-/L-. Here the outcome variable was clinical treatment seeking where 0 indicates that the person does not seek clinical treatment related to recent mood and MRB change and 1 indicates that the individual seeks clinical treatment. This measure was derived from responses to "*When you experience these changes in mood and behavior what do you do about them?*" Responses coded as "seeks clinical treatment" consisted of menu options: "I see a mental health professional", "I see a doctor/nurse practitioner", "I go to therapy" and "I see a therapist or counselor" (n=54, 16.7%). Two potential confounders, previous psychiatric diagnosis and prescription drug use, indicating prior access to clinical care, were used as the main covariates in the logistic regression models.

I decided to include socio-demographic factors which I thought would be the most likely to relate to receiving a psychiatric diagnosis and would therefore confound the interaction between attribution and clinical labeling. Of age, race, gender, and health insurance variables; age (treated as an ordinal variable) and health insurance status were significantly associated with clinical treatment seeking when entered into a multivariable model (Table 34). The odds of seeking clinical assistance in relation to recent changes in mood and MRB increased 1.2 times with each increase of ten years in age. The likelihood of clinical treatment seeking significantly varied by health insurance status such that individuals without health care coverage were 2.6 times less likely to seek clinical care versus those with private health insurance.

Table 34 *Socio-Demographic Characteristics Associated with Clinical Treatment Seeking*[a]

	ß	S.E.	Wald	df	p	OR	95% CI
Gender	-0.13	0.31	0.17	1	.677	0.88	0.48-1.61
Race	0.28	0.28	0.98	1	.322	1.32	0.76-2.29
Age	0.19	0.10	3.42	1	.064	1.21	0.99-1.47
Medicare/Medicaid	0.03	0.36	0.01	1	.928	1.03	0.51-2.08
No insurance	-0.94	0.34	7.81	1	.005	0.39	0.20-0.75
constant	-0.78	0.30	6.67	1	.010	0.46	

[a] *N*=318 with removal of "I don't know" response to insurance question

In univariate models, previous psychiatric diagnosis and prescription drug use, the main covariates, were each significantly associated with increased odds of seeking clinical treatment for recent changes in mood and MRB (Table 35a).

Table 35a *Prior Psychiatric Diagnosis and Prescription Drug Use are Associated with Seeking Clinical Treatment*

	ß	S.E.	Wald	df	p	OR	95% CI
Prev. Psych. Diag.	2.47	0.30	69.83	1	.000	11.81	6.62-21.07
constant	-1.95	0.25	59.64	1	.000	0.14	
Prescrip. Drug Use	2.77	0.29	89.09	1	.000	15.91	8.96-28.26
constant	-1.38	0.17	65.48	1	.000	0.25	

When controlling for previous psychiatric diagnosis and prescription drug use, age was no longer significantly associated with clinical treatment seeking (Table 35b) and was not included in subsequent analyses.

Table 35b *Prior Psychiatric Diagnosis and Prescription Drug Use are Associated with Seeking Clinical Treatment, Covariate Model*

	ß	S.E.	Wald	df	p	OR	95% CI
Prev. Psych. Diag.	1.76	0.34	26.69	1	.000	5.80	2.98-11.29
Prescrip. Drug Use	1.98	0.33	35.13	1	.000	7.23	3.76-13.90
Age	-0.01	0.13	0.01	1	.923	0.99	0.77-1.27
Medicare/Medicaid	-0.37	0.45	0.68	1	.410	0.69	0.29-1.67
No insurance	-0.72	0.40	3.29	1	.070	0.49	0.22-1.06
constant	-1.99	0.36	30.70	1	.000	0.14	

The use of clinical labels to describe recent changes in mood and MRB significantly predicted an increased likelihood of clinical treatment seeking (Table 36a). After controlling for the main and secondary covariates, clinical labeling was no longer

significantly associated with clinical treatment seeking (Table 36b). Multicollinearity between labeling and the covariates is likely the reason for the loss of the labeling as a predictor of clinical treatment seeking.

Table 36a *Clinical Labeling is Associated with Clinical Treatment Seeking*

	ß	S.E.	Wald	df	p	OR	95% CI
Clinical Label	1.30	0.32	17.08	1	.000	3.68	1.99-6.84
constant	-0.61	0.13	22.98	1	.000	0.54	

Table 36b *Clinical Labeling is Associated with Clinical Treatment Seeking When Controlling for Prior Psychiatric Diagnosis and Prescription Drug Use*

	ß	S.E.	Wald	df	p	OR	95% CI
Clinical Labeling	0.36	0.41	0.78	1	.377	1.43	0.65-3.18
Prev. Psych. Diag.	1.72	0.34	25.53	1	.000	5.60	2.87-10.91
Prescrip. Drug Use	1.91	0.34	32.17	1	.000	6.76	3.49-13.08
Medicare/Medicaid	-0.35	0.45	0.62	1	.432	0.70	0.29-1.69
No insurance	-0.74	0.40	3.39	1	.066	0.48	0.22-1.05
constant	-2.03	0.28	51.99	1	.000	0.13	

Environmental attribution of recent changes in mood and MRB was not significantly associated with clinical treatment seeking (Table 37). When entered into multivariable models with main and secondary covariates, environmental attribution was not significantly associated with clinical treatment seeking.

Table 37 E*nvironmental Attribution is Not Associated with Clinical Treatment Seeking*

	ß	S.E.	Wald	df	p	OR	95% CI
Quantitative	0.06	0.43	0.02	1	.898	1.06	0.46-2.46
Constant	-0.39	0.12	11.07	1	.001	0.68	
Qualitative	0.13	0.31	0.18	1	.668	1.14	0.62-2.09
Constant	-0.41	0.12	10.93	1	.001	0.67	
Any Env.	0.25	0.28	0.79	1	.375	1.28	0.74-2.23
constant	-0.44	0.13	11.87	1	.001	0.65	

The following analyses address the hypothesized interaction effect. Quantitative environmental attribution significantly interacts with clinical labeling to predict clinical

treatment seeking. When participants used clinical labels and made quantitative environmental attributions, they were less likely to seek clinical treatment than if their changes in mood and MRB were attributed to other causes (Table 38a). The interaction effect was not statistically significant when the primary and secondary covariates were added to the model (Table 38b; one cell size equaled 5, the minimum requirement for analysis). Significant interaction effects were not found for qualitative or any environmental attribution models without (Tables 39a and 40a) or with (Tables 39b and 40b) covariates.

Table 38a *Clinical Labeling and Quantitative Environmental Attribution Interact to Decrease Likelihood of Clinical Help Seeking*

	ß	S.E.	Wald	df	p	OR	95% CI
Clinical Label	1.57	0.34	20.89	1	.000	4.80	2.45-9.40
Quantitative Attribution	0.55	0.48	1.30	1	.253	1.73	0.68-4.41
Label*Attribution	-2.85	1.26	5.14	1	.023	0.06	0.01-0.68
constant	-0.65	0.13	24.00	1	.000	0.52	

Table 38b *Clinical Labeling and Quantitative Environmental Attribution Do Not Interact to Predict Clinical Help Seeking, Covariate Model*

	ß	S.E.	Wald	df	p	OR	95% CI
Clinical Label	0.53	0.43	1.50	1	.221	1.70	0.73-3.97
Quantitative Attribution	0.89	0.57	2.46	1	.117	2.44	0.80-7.46
Label*Attribution	-2.14	1.59	1.82	1	.177	0.12	0.01-2.63
Prev. Psych. Diag.	1.67	0.34	23.64	1	.000	5.31	2.71-10.40
Prescrip. Drug use	1.97	0.34	32.91	1	.000	7.17	3.66-14.05
Medicare/Medicaid	-0.38	0.44	0.73	1	.392	0.69	0.39-1.63
No insurance	-0.70	0.41	2.92	1	.088	0.50	0.23-1.11
constant	-2.10	0.29	51.86	1	.000	0.12	

Table 39a *Clinical Labeling and Qualitative Environmental Attribution Do Not Interact to Predict Clinical Help Seeking*

	ß	S.E.	Wald	df	p	OR	95% CI
Clinical Label	1.38	0.38	13.53	1	.000	3.97	1.90-8.27
Qualitative Attribution	-0.05	0.38	0.01	1	.905	0.96	4.5-2.02
Label*Attribution	-0.22	0.73	0.09	1	.767	0.81	0.19-3.37
constant	-0.61	0.14	19.65	1	.000	0.55	

Table 39b *Clinical Labeling and Qualitative Environmental Attribution Do Not Interact to Predict Clinical Help Seeking, Covariate Model*

	ß	S.E.	Wald	df	p	OR	95% CI
Clinical Label	0.53	0.47	1.25	1	.264	1.69	0.67-4.27
Qualitative Attribution	-0.13	0.49	0.07	1	.798	0.88	0.34-2.31
Label*Attribution	-0.56	0.95	0.36	1	.551	0.57	0.09-3.63
Prev. Psych. Diag.	1.71	0.34	24.75	1	.000	5.54	2.82-10.88
Prescrip. Drug use	1.93	0.34	32.09	1	.000	6.91	3.53-13.48
Medicare/Medicaid	-0.35	0.45	0.59	1	.442	0.71	0.29-1.71
No insurance	-0.78	0.41	3.71	1	.054	0.46	0.21-1.01
constant	-2.01	0.29	48.08	1	.000	0.13	

Table 40a *Clinical Labeling and Any Type of Environmental Attribution Do Not Interact to Predict Clinical Help Seeking*

	ß	S.E.	Wald	df	p	OR	95% CI
Clinical Label	1.52	0.39	15.47	1	.000	4.57	2.14-9.75
Any Env. Attribution	-0.27	0.33	0.68	1	.409	1.31	0.69-2.50
Label*Attribution	-0.78	0.69	1.25	1	.263	0.46	0.12-1.79
constant	-0.39	0.30	1.70	1	.192	0.68	

Table 40b *Clinical Labeling and Any Type of Environmental Attribution Do Not Interact to Predict Clinical Help Seeking, Covariate Model*

	ß	S.E.	Wald	df	p	OR	95% CI
Clinical Label	0.71	0.49	2.11	1	.147	2.02	0.78-5.25
Any Attribution	0.51	0.42	1.50	1	.221	1.67	0.74-3.77
Label*Attribution	-1.38	0.89	2.37	1	.124	0.25	0.04-1.46
Prev. Psych. Diag.	1.68	0.34	23.87	1	.000	5.34	2.73-10.46
Prescrip. Drug use	2.00	0.35	33.35	1	.000	7.36	3.74-14.49
Medicare/Medicaid	-0.29	0.44	0.42	1	.518	0.75	0.32-1.79
No insurance	-0.73	0.41	3.16	1	.076	0.48	0.22-1.08
constant	-2.14	0.30	50.63	1	.000	0.12	

Although attributing recent changes to environmental factors was not significantly associated with clinical treatment seeking, I did find that non-environmental attributions (i.e., stress) were significantly associated with seeking clinical assistance for recent mood and MRB changes (see Appendix K: Section H5).

Hypothesis V findings summary

As a unique predictor, environmental attribution is not significantly associated with clinical help seeking. In partial compliance with the hypothesis predicting that attribution will not impact relationships between clinical labeling and treatment seeking; clinically labeling recent changes in mood and MRB is significantly associated with clinical help seeking whether or not covariates are included in the model. Only quantitative environmental attribution interacted with labeling to significantly predict clinical treatment seeking. However, this interaction was significant only when covariates were not included in the model. The data did not support the latter part of the hypothesis predicting that non-labelers who made environmental attributions would be less likely to seek clinical treatment.

Analyses related to Hypothesis VI:

Among people with severe self-reported depressive symptoms, environmental attribution does not predict clinical help seeking. Among people with less severe depressive symptoms, those who make environmental attributions are less likely to seek clinical treatment than those who attribute their recent mood and mood-related behavior change to other causes.

Conditional logistic regression analyses were run to examine the interaction of two main predictor variables, severity of depressive symptoms and environmental attribution, in predicting clinical help seeking. The second main predictor, self-reported depression symptom severity, a continuous predictor variable, is derived from normally distributed responses to the CES-D. The CES-D was also treated as a clinically-relevant binary variable (see analyses related to Hypothesis IV above). As discussed in the analysis of Hypothesis V, clinical treatment seeking, the outcome variable was scored so that 0 was associated with seeking non-clinical treatment and 1 was associated with seeking clinical treatment. As a covariate, general psychological distress (K6) was used both a continuous and clinically-relevant binary variable (K6 and CES-D relationship is further examined in Appendix K: Section H6). Two variables, previous psychiatric diagnosis and prescription drug use were also covariates in the analyses.

As discussed earlier, age and health insurance status were significantly associated with clinical treatment seeking when entered into a multivariate model (Table 34). Odds of seeking clinical assistance in relation to recent mood and MRB change increased 1.2 times with every increase of ten years in age. The likelihood of clinical treatment seeking significantly varied by health insurance status; the uninsured were less likely to seek clinical care than the privately insured. Previous psychiatric diagnosis and prescription drug use the main covariates, were significantly associated with increased odds of seeking clinical treatment for recent changes in mood and MRB (Table 35a). After controlling for previous psychiatric diagnosis and prescription drug use, age was no

longer significantly associated with clinical treatment seeking and was not utilized in further analyses (Table 35b).

Table 41 indicates that individuals' severity of depressive symptoms and general psychological distress predict clinical treatment seeking such that greater psychological distress or depressive symptom severity are associated with an increased likelihood of seeking clinical-treatment. When CES-D and K6 scores were entered as binary variables based on clinically-relevant cut-points, these binary variables remained significantly associated with clinical treatment seeking. Logistic regression analyses did not significantly associate environmental attribution with clinical treatment seeking regardless of reporting style (Table 37).

Table 41 *Psychological Distress and Depressive Symptom Severity Predict Clinical Treatment Seeking*

	ß	S.E.	Wald	df	p	OR	95% CI
Severity of Depressive Symptoms							
Continuous	0.04	0.01	13.08	1	.000	1.04	1.02-1.06
constant	-1.41	0.31	20.74	1	.000	0.25	
Binary	0.64	0.33	3.79	1	.052	1.90	0.995-3.61
Constant	-0.93	0.31	9.29	1	.002	0.40	
Psychological Distress							
Continuous	0.13	0.02	29.58	1	.000	1.14	1.09-1.20
constant	-1.93	0.31	37.98	1	.000	0.15	
Binary	0.98	0.23	17.49	1	.003	2.66	1.68-4.21
Constant	-0.82	0.16	26.69	1	.000	0.44	

I conducted a series of logistic regression models with CES-D and K6 scores as the predictors of treatment seeking while controlling for primary and secondary covariates, (previous psychiatric diagnosis, prescription drug use, age, and health insurance status; Tables 42a and 42b). Treated continuously, severity of depressive symptoms had a significant but slight association with clinical treatment seeking (Table 42a). When

controlling for general psychological distress, the depressive symptom severity was no longer significantly associated with clinical treatment seeking (Table 42b).

Table 42a *Severity of Depressive Symptoms (Continuous) Slightly Associated with Clinical Help Seeking, Covariate Model*

	ß	S.E.	Wald	df	p	OR	95% CI
Severity of Depressive Symp.	0.03	0.01	5.16	1	.023	1.03	1.00-1.06
Prev. Psych. Diag.	1.70	0.34	24.74	1	.000	5.48	2.80-10.71
Prescrip. Drug Use	1.94	0.34	33.59	1	.000	6.97	3.61-13.43
Medicare/Medicaid	-0.56	0.46	1.53	1	.218	0.57	0.23-1.39
Uninsured	-0.84	0.41	4.13	1	.042	0.43	0.19-0.97
constant	-2.77	0.45	37.79	1	.000	0.06	

Table 42b *Severity of Depressive Symptoms (Continuous) Not Associated with Clinical Help Seeking when Controlling for Psychological Distress*

	ß	S.E.	Wald	df	p	OR	95% CI
Severity of Depressive Symp.	-0.01	0.02	0.36	1	.548	0.99	0.96-1.02
Distress	0.14	0.04	10.95	1	.001	1.15	1.06-1.25
Prev. Psych. Diag.	1.63	0.35	21.94	1	.000	5.10	2.58-10.10
Prescrip. Drug Use	1.98	0.35	32.77	1	.000	7.23	3.67-14.23
Medicare/Medicaid	-0.53	0.46	1.31	1	.252	0.59	0.24-1.46
Uninsured	-0.87	0.42	4.43	1	.035	0.42	0.19-0.94
constant	-3.20	0.49	42.62	1	.000	0.04	

With a clinically-relevant cut-point of 16, CES-D did not have a significant effect on clinical treatment seeking (Table 43a). When K6 was added to the model, the CES-D cut-point variable maintained a non-significant association with treatment seeking (Table 43b).

Table 43a *Severity of Depressive Symptoms (Cut-Point) Not Associated with Clinical Help Seeking, Covariate Model*

	ß	S.E.	Wald	df	p	OR	95% CI
Severity of Depressive Symp.	-0.34	0.42	0.64	1	.423	0.71	0.31-1.63
Prev. Psych. Diag.	1.74	0.34	26.24	1	.000	5.69	2.93-11.07
Prescrip. Drug Use	1.96	0.33	35.12	1	.000	7.11	3.72-13.61
Medicare/Medicaid	-0.39	0.44	0.78	1	.376	0.68	0.28-1.61
Uninsured	-0.72	0.40	3.29	1	.070	0.49	0.22-1.06
constant	-1.95	0.29	44.28	1	.000	0.14	

Table 43b *Severity of Depressive Symptoms (Cut-Point) Not Associated with Clinical Help Seeking when Controlling for Psychological Distress*

	ß	S.E.	Wald	df	p	OR	95% CI
Severity of Depressive Symp.	0.40	0.49	0.69	1	.405	1.50	0.58-3.88
Distress	0.13	0.03	15.33	1	.000	1.14	1.07-1.22
Prev. Psych. Diag.	1.64	0.35	22.01	1	.000	5.14	2.59-10.19
Prescrip. Drug Use	1.98	0.35	32.73	1	.000	7.24	3.68-14.27
Medicare/Medicaid	-0.57	0.46	1.54	1	.215	0.57	0.23-1.39
Uninsured	-0.91	0.42	4.80	1	.028	0.40	0.18-0.91
constant	-3.09	0.52	35.49	1	.000	0.05	

Treated continuously, psychological distress had a significant, positive association with clinical treatment seeking (Table 44). As previously noted in Table 42b, when K6 and CES-D were both entered into a multivariate model, distress was significantly associated with clinical help seeking behavior.

Table 44 *Psychological Distress (Continuous) Slightly Associated with Clinical Help Seeking, Covariate Model*

	ß	S.E.	Wald	df	p	OR	95% CI
Distress	0.12	0.03	15.44	1	.000	1.13	1.06-1.20
Prev. Psych. Diag.	1.63	0.35	21.97	1	.000	5.11	2.58-10.10
Prescrip. Drug Use	1.97	0.35	32.66	1	.000	7.17	3.65-14.09
Medicare/Medicaid	-0.57	0.46	1.57	1	.210	0.56	0.23-1.38
Uninsured	-0.90	0.41	4.70	1	.030	0.41	0.18-0.92
constant	-3.30	0.46	51.30	1	.000	0.04	

With a clinically-relevant cut-point of 13, distress has a slight association with clinical help seeking (Table 45a; p=0.01). As seen in Table 45b, when controlling for depression

symptom severity by entering CES-D scores as a continuous variable into the model, K6 was no longer significantly associated with clinical treatment seeking. However, when I controlled for severity of depression symptoms using a clinically-relevant cut-point of 16 (Table 45c), distress significantly predicted clinical treatment seeking (OR=2.16, $p<0.05$).

Table 45a *Psychological Distress (Cut-Point) Associated with Clinical Help Seeking, Covariate Model*

	ß	S.E.	Wald	df	p	OR	95% CI
Distress	0.78	0.31	6.59	1	.010	2.19	1.20-3.98
Prev. Psych. Diag.	1.66	0.34	23.24	1	.000	5.26	2.68-10.32
Prescrip. Drug Use	1.96	0.34	33.91	1	.000	7.13	3.68-13.80
Medicare/Medicaid	-0.47	0.45	1.12	1	.290	0.62	0.26-1.50
Uninsured	-0.81	0.41	3.94	1	.047	0.45	0.20-0.99
constant	-2.26	0.31	54.15	1	.000	0.10	

Table 45b *Psychological Distress (Cut-Point) is Not Associated with Clinical Help Seeking, When Controlling for Depressive Symptom Severity (Continuous)*

	ß	S.E.	Wald	df	p	OR	95% CI
Distress	0.57	0.38	2.31	1	.129	1.77	0.85-3.68
Severity of Depressive Symp.	0.02	0.02	0.95	1	.329	1.02	0.99-1.05
Prev. Psych. Diag.	1.66	0.35	23.18	1	.000	5.25	2.67-10.32
Prescrip. Drug Use	1.95	0.34	33.31	1	.000	7.02	3.62-13.61
Medicare/Medicaid	-0.55	0.45	1.44	1	.230	0.58	0.24-1.41
Uninsured	-0.85	0.41	4.22	1	.040	0.43	0.19-0.96
constant	-2.59	0.46	31.22	1	.000	0.08	

Table 45c *Psychological Distress (Cut-Point) is Not Associated with Clinical Help Seeking, When Controlling for Depressive Symptom Severity (Cut-Point)*

	ß	S.E.	Wald	df	p	OR	95% CI
Distress	0.77	0.32	5.94	1	.015	2.16	1.16-4.02
Severity of Depressive Symp.	0.07	0.44	0.02	1	.878	1.07	0.45-2.55
Prev. Psych. Diag.	1.66	0.34	23.19	1	.000	5.25	2.67-10.31
Prescrip. Drug Use	1.96	0.34	33.80	1	.000	7.11	3.67-13.78
Medicare/Medicaid	-0.47	0.45	1.13	1	.289	0.62	0.26-1.49
Uninsured	-0.80	0.41	3.93	1	.047	0.45	0.20-0.99
constant	-2.31	0.45	26.20	1	.000	0.10	

Next, I conducted a series of interaction models to determine if environmental attribution affects the associations between severity of depression symptoms and/or general psychiatric distress and treatment seeking. Depressive symptom severity did not significantly interact with environmental attribution as a predictor of treatment seeking behavior at the $p<0.05$ level after controlling for health insurance status, prior psychiatric diagnosis, prescription drug use, and general psychological distress (Table 46a, 46b & 46c).

Table 46a *Depressive Symptom Severity Does Not Interact with Quantitative Environmental Attribution to Predict Clinical Help Seeking*

	ß	S.E.	Wald	df	p	OR	95% CI
Quantitative Attribution	-0.52	1.39	0.14	1	.709	0.56	0.04-9.09
Severity of Depressive Symp.	-0.01	0.02	0.41	1	.523	0.99	0.95-1.03
Attribution*CES-D	0.05	0.05	0.92	1	.337	1.05	0.95-1.16
Distress (K6)	0.14	0.04	10.38	1	.001	1.15	1.06-1.25
Prev. Psych. Diag.	1.66	0.35	22.04	1	.000	5.25	2.63-10.50
Prescrip. Drug Use	2.00	0.35	32.25	1	.000	7.41	3.71-14.80
Medicare/Medicaid	-0.57	0.46	1.51	1	.219	0.57	0.23-1.40
No insurance	-0.85	0.42	4.09	1	.043	0.43	0.19-0.97
constant	-3.22	0.51	39.89	1	.000	0.40	

Table 46b *Depressive Symptom Severity Does Not Interact with Qualitative Environmental Attribution to Predict Clinical Help Seeking*

	ß	S.E.	Wald	df	p	OR	95% CI
Qualitative Attribution	-0.85	1.10	0.59	1	.443	0.43	0.05-3.73
Severity of Depressive Symp.	0.03	0.04	0.71	1	.400	1.03	0.96-1.11
Attribution*CES-D	-0.02	0.02	0.68	1	.410	0.99	0.95-1.02
Distress (K6)	0.14	0.04	10.94	1	.001	1.15	1.06-1.25
Prev. Psych. Diag.	1.64	0.35	22.04	1	.000	5.17	2.60-10.27
Prescrip. Drug Use	1.99	0.35	32.89	1	.000	7.30	3.70-14.40
Medicare/Medicaid	-0.53	0.46	1.31	1	.252	0.59	0.24-1.45
No insurance	-0.87	0.42	4.33	1	.037	0.42	0.19-0.95
constant	-3.07	0.52	35.05	1	.000	0.05	

Table 46c *Depressive Symptom Severity Does Not Interact with Any Type of Environmental Attribution to Predict Clinical Help Seeking*

	ß	S.E.	Wald	df	p	OR	95% CI
Any Env. Attribution	-0.84	1.03	0.66	1	.418	0.43	0.06-3.29
Severity of Depressive Symp.	-0.02	0.02	0.84	1	.359	0.98	0.95-1.02
Attribution*CES-D	0.05	0.04	1.60	1	.206	1.05	0.98-1.12
Distress (K6)	0.14	0.04	11.21	1	.001	1.15	1.06-1.25
Prev. Psych. Diag.	1.63	0.35	21.55	1	.000	5.10	2.56-10.14
Prescription Drug Use	2.00	0.35	32.96	1	.000	7.39	3.73-14.62
Medicare/Medicaid	-0.52	0.46	1.29	1	.256	0.60	0.24-1.46
No insurance	-0.82	0.42	3.86	1	.050	0.44	0.19-1.00
constant	-3.11	0.53	34.60	1	.000	0.05	

When treating severity of depressive symptoms (CES-D) as a binary variable representing a clinically-relevant cut-point, the interaction of CES-D and environmental attribution was not significantly associated with clinical treatment seeking (Table 47). A further post-hoc exploration of the CES-D cut-point in relation to treatment seeking is located in Appendix K: Section H6.

Table 47 *Depressive Symptom Severity (Cut-Point) Does Not Interact with Environmental Attribution to Predict Clinical Help Seeking, by Attribution Treatment*

	ß	S.E.	Wald	df	p	OR	95% CI
			Quantitative				
Quantitative Env. Attribution	-0.01	1.10	0.00	1	.991	0.99	0.11-8.54
CES-D cut-point	-0.47	0.54	0.77	1	.380	0.63	0.22-1.78
Attribution*CES-D	0.94	1.31	0.51	1	.473	2.55	0.20-32.94
Distress (K6)	0.13	0.03	15.23	1	.000	1.14	1.07-1.22
Prev. Psych. Diag.	1.66	0.36	21.82	1	.000	5.26	2.62-10.55
Prescrip. Drug Use	2.02	0.35	32.75	1	.000	7.53	3.77-15.04
Medicare/Medicaid	-0.61	0.46	1.81	1	.179	-0.61	0.22-1.32
No insurance	-0.90	0.42	4.43	1	.035	-0.89	0.18-0.94
constant	-3.12	0.55	32.59	1	.000	-3.12	
			Qualitative				
Qualitative Env. Attribution	-1.12	1.06	1.12	1	.290	0.33	0.04-2.59
CES-D cut-point	-0.69	0.54	1.66	1	.198	0.50	0.18-1.43
Attribution*CES-D	1.36	1.16	1.39	1	.239	3.91	0.40-37.89
Distress (K6)	0.13	0.03	15.37	1	.000	1.14	1.07-1.22
Prev. Psych. Diag.	1.65	0.35	21.99	1	.000	5.21	2.61-10.37
Prescrip. Drug Use	1.97	0.35	31.95	1	.000	7.14	3.61-14.11
Medicare/Medicaid	-0.55	0.46	1.45	1	.228	0.58	0.24-1.41
No insurance	-0.93	0.42	4.91	1	.027	0.39	0.17-0.90
constant	-2.86	0.55	26.96	1	.000	0.06	
			Any				
Any Env. Attribution	-0.85	0.95	0.80	1	.371	0.43	0.07-2.74
CES-D cut-point	-0.80	0.56	2.00	1	.158	0.45	0.15-1.36
Attribution*CES-D	1.49	1.05	2.02	1	.156	4.42	0.57-34.44
Distress (K6)	0.14	0.03	16.33	1	.000	1.15	1.07-1.23
Prev. Psych. Diag.	1.64	0.35	21.74	1	.000	5.18	2.59-10.33
Prescrip. Drug Use	1.98	0.35	31.93	1	.000	7.24	3.64-14.39
Medicare/Medicaid	-0.56	0.45	1.55	1	.214	0.57	0.23-1.38
No insurance	-0.87	0.42	4.26	1	.039	0.42	0.18-0.96
constant	-2.90	0.56	26.99	1	.000	0.55	

Post-hoc analysis

I conducted a series of post-hoc interaction models to determine if psychological distress (K6) interacted with environmental attribution to predict clinical treatment seeking. Distress significantly interacted with environmental attributions when the attribution was self-generated (qualitative: Table 48b) or reporting style was ignored (any environmental attribution: Table 48c).

Table 48a *Psychological Distress (K6) Does Not Interact with Quantitative Environmental Attribution to Predict Clinical Help Seeking*

	ß	S.E.	Wald	df	p	OR	95% CI
Quantitative Attribution	-1.58	1.66	0.91	1	.341	0.21	0.01-5.32
Distress	0.11	0.05	5.72	1	.017	1.11	1.02-1.22
Attribution*K6	0.21	0.14	2.29	1	.130	1.23	0.94-1.62
Severity of Depressive Symp.	-0.00	0.02	0.02	1	.889	1.00	0.96-1.03
Prev. Psych. Diag.	1.63	0.35	21.24	1	.000	5.10	2.55-10.19
Prescrip. Drug Use	2.03	0.35	33.79	1	.000	7.59	3.83-15.02
Medicare/Medicaid	-0.62	0.46	1.85	1	.173	0.53	0.22-1.32
No insurance	-0.86	0.43	4.07	1	.044	0.42	0.19-0.98
Constant	-3.13	0.51	38.01	1	.000	0.04	

Table 48b *Psychological Distress Interacts with Qualitative Environmental Attribution to Predict Clinical Help Seeking*

	ß	S.E.	Wald	df	p	OR	95% CI
Qualitative Attribution	-2.37	1.25	3.57	1	.059	0.09	0.01-1.09
Distress	0.12	0.04	7.36	1	.007	1.12	1.03-1.22
Attribution*K6	0.23	0.11	4.26	1	.039	1.25	1.01-1.55
Severity of Depressive Symp.	-0.01	0.02	0.46	1	.497	0.99	0.95-1.02
Prev. Psych. Diag.	1.68	0.35	22.56	1	.000	5.34	2.68-10.66
Prescrip. Drug Use	1.99	0.35	32.43	1	.000	7.33	3.69-14.55
Medicare/Medicaid	-0.56	0.46	1.47	1	.226	0.57	0.23-1.41
No insurance	-0.86	0.42	4.29	1	.038	0.42	0.19-0.95
Constant	-2.91	0.51	32.32	1	.000	0.05	

Table 48c *Psychological Distress Interacts with Any Type of Environmental Attribution to Predict Clinical Help Seeking*

	ß	S.E.	Wald	df	p	OR	95% CI
Any Env. Attribution	-2.13	1.11	3.70	1	.055	0.12	0.01-1.04
Distress	0.09	0.05	3.61	1	.058	1.09	1.00-1.20
Attribution*K6	0.23	0.10	5.91	1	.015	1.26	1.05-1.52
Severity of Depressive Symp.	0.00	0.01	0.03	1	.875	1.00	0.96-1.03
Prev. Psych. Diag.	1.63	0.36	21.16	1	.000	5.13	2.56-10.29
Prescrip. Drug Use	2.04	0.35	34.13	1	.000	7.72	3.89-15.33
Medicare/Medicaid	-0.64	0.46	1.92	1	.166	0.52	0.21-1.30
No insurance	-0.83	0.43	3.82	1	.051	0.44	0.19-1.00
Constant	-2.91	0.52	31.04	1	.000	0.05	

To better understand the interaction between distress (K6) and attribution, I explored the main effect of environmental attribution by using distress scores one S.D. above and below the mean. At one S.D. above the mean on distress (K6ABOVE), the use of qualitative environmental attributions is not associated with clinical treatment seeking (Table 49a). At one S.D. below the mean on distress (K6BELOW), the use of qualitative attribution was significantly and negatively associated with clinical treatment seeking (ß=-3.56, $p<0.05$; Table 49b).

Table 49a *At Higher Levels of Distress, Qualitative Environmental Attribution is Not Associated with Clinical Help Seeking*

	ß	S.E.	Wald	df	p	OR	95% CI
Qualitative Env. attribution	-1.17	0.75	2.45	1	.118	0.31	0.07-1.34
K6ABOVE	0.12	0.04	7.36	1	.007	1.12	1.03-1.22
Attribution*K6ABOVE	0.23	0.11	4.26	1	.039	1.25	1.01-1.55
Severity of Depressive Symp.	-0.01	0.02	0.46	1	.497	0.99	0.95-1.02
Prev. Psych. Diag.	1.68	0.35	22.56	1	.000	5.34	2.68-10.66
Prescrip. Drug Use	1.99	0.35	32.43	1	.000	7.33	3.69-14.55
Medicare/Medicaid	-0.56	0.46	1.47	1	.226	0.57	0.23-1.41
No insurance	-0.86	0.42	4.29	1	.038	0.42	0.19-0.95
Constant	-2.30	0.48	22.52	1	.000	0.10	

Table 49b *At Lower Levels of Distress, Qualitative Environmental Attribution is Negatively Associated with Clinical Help Seeking*

	ß	S.E.	Wald	df	p	OR	95% CI
Qualitative Attribution	-3.56	1.80	3.90	1	.048	0.03	0.00-0.97
K6BELOW	0.12	0.04	7.36	1	.007	1.12	1.03-1.22
Attribution*K6BELOW	0.23	0.11	4.26	1	.039	1.25	1.01-1.55
Severity of Depressive Symp.	-0.01	0.02	0.46	1	.497	0.99	0.95-1.02
Prev. Psych. Diag.	1.68	0.35	22.56	1	.000	5.34	2.68-10.66
Prescrip. Drug Use	1.99	0.35	32.43	1	.000	7.33	3.69-14.55
Medicare/Medicaid	-0.56	0.46	1.47	1	.226	0.57	0.23-1.41
No insurance	-0.86	0.42	4.29	1	.038	0.42	0.19-0.95
Constant	-3.53	0.63	31.64	1	.000	0.03	

I explored the significant main effect of making any kind of environmental attribution by using non-specific distress scores one S.D. above and below the mean as a way of capturing the interaction effect. At one S.D. above the mean on distress (K6ABOVE), environmental attribution was not associated with clinical treatment seeking (Table 50a). At one S.D. below the mean on distress (K6BELOW), the use of any style of environmental attribution was significantly and negatively associated with clinical treatment seeking (ß=-3.35, $p<0.05$) (Table 50b).

Table 50a *At Higher Levels of Distress, Any Type of Environmental Attribution is Not Associated with Clinical Help Seeking*

	ß	S.E.	Wald	df	p	OR	95% CI
Any Env.Attribution	-0.91	0.67	1.83	1	.177	0.40	0.11-1.51
K6ABOVE	0.09	0.05	3.61	1	.058	1.09	1.00-1.20
Attribution*K6ABOVE	0.23	0.10	5.91	1	.015	1.26	1.05-1.52
Severity of Depressive Symp.	-0.00	0.02	0.03	1	.875	1.00	0.96-1.03
Prev. Psych. Diag.	1.63	0.36	21.16	1	.000	5.13	2.56-10.29
Prescrip. Drug Use	2.04	0.35	34.13	1	.000	7.72	3.89-15.33
Medicare/Medicaid	-0.64	0.46	1.92	1	.166	0.53	0.21-1.30
No insurance	-0.83	0.43	3.82	1	.051	0.44	0.19-1.00
Constant	-2.45	0.50	24.42	1	.000	0.09	

Table 50b *At Lower Levels of Distress, Any Type of Environmental Attribution is Negatively Associated with Clinical Help Seeking*

	ß	S.E.	Wald	df	p	OR	95% CI
Any Env. Attribution	-3.35	1.58	4.48	1	.034	0.04	0.00-0.78
K6BELOW	0.09	0.05	3.61	1	.058	1.09	1.00-1.20
Attribution*K6BELOW	0.23	0.10	5.91	1	.015	1.26	1.05-1.52
Severity of Depressive Symp.	-0.00	0.02	0.03	1	.875	1.00	0.96-1.03
Prev. Psych. Diag.	1.63	0.36	21.16	1	.000	5.13	2.56-10.29
Prescrip. Drug Use	2.04	0.35	34.13	1	.000	7.72	3.89-15.33
Medicare/Medicaid	-0.64	0.46	1.92	1	.166	0.53	0.21-1.30
No insurance	-0.83	0.43	3.82	1	.051	0.44	0.19-1.00
Constant	-3.38	0.65	27.03	1	.000	0.03	

When treated as a binary variable, distress significantly interacted with environmental attribution to predict likelihood of seeking clinical treatment. Individuals who attributed their changes to the environment were more likely to seek clinical treatment when reporting clinically-relevant levels of psychological distress (above the cut-point) versus those with low levels of distress (Tables 51a, 51b and 51c).

Table 51a *Psychological Distress (Cut-Point) Interacts with Quantitative Environmental Attribution to Predict Clinical Help Seeking*

	ß	S.E.	Wald	df	p	OR	95% CI
Quantitative Attribution	-0.21	0.81	0.07	1	.795	0.81	0.17-3.98
Distress (cut-point)	0.31	0.39	0.63	1	.429	1.36	0.63-2.95
Attribution*K6	2.23	1.24	3.23	1	.072	9.25	0.82-104.82
Severity of Depressive Symp.	0.02	0.02	1.86	1	.172	1.02	0.99-1.06
Prev. Psych. Diag.	1.62	0.35	21.56	1	.000	5.06	2.55-10.02
Prescrip. Drug Use	2.06	0.34	35.69	1	.000	7.81	3.98-15.33
Medicare/Medicaid	-0.64	0.46	1.96	1	.162	0.53	0.21-1.30
No insurance	-0.82	0.42	3.87	1	.049	0.44	0.20-1.00
Constant	-2.74	0.49	31.60	1	.000	0.07	

Table 51b *Psychological Distress (Cut-Point) Interacts with Qualitative Environmental Attribution to Predict Clinical Help Seeking*

	ß	S.E.	Wald	df	p	OR	95% CI
Qualitative Attribution	-2.88	1.23	5.47	1	.019	0.06	0.01-0.63
Distress (cut-point)	0.36	0.39	0.87	1	.351	1.44	0.67-3.08
Attribution*K6	0.27	0.11	6.23	1	.013	1.31	1.06-1.62
Severity of Depressive Symp.	0.01	0.02	0.45	1	.501	1.01	0.98-1.04
Prev. Psych. Diag.	1.73	0.35	24.24	1	.000	5.63	2.83-11.21
Prescrip. Drug Use	1.96	0.34	32.70	1	.000	7.11	3.63-13.92
Medicare/Medicaid	-0.59	0.46	1.64	1	.200	0.56	0.23-1.36
No insurance	-0.85	0.42	4.22	1	.040	0.43	0.19-0.96
Constant	-2.39	0.48	24.79	1	.000	0.09	

Table 51c *Psychological Distress (Cut-Point) Interacts with Any Type of Environmental Attribution to Predict Clinical Help Seeking*

	ß	S.E.	Wald	df	p	OR	95% CI
Any Env. Attribution	-2.71	1.08	6.25	1	.012	0.07	0.01-0.56
Distress (cut-point)	0.15	0.40	0.13	1	.715	1.16	0.53-2.53
Attribution*K6	0.28	0.09	9.35	1	.002	1.33	1.11-1.59
Severity of Depressive Symp.	0.02	0.02	1.13	1	.288	1.02	0.99-1.05
Prev. Psych. Diag.	1.66	0.36	21.97	1	.000	5.28	2.63-10.59
Prescrip. Drug Use	2.05	0.35	35.10	1	.000	7.79	3.95-16.37
Medicare/Medicaid	-0.66	0.46	2.07	1	.150	0.52	0.21-1.27
No insurance	-0.84	0.43	3.86	1	.049	0.43	0.19-1.00
Constant	-2.56	0.50	26.58	1	.000	0.08	

Ancillary analyses regarding the K6 and its relationship to clinical treatment seeking can be found in Appendix K: Section H6.

Hypothesis VI findings summary

In logistic regression models with only one predictor, severe depression symptoms (CES-D) and higher levels of general psychological distress were significantly associated with an increased likelihood of seeking clinical treatment for recent mood and MRB changes. Contrary to the hypothesis, an interaction between environmental attribution and severity of depression symptoms was not indicated. However, levels of non-specific psychological distress did interact with environmental attribution to predict clinical treatment seeking behavior such that for environmental attributors with higher levels of distress were more likely to seek clinical treatment. This outcome suggests that the experience of severe depression is not enough to motivate clinical help-seeking.

Research Aim III findings summary

- The use of clinical language to label recent mood and MRB change, severity of depressive symptoms, and general distress were significantly and independently associated with clinical treatment seeking.
- Environmental attribution, regardless of reporting style and variable treatment, was not significantly associated with seeking clinical assistance.
- Clinical labeling and environmental attribution interacted to decrease the likelihood of clinical treatment seeking compared to people who use clinical labels and attribute their changes to non-environmental causes or to those who do not use clinical labels and make environmental attributions.
- Clinical treatment seeking was significantly associated with severity of depression symptoms in a logistic regression when controlling for previous diagnosis, health insurance status, and prescription drug use.
- Depressive symptom severity did not significantly interact with environmental attribution to predict treatment seeking.
- General psychological distress (K6) also predicted clinical treatment seeking when controlling for prior diagnosis, type of health insurance, and prescription drug use. In most scenarios, distress interacted with environmental attribution to predict an increased likelihood of seeking clinical treatment for recent mood and MRB changes such that high levels of distress interacted with environmental attribution to increase likelihood of seeking clinical treatment.

CHAPTER IV: DISCUSSION

Background Summary

High rates of untreated affective disorders remain a concern in the United States (Kessler, Chiu, et al., 2005). In addition to the personal hardships that accompany psychological dysfunction (seasonally related and other), mood disorders are associated with work-related impairments, (Lerner et al., 2004), high rates of health care services utilization and medication costs (Wang et al., 2005), and elevated morbidity and mortality in chronic illness (Evans & Charney, 2003). Despite widely accepted and available treatments for these disorders, a substantial number of individuals do not obtain appropriate care for a variety of reasons including cultural preferences, lack of financial resources, and situational obstacles (Kessler, Berglund, et al., 2001; Mojtabai, 2009; Mojtabai, Olfson, & Mechanic, 2002). In addition to these commonly cited barriers to care, individuals' psychological explanatory models associated with their symptoms are likely to influence treatment-seeking decisions (Jorm et al., 2000; Leventhal, Brissette, & Leventhal, 2003; Seligman, Abramson, Semmel, & von Baeyer, 1979). Belief regarding the cause of symptoms (causal attribution) is one facet of this explanatory model. Various environmental factors have been attributed as causes for psychological dysfunction alongside biochemical imbalances, physical illness, and social stressors (APA, 1994). Identifying the characteristics of individuals who attribute their experiences of affective disorder to environmental factors can contribute to a better understanding of how people develop their psychological causal models and, ultimately whether causal models that include environmental factors are associated with treatment seeking. To this end, data were collected with the intention of better understanding the illness behavior of

individuals who attribute personal changes in mood and MRB to environmental factors regardless of clinical diagnostic history. Exposure to natural light was the environmental factor of interest (see Methods Chapter for study design).

Review of Findings

Aim I: The first research aim sought to explore the circumstances under which people with recent changes in mood and mood-related behavior (MRB) attribute those changes to environmental factors. Three hypotheses related to this aim were tested.

With regard to Aim I, there were two main findings. Individuals reporting seasonally variant behavior are more likely to make environmental attributions versus non-environmental attributions regarding their recent changes in mood and mood-related behavior. The roles that bright light exposure and perceptions of bright light sensitivity play in this relationship remain unclear. The second main finding is related to perceptions of illness threat. In general, individuals perceiving their mood and MRB changes as threatening their well-being were less likely to attribute these changes to environmental factors. However, when cause of recent changes was selected from a list of response options, low perceived illness threat was related to environmental attribution. This finding lends some support to the hypothesis that people are more likely to make environmental attributions if their changes are not too problematic.

Aim II: The second research aim explored the relationships among attribution of recent changes to environmental factors, the ways in which people label these changes, and severity of self-reported depression symptoms.

There were two main findings regarding Aim II. People making environmental attributions, versus non-environmental attributions, were more likely to use clinical language to label changes. When the measure of severity of depressive symptoms (CES-D) was analyzed as a predictor of clinical labeling, it was not significant. In addition, none of the interactions involving CES-D and the various environmental attribution measures were significant, indicating no support for Hypothesis IV. However, K6 (a measure of general distress) did interact with environmental attributions (when reported qualitatively and when reporting styles were collapsed). In both instances, at a lower level of general distress, environmental attribution was associated with an increased likelihood of clinical labeling.

Aim III: The third research aim was an extension of the second – exploring whether environmental attribution, depressive symptom severity, and clinical self-labeling were associated with clinical treatment seeking. Aim III was evaluated through the use of two hypotheses.

There were three main findings with regard to the third research aim. In general, findings did not support Hypothesis V. Environmental attribution was not significantly associated with seeking clinical assistance for recent mood and MRB change. Environmental attribution, when reported quantitatively, significantly interacted with clinical labeling to predict treatment seeking, but this interaction became non-significant when psychiatric covariates were introduced into the model. Use of clinical labels was significantly

associated with clinical treatment seeking but not when the model was adjusted for prior diagnosis.

The second main finding involves self-assessments of psychological state and treatment seeking behavior for recent changes in mood and mood-related behavior. Although depressive symptom severity (CES-D) predicted treatment seeking behavior, it did not significantly interact with environmental attribution to predict treatment seeking; thus, Hypothesis VI is not supported by the findings. However, there is support for the hypothesis if general distress (K6) is used as the measure of psychological functioning instead of the CES-D. This is the third main finding.

Treated continuously, distress significantly interacted with qualitative environmental attribution to predict seeking clinical care. When individuals are experiencing low levels of distress, qualitative environmental attributions are negatively related to treatment seeking. Distress also significantly interacted with any type of environmental attribution to predict a decreased likelihood of seeking clinical treatment. Treated categorically, distress also significantly interacts with environmental attribution. When experiencing high levels of distress, individuals making either qualitative or any type of environmental attribution did not engage in clinical help seeking. The relationship was hypothesized with depression as the mental health factor of interest. At low levels of distress, individuals making either qualitative or any type of environmental attribution were significantly less likely to engage in clinical help seeking, also hypothesized using depression instead of general distress.

Findings Summary

Individuals whose mood and MRB vary across seasons (as indicated by high GSS scores) are more likely to attribute mood and MRB changes to natural environmental factors (i.e., photoperiod or temperature) versus non-environmental factors (i.e., stress or chemical imbalance). Environmental attribution was associated with using clinical labels to describe recent changes in mood and mood-related behavior. It was related to seeking clinical assistance depending on the level of psychological distress reported by the participant. People perceiving recent changes to be threatening to their well-being are less likely to believe environmental factors are the cause. Explanations for these apparent inconsistencies are discussed further on. As a whole, the results of the study demonstrate the complex relationships among environmental attribution of, labeling of, and treatment seeking for changes in mood and mood-related behavior that are strongly impacted by seasonal sensitivity and symptom severity.

Implications

Evidence that people scoring high on seasonal sensitivity are more likely to attribute changes in mood and MRB to environmental factors is consistent with previous research (Magnusson & Boivin, 2003; Mersch et al., 2004). Finding a relationship between seasonality and environmental attribution in a community sample provides a solid foundation on which to launch future prospective studies of illness perception, seasonal sensitivity, and psychological distress that can test causal pathways. For example, one such study should seek to uncover directionality between *believing* that changes in the

environment affect one's mood and MRB and *actually having* seasonally variant mood and mood-related behavior. Based on my findings, I hypothesize that individuals with seasonal sensitivities are more aware of seasonal fluctuations in environmental factors and, thus, more likely to associate mood change with fluctuations. Additionally, I suggest that individuals attributing mood and MRB changes to seasonal changes may actually induce periods of dysfunction because they anticipate its arrival. Testing these hypotheses would require in-depth information regarding individuals' global attribution styles, illness perceptions, and seasonality to overlay with multiple assessments of mood and behavior across time. If future research supports these hypotheses, seasonality could be conceived as a risk or causal factor for seasonal depression.

Information was gathered on participants' exposure to, and the value placed on exposure to, bright light. While items measuring levels of exposure to and/or control over light exposure predicted environmental attribution as hypothesized, perceived bright light sensitivity was associated with a decreased likelihood of making an environmental attribution. Individuals who claim sensitivity but not control over their exposure are not likely to make environmental attributions. This outcome suggests that people who feel in control over the amount of time they are exposed to bright light make a conscious effort to do so because they feel that there is a positive benefit to this behavior. As with those who are aware of their mood shifting over the course of the year, this group may be more likely to perceive changes in mood and MRB as being related to environmental exposures. There is a need to better measure perception of environmental factors and exposures to them. Continued effort should be made to develop a measure assessing attitudes

regarding and exposure to natural light. A measure with strong psychometric properties will better facilitate analysis of relationships between light exposure and psychological wellness. Questions eliciting information regarding sensitivity to other environmental factors (i.e. temperature, barometric pressure, rainfall), and motivation for light exposure, (not used in this study), may help in illuminating the psychological explanations behind environmental causal attribution, because sensitivities may be sourced in non-light exposures.

Considerable effort and analytic focus was spent trying to determine how the two measures of psychological dysfunction acted in relationship to other study variables (see Appendix K). Depending on how psychological distress was defined, either by CES-D or K6 self-report scores, these relationships varied. For instance, the K6 scale but not the CES-D interacted with environmental attribution to predict use of clinical labels to describe recent changes in mood and mood-related behavior. The K6 also interacted with some treatments of environmental attribution to slightly increase likelihood of seeking clinical treatment.

This is interesting because the CES-D has been used in studies focused on seasonal depression and light exposure (Espiritu et al., 1994; Park, Kripke, & Cole, 2007; Steinhausen, Gundelfinger, & Winkler Metzke, 2009), but the K6 has not. In fact, the CES-D was recently found to best predict those identified with seasonal affective disorder with the SPAQ (Steinhausen, Gundelfinger, & Winkler Metzke, 2009). Some of the K6 items are related to depressive symptoms, (e.g., worthlessness) thus overlapping

with the CES-D and possibly explaining why the scales, at times, acted similarly. Conceptually, the scales purport to address different phenomena: the CES-D assesses the severity of depressive symptoms and the K6 screens for psychological distress related to serious mental illness (SMI). The response anchors ask participants to qualify the frequency, not the intensity, with which scale items occur. Response bias related to retrospective reporting may be better controlled in the CES-D because it pairs approximations of frequency (i.e., "some or a little of the time") with quantifiable markers (i.e., "1-2 days"), potentially facilitating more accurate recall than the K6 that relies on approximations only.

Additionally, the scales appeared consecutively within the larger research survey. This may have deemphasized the subtle differences in the response anchors, blurring the line between reports of the "past week" and the "past 30 days." Response timeframes may have intersected with time of participants to introduce measurement error. Individuals responding to the survey in early September vs. early November are more likely to be referencing feelings associated with summer vacations vs. daily routine. This may have impacted subsequent regression analyses implementing scale scores, particularly because this sample contained many participants with seasonal variations in mood and mood-related behavior.

The K6 appears to detect high levels of distress fairly well. When compared with outcomes from structured, clinical interviews with men and women, the K6 had solid specificity (Swartz, 2008). Age- and gender- adjusted K6 scores, over the 13+ cut-point

indicating serious psychological distress, have been associated with negative outcomes including increased risk for mortality that coincides with psychological disorders (Pratt, 2009; Pratt, Dey, & Cohen, 2007). The scale's sensitivity to recognize SMI may vary by disorder; such that the K6 performs best when distinguishing individuals with multiple psychological disorders from those with none/less severe distress (Veldhuizen, Cairney, Kurdyak, & Streiner, 2007). The inclusion of the K6 in future seasonal depression research may be helpful in defining the psychological health of a sample but it may be less effective as a means of differentiating the nuances within a depressive sample.

Numerous research studies have demonstrated a relationship between clinical treatment and symptom severity (Edlund, Unützer, & Curran, 2006; Mojtabai & Olfson, 2006). This was true of this study as well: the likelihood of seeking clinical treatment for changes in mood and MRB increased when depressive symptoms were severe and/or levels of distress was high. Finding that environmental attribution was associated with clinical labeling but not associated with clinical treatment seeking, is challenging to interpret especially because clinical labeling was independently associated with clinical treatment seeking. When self-reported distress was low, making an environmental attribution was associated with an increased likelihood of clinical labeling. Predicting that causal beliefs related to the environment would signal a rejection of clinical models of illness, the hypothesis was developed in the direction that environmental attribution would be associated with a decreased likelihood of using clinical labels. While the inconsistency needs to be explained, I believe that the outcome may be partially elucidated by findings indicating that perceptions of high illness threat were related to

non-environmental attributions – made by individuals more likely to seek clinical treatment. Certain illness perceptions, such as uncertainty or worry related to changes in mood and mood-related behavior, have been associated with negative appraisals of physician-patient interaction (Frostholm, Fink, Oernboel, Christensen, Toft, et al., 2005) which may deter individuals from seeking clinical care. If these or similar illness perceptions coincided with environmental attributions, individuals may have been disinclined to seek formal care.

In 2005, the pharmaceutical industry spent over $4.2 billion in direct-to-consumer drug advertisement (USGAO, 2006). Clinical labeling may not be a powerful indicator of help seeking behavior in the presence of environmentally-related causal beliefs because of the inundation of pharmaceutical advertisements in mainstream media. Saturating lay audiences with advertisements framing depression as an illness of the brain which can be healed with brain-altering medication (Gardner, 2003) misleads the public regarding plausible causes for mental illness, such as a chemical imbalance of serotonin causing depression (Lacasse & Leo, 2005). Additionally, persistent exposure to medical jargon may have created an atmosphere in which the public is casually using clinical labels to refer to their own experiences and/or implementing clinical descriptors that do not reflect their beliefs about cause regarding changes in mood and mood-related behavior. Exposure to pharmaceutical advertisements may also mislead consumers regarding prevalence of depression (Park & Grow, 2008). Taken together, I speculate that environmental factors may be an accepted clinical causal explanation for mood and MRB

change but not one that is generally associated with a need for clinical treatment because it is perceived as a commonplace phenomenon.

People often wait a significant amount of time between the onset of their symptoms and seeking clinical treatment for them (Wang, Berglund, Olfson, Pincus, Wells, et al., 2005), a practice which can be problematic. Increasing the community's mental health literacy by elevating the frequency and quality of public conversation regarding mental health may facilitate more timely clinical treatment seeking. Community-level training programs focused on increasing public awareness of mental health "warning signs" and more positive attitudes towards clinical help seeking (Kitchener & Jorm, 2008) may be one way to accomplish this goal. Participants who accurately labeled vignettes depicting depression- or schizophrenia-related behavior are likely to identify appropriate treatment seeking options (Wright, Jorm, Harris, & McGorry, 2007). Individuals struggling with mental health problems may be more likely to seek clinical assistance and avoid negative outcomes (i.e., inability to work, hospitalization, suicide) if family members, co-workers, and physicians readily identify their symptoms and offer support.

Reflections on Methodological Choices

Internet-based data collection

I found internet-based data collection to be a valuable method for two main reasons. Most importantly, the online nature of the survey allowed me to gather sensitive information regarding participants' mental health; response bias may have been reduced with this method of administration compared to that of face-to-face interviews (Lewis, 1994;

Pealer et al., 2001). Also, using an internet-based survey allowed me to recruit participants across the country, in urban and rural areas, quickly and with little expense. A large portion of survey completers voluntarily entered themselves into the prize drawings - indicating that the prize drawings were an effective participant incentive. The sample was reflective of the national population in many ways (i.e. white vs. non-white ratio, geographic diversity, urban vs. rural living ratio, previous psychiatric diagnosis vs. not) but not in others (i.e. too many women, people under 40, those with advanced education). The sample spent more time using the Internet compared to the 2006 General Social Survey's national sample which could raise questions regarding the ability to extrapolate findings to the general U.S. population. In the future, I will continue to use this method of administration but will consider over-sampling men (only 20% of this study sample) and people without college educations (14% of sample) to better represent those groups.

The survey was conducted using survey construction software because of limitations on time and funding. While using an established survey development platform with dedicated support staff facilitated swift survey development and troubleshooting, it also limited construction to the available formatting parameters. This was most evident when I wanted certain responses to trigger a skip, i.e. a connection to a survey item not directly following another. It might be worthwhile to design future studies do novo so that concessions regarding formatting and question order do not have to be made.

Study design

By approaching research on seasonally variant mood and MRB using a community sample, information was gathered from individuals both with and without previous diagnoses. Thus, data collection was neither restricted to participants formally nor informally diagnosed with seasonal depression nor to those inculcated to a possibly more clinical view of their recent variations in mood. If I had restricted the population to those with experiences labeled as "seasonal depression" I would have been likely forced to use a treatment sample in order to gather enough participants. Because I did not use a treatment sample, findings demonstrating significant differences between environmental attributers vs. non-environmental attributers are likely to have greater external validity - more accurately represent existing phenomena in the U.S. population.

This study implemented a cross-sectional, mixed-methods design to access a national sample through (fairly general) recruitment announcements on the Internet and with minimal incentive. While the study design accomplished this goal, future research of this nature might employ a longitudinal design. The cross-sectional nature of this study limited the ability to extrapolate the directional nature of the many statistically significant associations found in the analysis. For example, I found that high levels of self-reported seasonal variation in mood and MRB were significantly associated with an increased likelihood of making an environmental attribution regarding recent changes. It is unclear whether a belief that aspects of environmental change can evoke mood change influences assessment of seasonality or if people with seasonally variant mood and MRB are more likely to believe that environmental factors cause mood change. I can only postulate as to the direction of this effect.

Additionally, the cross-sectional design and sample size did not allow me to address issues of geography-bound cultural perceptions and behaviors related to environmental factors (i.e., local expectations for winter outdoor activity). Analysis of regional data may reveal variations in the way people respond to changes in weather and light, seasonally-variant behavior, and/or coping with these changes that reflect underlying place-oriented experiences. Differences in regional culture may also explain inconsistencies in results regarding attribution, clinical labeling, and treatment seeking.

Seasonal sensitivity was assessed using questions from the General Social Survey but if participants had been able to provide repeated assessments of sensitivity, (or better, chronicle their changes in mood and behavior through a daily journal), reliance on retrospective assessments of mood and behavior change would be lessened. A year's worth of entries may have revealed that a large percentage of participants have seasonal mood and behavior change but only a few acknowledge and/or are disturbed by the changes.

It was necessary to minimize the number of items in the online survey to achieve a high completion rate. However, studies with a different research design might be improved by the presence of three additional assessments. The first suggested additional measure would be an anxiety measure that could provide data to help with the interpretation of significant findings associated with general psychological distress (K6). On a number of occasions, distress (K6) was associated with outcomes but depressive symptoms which

had been hypothesized to have significant impacts were not. Information regarding anxiety state could help illuminate which aspects of the K6 are associated with this relationship. Second, data from comprehensive psychiatric histories could provide useful information regarding family history, timelines of illness, specific diagnoses, who provided diagnoses, and decision-making regarding treatment. The histories could be used as a "gold standard" with which to compare outcomes from CES-D and K6 scores as well as reports of mood and MRB change.

Finally, analysis could also benefit from an assessment of trait personality. Having access to information regarding personality may help further explain differences between those people attributing their changes in mood and MRB versus those who did not. Although neuroticism has been shown to be associated with seasonality (Jang, et al., 1997), its relationship to seasonal depression is less clear (Jain et al., 1999; Michalak et al., 2004). It would have been interesting to compare environmental attributors' personality traits to the existing literature. Also, it has been demonstrated that a number of individual characteristics can inform prediction of the course of psychological illness (Forsell, 2007; Kendler, Gardner, & Prescott, 2001). Personality trait data could potentially inform course of illness patterns for those exhibiting seasonal variations in mood and MRB captured with longitudinal data.

Along with the notation of these additional measures, I want to draw attention to two sets of questions used in the study that proved problematic: those related to light exposure and illness perception. Further attempts will need to be made to develop a scale tapping into

constructs related to light behavior. As noted above, data from the bright light sensitivity item acted very differently than the other items suggesting the need to further examine aspects of light exposure behavior. Although the five items used were the result of pilot testing, additional items would have allowed me to develop constructs more effectively related to exposure time, control over exposure, light sensitivity, and perceived benefits of exposure.

Additionally, analyses revealed problems in the implementation of the Brief IPQ to address my research aims with this sample. Some may be resolved by making slight revisions to the wording of the items and some problems may be broader. In this sample, not all respondents were "treating" their changes in mood and mood-related behavior. Therefore, "How much do you think your treatment can help your changes in mood and/or behavior?" (Item 4; see Appendix A) referenced a highly variable, if not unknown, "treatment." This likely resulted in misguiding patterns of response. Rewording the original question "How much do you experience symptoms from your (*disease name*)?" to "How much do you experience symptoms from your changes in mood and/or behavior?" (Item 5) may have been confusing. The question becomes nonsensical when applied to this survey, essentially asking "How much do you experience symptoms from your symptoms?" The scale, while generic, was initially developed on samples with specific physically-based illnesses and the wording of the questions, when applied to non-specific changes in mood and mood-related behavior, is not ideal.

A larger conceptual problem may exist with the Brief IPQ that can be applied to other measures similarly created by abbreviating an established scale with tested psychometric properties. The Brief IPQ is comprised of items representing each of eight, non-causal, dimensions of the larger IPQ-R (Figueiras & Alves, 2007). Whereas Figueiras & Alves found a seven-factor solution for the non-causal IPQ-R items; in a post-hoc factor analysis I found a two-factor solution for the Brief IPQ. Within this two-factor solution the components contain items that appear to be asking very conceptually different questions. For example, "How much do you think your treatment can help your x?" and "How well do you feel you understand your changes in x?" load together on factor two. As well, "How long do you think your changes in x will continue?" and "How much do you experience symptoms from your x?" comprise the other factor. Because of the variation in the items, the factor loadings are difficult to interpret. In an effort to achieve brevity, the utility of the scale may have been compromised.

Beliefs common to individuals experiencing similar dysfunctions are important because they inform decisions regarding treatment, prevention, and recovery (ex. Petrie, Cameron, Ellis, Buick, & Weinman, 2002). French and Weinman (2008) note that the generic nature of the IPQ limits researchers' abilities to glean disorder-specific insights. It is my suggestion that future studies bypass the abbreviated Brief IPQ and, instead, implement the full length IPQ-R (with a careful eye towards rewording items). The IPQ-R should be accompanied with open-ended questions regarding illness perceptions that capture participants' cognitions and explanations in detailed narrative. Alternatively, a new illness behavior measure could be developed.

Analysis

In addition to the traditional, psychometrically validated measures within the survey, I added a few open-ended items to which participants provided narrative responses, later analyzed qualitatively. In a few instances, participants had the opportunity to write-in "other" responses not represented by the close-ended response options provided to them. "Other" responses describing participants' changes in mood and MRB revealed a number of issues surrounding negative mood and anxiety that will be included as close-ended response options in the future. For example, feelings of anxiousness and uncontrollable crying were frequently mentioned in "other" responses (e.g., "increased anxiety" and "crying much more easily than usual").

Questions with open- vs. close-ended formats, seeking to gather the same information, have been demonstrated to elicit statistically different responses (Ivis, Bondy, & Adlaf, 1997; Schwarz, 1999). In an effort to identify the best way to elicit beliefs about the reason for mood and MRB change, information regarding participants' causal attributions was gathered two ways. Participants reported one to three causes for their recent mood changes in rank order in response to an open-ended item. They were then asked to pick a "primary cause" from a list of response options that were provided to them. Acknowledging that participants might tailor responses to perceived goals of research (Norenzayan & Schwarz, 1998), question order was intentional: the open-ended question was first so that responses would not be swayed by our response options for the closed. Analyses focused on attribution were run with data from these two items separately.

Unfortunately, question style did influence responses and the findings varied depending on which data were used. This outcome should generate further conversation regarding the best question structure with which to gather attribution information because there is no definitive answer from this data. Another way in which to elicit attribution data in the future would be to ask participants to rate the relevancy of causes (provided in a list) to their symptoms (Tully, Parker, Wilhem, & Mahli, 2006). In an effort to make a determination about the most useful question format, interviews or in-depth questioning should be used to better understand participants' responses to open- versus close-ended versions of the attribution question.

In these analyses, I included both the K6 (general distress) and CES-D (presence of depressive symptoms) outcomes in the models to control for participants' state of well-being at the time of survey participation. While I acknowledge that, in some ways, these assessments are redundant, they were designed to have different clinical relevance: the K6 indicates the degree to which a person is experiencing general psychological distress and the CES-D indicates severity of depressive symptoms. If I had been interested in the specific relationship of either measure to attribution or other research outcomes, it would have been a mistake to include them simultaneously in the regression models. However, I wanted to completely control for problematic psychological state and thus included them together in the regression models.

Plans for Future Research

Using this data, future analyses unrelated to the hypotheses presented here will seek to answer questions surrounding specific symptoms, attribution, and treatment seeking with a focus on understanding what kinds of symptom experiences are more likely to result in clinical treatment. As well, analyses of the relationship between individuals' regional place of residence and symptom labeling will be conducted in the hope of generating data to support a future qualitative study investigating regional trends in seasonal expectations, activity patterns, and symptom attribution.

This study should be seen as a pilot study for future research investigating attribution of seasonal mood and MRB change. I will use findings from this study as building blocks with which to inform a more comprehensive, longitudinal, mixed-methods research program. Ideally, a national community sample should be recruited and assessed for current and previous psychological impairments using a gold standard Structured Clinical Interview for DSM-IV. Then, scale scores for personality, psychological distress, depression, anxiety, seasonal sensitivity, and illness perception could be compared to interview findings. As previously noted, development of a scale addressing light exposure is needed. The recording of vitamin D sera levels could be used as proxies for light exposure behavior until this measure is developed.

Multiple assessments of these factors over a period of time long enough to assess cyclical patterns (three years or more) would permit tracking of longitudinal diagnoses, (e.g., Schwartz et al., 2000), to establish patterns of seasonal variation in mood and MRB that could not be revealed with only one or two years' worth of data. In this way, if patterns of

seasonal mood and MRB existed in a community sample for both those who did, and those who did not, exhibit problematic seasonal changes in mood and mood-related behavior; longitudinal data could more definitely demonstrate that mood and MRB change qualifying as seasonal mood disorders are extreme, dysfunctional expressions of normal rhythms of mood and mood-related behavior. Tracking vitamin D and various psychological assessments in concert could demonstrate that changes in bright light exposure across a year are related to risk for seasonal mood disorders. If drastic changes in vitamin D levels co-occur with psychological dysfunction, the prevention or mitigation of problematic seasonal variations in mood and MRB through behavioral or dietary interventions should emerge.

Grafting attribution data, (collected both qualitatively and quantitatively as suggested earlier), onto the patterns of mood and MRB change and vitamin D levels could assist with the production of a multi-faceted examination of mood and mood-related behavior. By tracking physiological, psychological, and attribution-related data across time, we will be better equipped to answer questions related to environmental psychology (*Is light behavior related to illness perception? How does seasonal change impact mood*?), epidemiology ("*Is high seasonality a risk factor for seasonal depression?),* public health, (*Are there ways to educate the public regarding seasonal dysfunction that would reduce incidence?),* and health services research (*How to identify individuals in need of specialty clinical care?)* to best serve those impacted by problematic seasonal mood and MRB change.

Concluding Thoughts

In this dissertation study, environmental factors were attributed as causes for periods of psychological and behavioral dysfunction alongside stress, physical health, biochemical imbalances, and genetic predisposition. The project set out to explore whether environmental attribution differentiated participants experiencing recent changes in mood and mood-related behavior and if so, how. In light of the discussion above, it appears that the way in which people attribute cause for episodes of irregular mood is likely related to their attribution style; beliefs regarding the environment, mental illness, and clinical treatment; and their illness perceptions, all of which have been informed by their communities, experiences with clinical care, and health histories.

Because everyone lives within natural and physical environments, it is important to understand how exposure to the changeable aspects of these environments may influence health and well-being. To be sure, a range of responsiveness to environmental factors exists - why some are more responsive than others to environmental exposures remains to be uncovered. If heightened sensitivity to environmental exposures or highly variant mood across seasons positions individuals to be at a greater risk for problematic episodes of mood and mood-related behavior dysfunction then understanding the etiology of seasonal mood and mood-related behavior change could mitigate future episodes. It is imperative for clinicians diagnosing and/or treating individuals with mood and mood-related behavior changes to take the time to learn patients' beliefs regarding cause of dysfunction because patients' attributions may assist in targeting the best course of treatment. This practice may be best suited to clinical specialists (as opposed to general

practitioners) as they are able to spend more time with patients, giving them the opportunity to fully delve into their explanatory models of illness. Individuals making environmental attributions may benefit from interventions that address environmental exposures as ways to mediate or prevent changes in mood and mood-related behavior. In differentiating those who are susceptible to negative or dysfunctional reactions to these exposures, researchers can provide richer diagnostic guidelines and preventative strategies for clinicians, epidemiologists, and impacted individuals.

Table 1 *Scale Distributions* (*N*=324)

Dimension	Scale	Range	Clinical Cut-point	*M*	*SD*	Skewness	Kurtosis
Seasonal Sensitivity	GSS	0-24	11	10.29	5.96	0.08	-0.70
Depressive Symptom Severity	CES-D	0-60	16	28.53	12.27	0.01	-0.72
General Psychological Distress	K6	0-24	13	11.45	5.30	0.17	-0.56
Illness Perception	Brief IPQ	0-60	--	43.39	11.06	-0.21	-0.12

Table 52 *Variables in Analysis*

Abbreviation	Dimension	Variable type	Outcome	Predictor	Covariate
Qualitative	Qualitative causal attribution	Binary Categorical	✓	✓	
Quantitative	Quantitative causal attribution	Binary Categorical	✓	✓	
Any env.	Environmental causal attribution	Binary	✓	✓	
GSS, seasonality	Seasonal sensitivity	Continuous Binary Categorical	✓		
CES-D	Depressive symptom severity	Continuous Binary		✓	✓
Distress, K6	General psychological distress	Continuous Binary		✓	✓
Brief IPQ	Illness perception *Factor:* Control	Continuous		✓	
Light	Natural light exposure *Factors:* Exposure Control Sensitivity	Continuous		✓	
Label	Using clinical language to label symptoms	Binary	✓	✓	
Treatment seeking	Clinical treatment seeking	Binary	✓		
Prev. psych. diag.	Previous psychiatric disorder	Binary		✓	✓

	diagnosis			
Prescrip. drug use	Prescription drug use	Binary	✓	✓
Medicaid/care, uninsured	Health insurance status	Binary Categorical		✓
---	Gender	Binary		✓
---	Race	Binary		✓
---	Age	Binary Categorical		✓
---	Education	Binary Categorical		✓
---	Mountain region of residence	Binary Categorical		✓
Small city	Living in a small city	Binary Categorical		✓

Appendix A. Survey Items

Changes in Mood and Behavior Survey

Sociodemographic Questions

What is your age?

What is your gender?

- Female
- Male

Are you of Latino or Hispanic origin?

- Yes
- No

What is your race/ethnicity?

In the last twelve months, have you experienced changes in your mood and/or behavior that lasted at least two weeks?

- Yes
- No

In what state do you live?

Would you describe the place where you currently live as ... ?

- A big city
- The suburbs or outskirts of a big city
- A medium size city
- A small city or town
- A rural town or village
- A farm or home in the country
- I don't know

How long have you lived there?

What is the highest grade of school or year of college you completed?

Changes in Mood and Behavior Survey

Do you have health insurance?

- ◯ Yes, I have full coverage
- ◯ Yes, I have partial coverage
- ◯ Yes, I have Medicare/Medicaid
- ◯ No, I do not have health insurance
- ◯ I don't know

Not counting e-mail, about how many hours a week do you use the internet?

Center for Epidemiologic Studies Depression scale (CES-D: Radloff, 1977)
Items 1-10

Changes in Mood and Behavior Survey

Below is a list of ways you may have felt or behaved. Please tell me how often you have felt this way DURING THE PAST WEEK by clicking the appropriate box for each question.

DURING THE PAST WEEK...

	Rarely or none of the time (<1 day)	Some or a little of the time (1-2 days)	Occasionally or a moderate amount of time (3-4 days)	Most or all of the time (5-7 days)
I was bothered by things that usually don't bother me.	◯	◯	◯	◯
I did not feel like eating; my appetite was poor.	◯	◯	◯	◯
I felt that I could not shake off the blues even with help from my family or friends.	◯	◯	◯	◯
I felt I was just as good as other people.	◯	◯	◯	◯
I had trouble keeping my mind on what I was doing.	◯	◯	◯	◯
I felt depressed.	◯	◯	◯	◯
I felt that everything I did was an effort.	◯	◯	◯	◯
I felt hopeful about the future.	◯	◯	◯	◯
I thought my life had been a failure.	◯	◯	◯	◯
I felt fearful.	◯	◯	◯	◯

Center for Epidemiologic Studies Depression scale (CES-D: Radloff, 1977)
Items 11-20

Changes in Mood and Behavior Survey

As you did on the previous page, please tell me how often you have felt this way DURING THE PAST WEEK by clicking the appropriate box for each question.

DURING THE PAST WEEK...

	Rarely or none of the time (Less than 1 day)	Some or a little of the time (1-2 days)	Occasionally or a moderate amount of the time (3-4 days)	Most or all of the time (5-7 days)
My sleep was restless.	◯	◯	◯	◯
I was happy.	◯	◯	◯	◯
I talked less than usual.	◯	◯	◯	◯
I felt lonely.	◯	◯	◯	◯
People were unfriendly.	◯	◯	◯	◯
I enjoyed life.	◯	◯	◯	◯
I had crying spells.	◯	◯	◯	◯
I felt sad.	◯	◯	◯	◯
I felt that people dislike me.	◯	◯	◯	◯
I could not "get going."	◯	◯	◯	◯

K6 (Kessler et al., 2002)

Changes in Mood and Behavior Survey

The following questions ask how you have been feeling OVER THE PAST 30 DAYS. For each question, please indicate the number that best describes how often you had this feeling.

During the LAST 30 DAYS, about how often did you feel...

	All of the time	Most of the time	Some of the time	A little of the time	None of the time
...nervous?	◯	◯	◯	◯	◯
...hopeless?	◯	◯	◯	◯	◯
...restless or fidgety?	◯	◯	◯	◯	◯
...so depressed that nothing could cheer you up?	◯	◯	◯	◯	◯
...that everything was an effort?	◯	◯	◯	◯	◯
...worthless?	◯	◯	◯	◯	◯

Changes in Mood and Behavior Survey

	Excellent	Very good	Good	Fair	Poor
How would you rate your overall PHYSICAL health?	◯	◯	◯	◯	◯
How would you rate your overall MENTAL health?	◯	◯	◯	◯	◯

Have you ever been diagnosed with a major psychological disorder by a doctor, psychiatrist or other mental health clinician?

Select all that apply.

- ☐ I have been diagnosed with an Anxiety disorder (Post-traumatic stress disorder, Obsessive Compulsive disorder, etc.)
- ☐ I have been diagnosed with a Mood disorder (Depression, Bipolar disorders, etc.)
- ☐ I have been diagnosed with Schizophrenia or other psychotic disorder
- ☐ No, I have never been diagnosed with a major psychological disorder
- ☐ Other (please specify)

Are you currently being treated for a psychological disorder?

- ◯ Yes
- ◯ No

Do you have any of the following chronic conditions?

☐ Arthritis	☐ Diabetes	☐ Rheumatic fever
☐ Asthma	☐ Epilepsy	☐ Seasonal allergies like hay fever
☐ Cancer	☐ High blood sugar	☐ Severe or frequent headaches
☐ Chronic back/neck problems	☐ Heart disease	☐ Stroke
☐ Chronic lung disease	☐ Heart trouble/problems	☐ Ulcer in stomach/intestine
☐ Chronic pain	☐ High blood pressure	☐ NO CHRONIC CONDITIONS

☐ Other (please specify)

Changes in Mood and Behavior Survey

The following questions ask you about your changes in mood and/or behavior.

You said that within the last year that you experienced changes in mood and/or behavior lasting at least two weeks - what are these changes?

Check all that apply.

- ☐ Annoyed by things that don't usually bother me
- ☐ Loss of interest in previously satisfying activity
- ☐ Sleeping more
- ☐ Sleeping less
- ☐ More energy
- ☐ Less energy
- ☐ Other (please specify)
- ☐ Eating more
- ☐ Eating less
- ☐ Eating different foods
- ☐ Increased desire to socialize
- ☐ Decreased desire to socialize
- ☐ Weight gain
- ☐ Weight loss
- ☐ Moving quickly
- ☐ Moving slowly
- ☐ Increased time with family & friends
- ☐ Decreased time with family & friends

Are you experiencing these changes in mood and/or behavior now?

- ◯ Yes
- ◯ No

Do you have a name for your changes in mood/behavior?

- ◯ No
- ◯ Yes

How did you come by this name?

- ☐ I do not have a name for my changes in mood and/or behavior.
- ☐ I do have a name - this is how I came to use it...

For how many years have you been experiencing these periods of change in mood and/or behavior?

Seasonal Health Questionnaire (Thompson & Cowan, 2001)
First two items regarding time of year

Changes in Mood and Behavior Survey

Can you estimate the month(s) when these changes in mood and/or behavior usually start?

Select all that apply.

- ☐ January
- ☐ February
- ☐ March
- ☐ April
- ☐ May
- ☐ June
- ☐ July
- ☐ August
- ☐ September
- ☐ October
- ☐ November
- ☐ December

Can you estimate the month(s) in which these changes in mood and/or behavior usually finish?

Select all that apply.

- ☐ January
- ☐ February
- ☐ March
- ☐ April
- ☐ May
- ☐ June
- ☐ July
- ☐ August
- ☐ September
- ☐ October
- ☐ November
- ☐ December

When you experience these changes in mood and/or behavior what do you do about them?

Select all that apply.

- ☐ Change my diet
- ☐ Sleep more
- ☐ Sleep less
- ☐ Take naps
- ☐ Increase my access to natural sunlight
- ☐ Exercise
- ☐ Go tanning
- ☐ Other (please specify)
- ☐ Go to therapy
- ☐ Keep the lights on when I'm inside
- ☐ Spend more time inside
- ☐ Spend more time outside
- ☐ Take a vacation
- ☐ Take curtains off the windows
- ☐ Take days off from work
- ☐ Use prescription anti-depressants
- ☐ Use other prescription drugs
- ☐ Use non-prescription or over-the-counter drugs
- ☐ Use natural/homeopathic medicines
- ☐ Take vitamins
- ☐ Use a sunlamp
- ☐ I don't do any of these

Changes in Mood and Behavior Survey

When you experience these changes in mood and/or behavior do you do any of the following?

Select all that apply, including conflicting responses.

- ☐ See a mental health professional
- ☐ See a doctor/nurse practitioner
- ☐ See a therapist or counselor
- ☐ Seek assistance from people in non-medical agencies
- ☐ Talk with my partner about how I'm feeling
- ☐ Talk with friends about how I'm feeling
- ☐ Other (please specify)
- ☐ Talk with family about how I'm feeling
- ☐ Talk to clergy
- ☐ Pray
- ☐ Research my symptoms
- ☐ I don't do any of these

Changes in Mood and Behavior Survey

Do you go to the SAME doctor/nurse practitioner every time regarding your changes in mood and/or behavior?

- ◯ Yes
- ◯ No
- ◯ I do not go to a doctor regarding my changes in mood or behavior

Do you go to the SAME psychiatrist/psychologist/counselor every time regarding your changes in mood and/or behavior?

- ◯ Yes
- ◯ No
- ◯ I do not go to a doctor regarding my changes in mood or behavior

Brief Illness Perception Questionnaire (Brief IPQ: Broadbent, et al. 2006)

Changes in Mood and Behavior Survey

In this section, please indicate the number that best corresponds to your views:

	1	2	3	4	5	6	7	8	9	10
How much do your changes in mood and/or behavior affect your life?	No affect at all									Severely affects my life
How long do you think your changes in mood and/or behavior will continue?	A very short time									Forever
How much control do you feel you have over your changes in mood and/or behavior?	Absolutely no control									Extreme amount of control
How much do you think your treatment can help your changes in mood and/or behavior?	Not at all									Extremely helpful
How much do you experience symptoms from your changes in mood and/or behavior?	No symptoms at all									Many severe symptoms
How concerned are you about your changes in mood and/or behavior?	Not at all concerned									Extremely concerned
How well do you feel you understand your changes in mood and/or behavior?	Don't understand at all									Understand very clearly

Brief Illness Perception Questionnaire (Brief IPQ: Broadbent, et al. 2006) continued

Changes in Mood and Behavior Survey

	1 Not at all affected emotionally	2	3	4	5	6	7	8	9	10 Extremely affected emotionally
How much do your changes in mood and/or behavior affect you emotionally? (e.g. do they make you angry, scared, or upset?)	○	○	○	○	○	○	○	○	○	○

Please list in rank-order the three most important factors that you believe caused your changes in mood and/or behavior.

1.

2.

3.

Changes in Mood and Behavior Survey

What do you believe is the primary cause of your changes in mood and/or behavior?

- ◯ Changes in the seasons
- ◯ Changes in the weather
- ◯ Chemical imbalance
- ◯ Genes and/or family history
- ◯ Poor health
- ◯ Stress
- ◯ Other (please specify)

Global Seasonality Scale (GSS: Rosenthal, et al., 1987)

Changes in Mood and Behavior Survey

The purpose of this section is to find out how your mood and behavior change over time. I am interested in YOUR experiences; not others you may have observed.

To what degree do the following CHANGE WITH THE SEASONS?

	No change	Slight change	Moderate change	Marked change	Extremely marked change
Sleep length	◯	◯	◯	◯	◯
Social activity	◯	◯	◯	◯	◯
Mood (Overall feeling of well-being)	◯	◯	◯	◯	◯
Weight	◯	◯	◯	◯	◯
Appetite	◯	◯	◯	◯	◯
Energy level	◯	◯	◯	◯	◯

Changes in Mood and Behavior Survey

The following questions ask you about natural light. Think of natural light as both direct (being outside) and indirect (sunlight coming in through an office or car window).

How important is it for you to be exposed to natural light each day?

- ◯ Extremely important
- ◯ Very important
- ◯ Moderately important
- ◯ A little important
- ◯ Not at all important

On an average day, how much time do you spend exposed to natural light?

- ◯ The majority of my day
- ◯ Half of my day
- ◯ A few hours of my day
- ◯ An hour or so of my day
- ◯ A few minutes of my day

If you could choose, how much of your day would you prefer to be exposed to natural light?

- ◯ The majority of my day
- ◯ Half of my day
- ◯ A few hours of my day
- ◯ An hour or so of my day
- ◯ A few minutes of my day

How much control do you have over your natural light exposure?

- ◯ Complete control
- ◯ Lots of control
- ◯ Some control
- ◯ Little control
- ◯ No control

Changes in Mood and Behavior Survey

How sensitive are you to bright light?

- ◯ Extremely sensitive
- ◯ Very sensitive
- ◯ Somewhat sensitive
- ◯ A little sensitive
- ◯ Not at all senstiive

Changes in Mood and Behavior Survey

In Conclusion

Thank you for your time and interest in this research study!

How did you hear about this questionnarie?

- ◯ Craigslist posting for volunteers
- ◯ Kijiji posting for volunteers
- ◯ On my group's message board
- ◯ Social Psychology Network website
- ◯ Psychology Research on the Net website
- ◯ Online post elsewhere
- ◯ Forwarded from a friend

You are eligible to enter prize drawings for $30 Amazon.com gift cards as a thank you for your participation.

If interested, please enter your email address into the box below:

The results of this study can be sent to you.

If interested, please enter your email address into the box below:

Changes in Mood and Behavior Survey

Thank You for Your Interest

Comments and questions regarding this study can be sent to the primary investigator at moodandbehaviorsurvey@gmail.com

Feel free to add comments below:

Know other people who would be interested in this survey?

Send them the survey link!
http://www.surveymonkey.com/s.aspx?sm=6yF6YATu9_2b7_2f7YQEGM5F2g_3d_3d

Appendix B. Recruitment Announcement

Diverse Group of Participants Needed for Psychological Study

- Are you 18 years or older?
- Do you live in the United States?
- Have you experienced a change in your mood or behavior that lasted for at least two weeks?

Hello, my name is Meredith Theeman, and I am a graduate student pursuing a PhD in Psychology at The Graduate Center – City University of New York. I am conducting a research project looking at changes in behavior and mood. The study involves completing a few eligibility questions, and if eligible, completing a questionnaire. The study is being conducted online and I would be extremely grateful if you would be willing to complete the survey.

It will take approximately 20 minutes of your time and IF COMPLETED, YOU WILL BE ELIGIBLE TO PARTICIPATE IN A PRIZE DRAWING FOR A $30 AMAZON.COM GIFT CARD. Odds of winning are one in thirty. To find out if you are eligible for the study, please visit the link below:

http://www.surveymonkey.com/s.aspx?sm=6yF6YATu9_2b7_2f7YQEGM5F2g_3d_3d

If you have any questions about me or my study, you can contact me via email at moodandbehaviorsurvey@gmail.com

Thank you for your help with this project.
Sincerely,
Meredith L. Theeman, MSc, MPhil

Appendix C. Text of Email to Community Group/Chat Room Managers

Hello,
My name is Meredith Theeman and I am a psychology student pursuing a PhD at The Graduate Center - City University of New York. I am conducting research looking at how people think and respond to their mood and behavior changes. The study asks individuals to complete a few eligibility questions, and if eligible, complete a survey about their moods and behavior. Participation is confidential.
The survey is being conducted online and I would be extremely grateful if you would grant me permission to recruit participants from/post an announcement on your message board. Each eligible participant completing the survey will be given a chance to win one of ten $30 Amazon.com gift cards. I am interested in a diverse group of people in terms of age, race/ethnicity, health, and emotional well-being. For this reason, I believe your group would be an ideal venue for recruitment.
After I have your approval I can either:

- Email you the survey link along with a message to your community members so that you can post it yourself

  or
- Post the survey link along with a message to your community members directly to the group site

If you have questions about me or my study, please contact me via email at mtheeman@gc.cuny.edu .
Thank you for your time and consideration.
Sincerely,
Meredith L. Theeman

Appendix D. List of Posting Locations by Region

U.S. Geographic Regions used in General Social Survey crossed with Craiglist.org posting locations:

GSS Region	States in Region	Craigslist Post Round I [a]	Craigslist Post Round II	Craigslist Post Round III
1	CT, ME, MA, NH, RI, VT	New Haven, CT	Maine	Boston, MA
2	NJ, NY, PA	Buffalo, NY	Philadelphia, PA	NYC
3	IL, IN, MI, OH, WI	Milwaukee, WI	Detroit, MI	Chicago, IL
4	IA, KS, MN, MO, NE, ND, SD	South Dakota	Minneapolis/ St.Paul, MN	Kansas City, KS
5	D.C., DE, FL, GA, MD, NC, SC, VA, WV	Charlotte, NC	Washington, D.C	Miami/South Florida
6	AL, KY, MS, TN	[b]	Birmingham, AL	Memphis, TN
7	AR, LA, OK, TX	New Orleans, LA	Oklahoma City, OK	Houston, TX
8	AZ, CO, ID, MT, NM, NV, UT, WY	Salt Lake City, UT	Montana [c]	Las Vegas, NV
9	AK, CA, HI, OR, WA	Alaska	Portland, OR	Seattle, WA San Francisco Bay area [b]

[a] Note: I started off with less populated locations in case changes needed to be made to the posting message, posting tag, etc….

[b] Note: Region 6 Round I – Due to small population and region size, Region 6 was sampled twice. Extra round given to Region 9.

[c] Note: Region 8 Round II – Montana flagged; moved to Boise, Idaho, flagged twice; moved to Albuquerque, NM

Appendix E: Recruitment Announcement Posting Schedule

09.08.08
Craigslist.org>**New Haven, CT**>Volunteers
09.08.08
MSN Groups>Depression Chat Support
MSN Groups> Depression Sucks Life
MSN Groups> Information: Depression
MSN Groups> Mental Health Center> Depression & Bipolar Disorder message board
Yahoo Groups>Bipolar_world (posted by manager)
Yahoo Groups>Biofeedback (posted by me)
09.09.08
Responded to community group managers with questions regarding posting
Yahoo Groups> Radiantdepression (posted by manager)
Yahoo Groups>Bi-Polar (posted by manager)
09.10.08
Craigslist.org>**Buffalo, NY**>Volunteers
09.10.08
Responded to community group managers regarding posting (GC email) and individuals with questions about the study (Study's GMAIL account)
09.11.08
Craigslist.org>**Buffalo, NY**>Volunteers flagged & removed
09.11.08
Craigslist.org>**New Haven, CT**> Volunteers removed
Craigslist.org>**Buffalo, NY**>Volunteers reposted
09.11.08
Yahoo Groups>Effexor (posted/forward by manager)
09.13.08
Craigslist.org>**Buffalo, NY**>Volunteers removed
Craigslist.org>**Milwaukee, WI**> Volunteers posted
09.15.08
Craigslist.org>**Milwaukee, WI**> Volunteers removed
Craigslist.org>**South Dakota**>Volunteers posted
09.16.08
Google Groups> The Journey Inside (posted by me)
Google Groups> Beepers Peepers (public) (posted by me)
Google Groups> alt.support.depression.medication (posted by me)
Google Groups> soc.support.depression.manic (posted by me)
Google Groups> alt.support.depression (posted by me)
Google Groups> Summer SAD (posted by me)
09.17.08
Craigslist.org>**South Dakota**>Volunteers removed
Craigslist.org>**Charlotte, NC**>Volunteers posted
Google Groups>Beepers Peepers (posted by manager)
09.19.08
Craigslist.org>**Charlotte, NC**>Volunteers removed
Craigslist.org>**New Orleans**>Volunteers posted

09.21.08
Craigslist.org>**New Orleans**>Volunteers removed
Craigslist.org>**Salt Lake City**>Volunteers posted
09.23.08
Craigslist.org>**Salt Lake City**>Volunteers removed
Craigslist.org>**Alaska**>Volunteers posted
09.25.08
Craigslist.org>**Maine**>Volunteers posted
09.27.08
Craigslist.org>**Maine**>Volunteers removed
Craigslist.org>**Philadelphia**>Volunteers posted
09.29.08
Craigslist.org>**Philadelphia**>Volunteers removed
Craigslist.org>**Detroit Metro**>Volunteers posted
10.01.08
Craiglist.org>**Detroit Metro**>Volunteers removed
Craiglist.org>**Minneapolis/St.Paul**>Volunteers posted
10.03.08
Craiglist.org>**Minneapolis/St.Paul**>Volunteers removed
Craigslist.org>**Washington DC**>Volunteers posted
10.05.08
Craigslist.org>**Washington DC**>Volunteers removed
Craigslist.org>**Birmingham, AL**>Volunteers posted
10.07.08
Craigslist.org>**Birmingham, AL**>Volunteers reposted
Craigslist.org>**Oklahoma City**>Volunteers posted
10.08.08
Inclusion to the *Psychological Research on the Net* listings of online research
Inclusion to the *Social Psychology Network* listings of online research
10.09.08
Craigslist.org>**Birmingham, AL**>Volunteers removed
Craigslist.org>**Oklahoma City**>Volunteers removed
Craigslist.org>**Montana**>Volunteers posted (flagged immediately)
Craigslist.org>**Boise, ID**>Volunteers posted 17:15 (regional substitute for Montana)
10.11.08
Craigslist.org>**Albuquerque, NM**>Volunteers posted (regional substitute for Montana & Boise)
10.12.08
Craigslist.org>**Albuquerque, NM**>Volunteers removed
Craigslist.org>**Portland, OR**> Posted
10.15.08
Craigslist.org>**Portland, OR**>Removed
Craigslist.org>**Boston**> Volunteers Posted
10.17.08
Craigslist.org>**Boston**>Volunteers removed
Craigslist.org>**NYC-Midtown East**>Volunteers posted

10.18.08
Craigslist.org>**NYC-Midtown East**> Post almost off first 100 so freshly posted
Craigslist.org>**NYC-BK**>Volunteers posted
Tag: Online Mood Study Seeks Research Participants ($30 prize drawings)
10.19.08
Craiglist.org>**NYC**>V removed
Craiglist.org>**NYC-BK**>V removed
Craiglist.org>**Chicago**>Volunteers posted
10.21.08
Chicago reposted to top of list
(later in day) both Craigslist.org>**Chicago**>Removed
Craigslist.org>**Kansas City**>Volunteers posted
10.22.08
Craigslist.org>**Kansas City**>Volunteers flagged & removed
Craigslist.org>**Kansas City**> reposted
10.23.08
Craigslist.org>**Kansas City**>Volunteers removed
Craigslist.org**>Miami/South Florida**>Volunteers posted
10.26.08
Craigslist.org**>Miami/South Florida**>Volunteers removed
Craigslist.org**>Memphis**>Volunteers posted
10.28.08
Craigslist.org>**Houston**>Volunteers posted
10.30.08
Craigslist.org>**Houston**>Volunteers removed
Craigslist.org>**Las Vegas**>Volunteers posted
Flagged and reposted with new format 22:51
Posted abbreviated call to "psychology" discussion Craigslist forum.
11.01.08
Craigslist.org>**Las Vegas**>Volunteers removed
Craigslist.org>**Seattle-Tacoma**>Volunteers posted
11.03.08
Craigslist.org>**Seattle-Tacoma**>Volunteers removed
Craigslist.org>**San Francisco Bay Area/Oakland downtown**>Volunteers posted
11.05.08
Craigslist.org>**San Francisco Bay Area/Oakland downtown**>Volunteers removed
Emails sent to *Psychological Research on the Net* and *Social Psychology Network* list managers to remove the survey
Closed survey access through SurveyMonkey.com

Appendix F. Informed Consent Screen

Changes in Mood and Behavior Survey

Informed Consent

INTRODUCTION & PURPOSE:
You are being asked to participate in a study investigating changes in mood and behavior. The study will involve completing a few eligibility questions, and if eligible, completing a questionnaire that asks you to think about changes in mood and behavior. The study will include a diverse group of people in terms of age, race/ethnicity, and lifestyle.

Please read this information page carefully before deciding whether or not to complete the survey. This study is conducted by Meredith L. Theeman, a doctoral student in the Department of Psychology at the Graduate Center of the City University of New York. You are encouraged to contact her with any questions you may have. Three hundred participants are expected to be included in the study.

PROCEDURES:
1. The short eligibility questionnaire asks you a few questions about yourself and your experiences with changes in mood and behavior. These questions will take about four to six minutes to answer.
2. If, based on your answers to the screening questions, you are eligible; you will be brought directly to the study questionnaire.
3. If you are eligible and choose to complete the study, which will take approximately 30 minutes to finish, you will be eligible to participate in prize drawings for $30 Amazon.com gift cards.

RISKS & BENEFITS:
The only risk to participating in this study is the potential distress you may feel answering questions about changes in mood. The researcher has made every effort to minimize this risk. If you choose to end your participation, you may do so at any time. You will not be asked to provide your name or any other identifying information during the questionnaire part, making it impossible for the research team to link you with your responses to research questions. If you chose to enter yourself in the prize drawing, you will have to provide an email address, but this will not be linked to your questionnaire responses. With an estimated 300 participants, chances of winning are approximately 1:30, or one in thirty. Winners will be immediately contacted after data collection. Although you will not receive any direct benefits, your participation will further knowledge in the fields of psychology, psychiatry, and public health.

CONFIDENTIALITY:
Your participation in the study will be completely confidential. Only the primary investigator and her research advisors will have access to your responses. If voluntarily provided,your email address will be used to enter you in a prize drawing for one of ten gift cards and/or to provide you with a copy of the writting report of the study outcomes. Record of your email address will be destroyed after this information is sent to you. Your email address will not be disclosed in any publications or presentations of the study. The study will not ask you for your name, address, or telephone number.

CONTACT PERSONS:
If you have questions about the research or your participation, you are encouraged to contact the principal investigator, Meredith L. Theeman (718.986.1368) moodandbehaviorsurvey@gmail.com, or Professor Joseph Glick (212.817.8706) jglick@gc.cuny.edu. This study has been approved by The Graduate Center (CUNY) Human Subjects Review Board. If you have questions about your rights as a research participant, please contact Kay Powell, IRB Administrator, The Graduate Center (CUNY) at 212.817.7525 or kpowell@gc.cuny.edu.

VOLUNTARY PARTICIPATION:
Participation in this study is voluntary. You may withdraw from the study at any time by closing your web browser. If you withdraw from the study or refuse to participate, you will not be penalized. If you discontinue your participation, the information that you have provided will be retained by the investigator unless you contact her to request that your responses be destroyed. Only those completing the study in its entirety and providing an email address will be able to participate in the prize drawings. To limit possible multiple submissions, one survey per internet protocol (IP) address will be accepted.

If you are 18 years or older, live in the United States, and agree to participate in this study you can continue on to the eligibility questions by clicking on the "I agree" link below. If you do not want to participate, please click on the "I do not wish to participate at this time" button or navigate to another webpage.

Do you agree to these terms of participation?

◯ YES, I understand and agree to participate. ◯ NO, I do not wish to participate at this time.

Appendix G. Data Checking Protocol

	New Surveys Opened		Dropouts		Ineligible Surveys Completed		Eligible Surveys Completed	
09.08.08	Launch							
09.10.08	43		6		3		34	
09.13.08	9	(052)	2	(008)	0	(003)	7	(041)
09.15.08	12	(064)	1	(009)	1	(004)	10	(051)
09.17.08	6	(071)	2	(011)	0	(004)	5	(056)
09.19.08	4	(075)	1	(012)	0	(004)	3	(059)
09.21.08	6	(081)	2	(014)	0	(004)	4	(063)
09.23.08	3	(084)	0	(014)	1	(005)	2	(065)
09.25.08	18	(102)	2	(016)	3	(008)	13	(078)
09.29.08	15	(117)	1	(017)	4	(012)	10	(088)
09.30.08	17	(134)	3	(020)	2	(014)	12	(100)
10.02.08	18	(152)	6	(026)	0	(014)	12	(112)
10.04.08	9	(161)	4	(030)	0	(014)	5	(117)
10.07.08	9	(172)	5	(035)	2	(016)	4	(121)
10.09.08	29	(201)	4	(039)	10	(026)	15	(136)
10.11.08	17	(218)	5	(044)	5	(031)	5	(141)
10.14.08	34	(252)	10	(054)	10	(041)	14	(155)
10.16.08	37	(289)	9	(063)	13	(054)	15	(170)
10.17.08	11	(300)	3	(066)	0	(054)	8	(178)
10.18.08	15	(315)	2	(068)	4	(058)	9	(187)
10.19.08	19	(334)	4	(072)	4	(062)	11	(198)
10.20.08	32	(366)	7	(079)	6	(068)	19	(217)
10.21.08	17	(383)	5	(084)	2	(070)	10	(227)
10.22.08	15	(398)	1	(085)	5	(075)	9	(236)
10.23.08	11	(409)	4	(089)	1	(076)	6	(242)
10.24.08	7	(416)	1	(090)	1	(077)	5	(247)
10.28.08	10	(426)	0	(090)	3	(080)	7	(254)
10.29.08	7	(433)	2	(092)	1	(081)	4	(258)
10.30.08	7	(440)	4	(096)	0	(081)	3	(261)
10.31.08	25	(465)	6	(102)	9	(090)	10	(271)
11.01.08	12	(477)	3	(105)	1	(091)	8	(279)
11.02.08	18	(495)	3	(108)	7	(098)	8	(287)
11.03.08	12	(507)	4	(112)	2	(100)	6	(293)
11.04.08	52	(559)	12	(124)	14	(114)	26	(319)
11.05.08	21	(580)	7	(131)	3	(117)	11	(330)

Note: Surveys #195, 203, 218, 263, 327, 359, & 420 need to be tossed b/c skip logic didn't work for "outside US"

Appendix H. Raw Data Transfer Protocol

- Download data from SurveyMonkey
  - All responses collected
  - Columns: condensed
  - Cells: Numerical value
- Zip drive appears
  - Double click on .xls file
- Excel should open
  - Save excel file as "xxdatexx raw" under dissertation folder
  - Close excel
- Open SPSS
  - Open>Data
  - Change file extension to .xls
  - Select recently saved data file
- Data view
  - Remove line 1
- Open *Drop Variables* **syntax**
  - Change file name to *xxdatexx* in save line
  - Run syntax
  - Check to see if v14 disappears, if not rerun
- Close data set
- Open new "xxdatexx".sps **data file**
- Open *Variable Properties* **data file**
  - Make room for five NEW variables (which will eventually transfer from *variable properties* to *xxdatexx*). LEAVE new variables BLANK.
    - after STATE v11 (it will become STATEC)
    - after ONLINE v17 (it will become ONLINEC)
    - after v54 (it will become PSYCDX)
    - after v61 "are you…" (it will become CHRNIC)
    - after v81 (it will become CHNGSX)
  - Paste **type** from *variable properties* to *xxdatexx*
  - Paste **names** from *variable properties* to *xxdatexx*
  - Paste **labels** from *variable properties* to *xxdatexx*
  - Paste **values** from *variable properties* to *xxdatexx*
  - Save
- Open *Variable Recodes* **syntax**
  - Run file in sections as noted in syntax
    - Will need to hand code 888 after ELIGBL syntax run CAREFUL
  - Read output for glitches
  - Save

Appendix I. Qualitative Coding

This appendix delineates decisions made by the primary investigator regarding participant responses to four survey questions with an "other, please specify" response option.

Have you ever been diagnosed with a major psychological disorder by a doctor, psychiatrist, or other mental health clinician?

Participant response to "Other, please specify*	Action**	MT Comment
8 yrs ago I lost my 8 yrs old son spent 1 yrs on anti-depression drugs had 6 ok years then in the last year my stress and depression has resurfaced.	PSYCDX=1 PSYCDX_4=0	Treated w/ anti-depressants/used clinical language/recurring depressive episode
add	PSYCDX=1	DSM diagnosis
ADD	PSYCDX=1	DSM diagnosis
ADD	PSYCDX=1	DSM diagnosis
addiction to drugs/alcohol	PSYCDX=1	DSM diagnosis
adhd	PSYCDX=1	DSM diagnosis
adhd	PSYCDX=1	DSM diagnosis
ADHD; Seasonal Depression; Insomnia	PSYCDX=1	DSM diagnosis
anorexia nervosa	PSYCDX=1	DSM diagnosis
Anorexia nervosa	PSYCDX=1	DSM diagnosis
autism/AS	PSYCDX=1	DSM diagnosis
bipolar	PSYCDX=1 PSYCDX_1=1	Recoded into Mood category
Bipolar	PSYCDX=1 PSYCDX_1=1	Recoded into Mood category
Borderline Personality Disorder; Eating Disorder NOS	PSYCDX=1	DSM diagnosis
Bulimia Nervosa	PSYCDX=1	DSM diagnosis
Doctors have suggested things, but never diagnosed. I don't see any doctors for mood or behavioral problems.	PSYCDX_4=1	Recoded into "never diagnosed" category
don't go to the doctor	PSYCDX_4=1	Recoded into "never diagnosed" category
Due to years of episode in which my world of schiz. i.e. "fantasy world" was more horrifying that battle situations, I can assume that my fear of humans, disorganized thought, and extreme lack of sense of self, are impart if not wholly caused by the several year duration of total emersion in nightmarish schiz. "fantasy world." My ten year episode included many years in housing, but it also included several years on the street. The years on the street were the absolute most terrifying as the effects were multiplied many more times than those experienced in housing.	PSYCDX=1 PSYCDX_3=1	Recoded into Sz category
Dysthymia	PSYCDX=1 PSYCDX_1=1	Recoded into Mood category
eating disorder, major depression	PSYCDX=1	Recoded into Mood category

	PSYCDX_1=1	
eating disorder, bulimia nervosa	PSYCDX=1	DSM diagnosis
eating disorders	PSYCDX=1	DSM diagnosis
full work-up , on several occassions- have tried psychological meds as a "try this, try that" approach but nothing worked, and now realize they cannot cure a bacteria infection in the central nervous system- I have a hollistic therapist usuing natural methods of relaxing and coping- no supplements although I have tried some in the past.	No change	CNS bacterial infection is organic - does not classify as DSM d/o
Have never seen a doctor, would suspect anxiety.	No change	
In the past month, I have not been given an official diagnosis but I have been told that an anxiety disorder, a mood disorder (depression), and Borderline Personality Disorder are all possible diagnoses but that it is too early to tell since I have only been in therapy for a few months.	No change	
Inattentive ADHD	PSYCDX=1	DSM diagnosis
lost	No change	
No one has ever been able to diagnose my disorder though not for lack of my trying to get a diagnosis.	No change	
over stressed, need to make changes in lif. mind foggy, a bit depressed	No change	
PMDD	PSYCDX=1	DSM diagnosis
The doctor decided that she made a mistake	No change	Participant selected one d/o category in addition to "other" comment

***** Participant responses are verbatim

******Action taken on "other" participant responses:

PSYCDX=1 "presence of a prior diagnosis for a major psychological disorder"

PSYCDX_1=1 "presence of prior diagnosis for mood disorder"

PSYCDX_3=1 "presence of prior diagnosis for schizophrenia or other psychotic disorder"

PSYCDX_4=0 "participant has prior diagnosis of major psychological disorder"

PSYCDX_4=1 "participant never diagnosed with major psychological disorder"

No change "response was in addition to selection of another category and/or information given does not necessitate a recode"

Do you have any of the following chronic conditions?

Participant response to "Other, please specify"*	**Action****	**MT Comment**
Adult Acne	No change	Not chronic
anemic	CHRNIC +1	
autoimmune hepatitis, ulcerative colitis, primary sclerosing cholangitis	CHRNIC +3	
Blood disorder	CHRNIC +1	
chronic cough	CHRNIC +1	

Chronic Fatigue	CHRNIC +1	
Chronic Fatigue Syndrome	CHRNIC +1	
Chronic pancreatitis, Fibromyalgia, Chronic Fatigue Syndrome, Endometriosis, Restless Legs Syndrome	CHRNIC +5	
chronic/late-misdignosed lyme disease-multisystemic- few doctors who understand the complexity of the disease	CHRNIC +1	
currently 9 months pregnant	No change	Not chronic
cushings	CHRNIC +1	
diagnosed w/diabetes ~4yrs ago--it's in remission but I'm still on medication	CHRNIC_DIABETES=1 CHRNIC +1	
eating disorders	No change	Recorded under “psych diagnosis” question
essential tremor which may be psychogenic	CHRNIC +1	
exercised induced asthma,	CHRNIC_ASTHMA=1 CHRNIC +1	
Fibromyalgia, blood clotting disorder, Rheumatoid arthritis, recent long hospitalization for pulmonary embolism and DVT.	CHRNIC +2	Arthritis category already selected
hypo throid	CHRNIC +1	
hypothyroidism	CHRNIC +1	
I DON'T KNOW IF I HAVE ANY OF THESE CONDITIONS SINCE I DON'T HAVE INSURANCE. HAVE NOT SEEN A DOCTOR FOR YEARS.	No change CHRNIC_NONE=1	
I was in an accident and broke my pelvis in three places; this has been both painful and psychologically damaging, and has affected my moods and activities and feelings dramatically this year.	CHRNIC_PAIN=1 CHRNIC +1	
Injured my right eye when i was in the military i am blind in that eye now.	CHRNIC +1	
kidney disease and glaucoma	CHRNIC +2	
low blood pressure	CHRNIC +1	
Low blood pressure - Fibromyalgia	CHRNIC +2	
Low blood pressure.	CHRNIC +1	
low thyroid	CHRNIC +1	
Lupus [SLE]	CHRNIC +1	
migraines	CHRNIC_HEADACHE=1 CHRNIC +1	
Multiple Schlerosis	CHRNIC +1	
My arthritis is rheumatoid arthritis...very different from osteo... arthritis.	CHRNIC_ARTHRITIS=1 CHRNIC +1	
Myasthenia gravis- in remission	CHRNIC +1	
Need dental work badly	No change	Not chronic
Neurally Mediated (Vasovagal) syncope	CHRNIC +1	
Neurofibromatosis	CHRNIC +1	
none	No change CHRNIC_NONE=1	

NONE	No change CHRNIC_NONE=1
recently in the last 3 months significant increase in stomach pain/reflux. Stomach irritation found on upper GI tests	CHRNIC_PAIN=1 CHRNIC +1
Restless Leg Syndrome	CHRNIC +1
Sinus problems	CHRNIC +1
sinus'/allergies (seasonal)	CHRNIC_ALLERGY=1 CHRNIC+1
Some fibromyalgia type sx	No change
thyroid disease	CHRNIC +1
Tramatic Brain Injury TBI	CHRNIC +1
tremor and fibrmagia n fatigue	CHRNIC +3
Vertigo	CHRNIC +1
vitanmin deficicenty	No change

- Participant responses are verbatim
- Action taken on "other" participant responses:

CHRNIC+#	"other chronic condition given, increasing total number of chronic conditions by # indicated"
CHRNIC_NONE=1	"response indicated that participant did not have any chronic conditions and was recoded into 'No chronic conditions' response category"
CHRNIC_ALLERGY=1	"response recoded into Chronic Allergies response category"
CHRNIC_ARTHRITIS=1	"response recoded into Chronic Arthritis response category"
CHRNIC_ASTHMA=1	"response recoded into Chronic Asthma response category"
CHRNIC_DIABETES=1	"response recoded into Chronic Diabetes response category"
CHRNIC_HEADACHE=1	"response recoded into Chronic Headache response category"
CHRNIC_PAIN=1	"response recoded into Chronic Pain response category"
No change	"response provided information that does not necessitate a recode"

You said that within the last year that you experienced changes in mood and/or behavior lasting at least two weeks – what are these changes?

Participant response to "Other, please specify"*	**Action****	**MT Comment**
Always feel like I am off balance and dizzy	CHNGSX +1	
Anxious, restless, despair	CHNGSX +3	
Crying much more easily than usual	CHNGSX +1	
depression, anxiety, loss of libido	CHNGSX +3	
Extreme discontent, extreme desire to not conform, defiance of authority	CHNGSX +3	
Feel overwhelmed	CHNGSX +1	
Feelings of being unloved and loveable, overwhelmed as well as suicidal.	CHNGSX +3	
feelings of failure	CHNGSX +1	
feelings of lonliness (but a desire to	CHNGSX +1	

be social)		
felt depressed, hopeless; had crying spells	CHNGSX +3	
hopelessness, anxiety, a chronic physical knot in my stomach, crying easily, angering more easily	CHNGSX_ANNOY+1 CHNGSX+5	Recoded for "angering more easily" into "annoyed" category
Hyper self-critique and literal self-hatred.	CHNGSX+1	Could not justify as two sx
I had an exceptionally great year	No changes	
I just think life sucks, I want to cry all the time	CHNGSX +1	For crying
I moved away from friends/family a year ago. Had not made many new friends. Have become somewhat of a hermit	No changes	Environmental change – not symptom description
I typically have a more profound struggle with depression but started supplementing with 5htp haven't struggled with it since. I still get discouraged but not depressed.	CHNGSX+1	Coded for "still get discouraged"
increased anxiety. Increased raising thoughts. Decreased ability to concentrate.	CHNGSX+3	
Just exhaustion from being busy.	No changes	
Loss of mobility and the need for personal care and assistance with basic daily life caused me to feel very helpless for the first time in my life.	CHNGSX+1	"feeling very helpless"
mixed states last winter and in the Spring, depression last winter also	CHNGSX+1	"depression"
nervousness	CHNGSX+1	
no energy	CHNGSX_EL +1 CHNGSX +1	Recoded into "low energy category"
not wanting to hang out with others, not wanting to talk much, having nitemares	CHNGSX_TIMEL+1 CHNGSX +2	Recoded into "decreased time w. family/friends" category
physically cannot do the things I love to do- activities. Too much pain and headaches- stiff muscles- pace has slown down very much over past year	CHNGSX_MOVS+1 CHNGSX +1	Recoded into "moving slowly" category
Physically inactive, no desire to move my body	CHNGSX_MOVS+1 CHNGSX +1	Recoded into "moving slowly" category
sexual apathy	CHNGSX+1	
There are a lot of external factors such as stress, grad school, and working the graveyard shift.	No changes	
Yelling, little things at home make me angry, then I feel sad about yelling at everyone	CHNGSX_ANNOY+1 CHNGSX +2	Recoded into "annoyed by things that don't usually annoy me" category -

* Participant responses are verbatim

**Action taken on "other" participant responses:

CHNGSX+# "response indicates presence of mood and behavior changes not listed – total number of changes increased by number noted"

CHNGSX_ANNOY=1 "response recoded into 'annoyed by things that don't usually annoy me' category"

CHNGSX_EL=1 "response recoded into 'low energy' category"

CHNGSX_MOVS=1 "response recoded into 'moving slowly' category"

CHNGSX_TIMEL=1 "response recoded into 'decreased time with family/friends' category"

No change "response provided information that does not necessitate a recode"

What do you believe is the primary cause of your changes in mood and/or behavior?

Participant response to "Other, please specify"*	Action**	MT Comment
Work (lack of)	PICKCS_6	Ext. stressor
While I believe that brain chemistry is the end cause of affective disorder, I believe that genetics are a very important factor.	PICKCS_4	
Was robbed in September. The seasons seem to change to gloomy weather this time of year also.	PICKCS_6	Ext. stressor
the changes which are occuring in my life right now. I graduated from high school, i am now going to college, i broke up with a boyfriend who i really started to care about, i feel very lonely and i don't have much confidence. i haven't talked to anyone but i do think that i am depressed.	PICKCS_6	Ext. stressor
stress and poor health	PICKCS_6	Stress named 1st
recent move	PICKCS_6	Stressful life event
rCertain times of the year are hard because I think about my son more.	OTHER	
pregnancy	PICKCS_6	Stressful life event
pms	PICKCS_3	Chemical imbalance
On the previous question about what month did it start and stop, I wanted to said "n/a" but that was not an option (so I said "June", even though that is irrelevant and arbitrary). My temporary depression was not seasonal affective disorder.	No change	
no love life, eye injury, low self esteme	OTHER	Cannot determine single cause from response
Moving to a different state	PICKCS_6	Stressful life event
Loss of home, job, stress of living with family.	PICKCS_6	Stressful life event
Loneliness... lack of direction in my life.... being unemployed	PICKCS_6	Coded on unemployed
Lifestyle	PICKCS_6	Stress?
life events	PICKCS_6	Ext. stressor
life	PICKCS_6	Ext. stressor
impending menopause	OTHER	Don't know if anxiety related or menopause sx
idk	Don't know 888	
I went back to school at 55 and just got my degree. Now I have no goals. I sort of like not working but	PICKCS_6	Ext. stressor

we need the money. Badly.		
I honestly could not say or even guess because I think it is very much a complicated combination.	Don't know 888	
I have family history of ADD/Allergies; I do believe that if in better health (excercise;build up immune system;supplements) my symptoms can be remedied	PICKCS_4	
I don't really know.	Don't know 888	
I don't know.	Don't know 888	
I dont know	Don't know 888	
I deep feeling the I'm a failure	OTHER	Don't know if this is stress or dep.
i cant just pick one: its more of a combination of stress, changes in season, sexual issues	PICKCS_6	Stress/sexual issues
Horomones	PICKCS_3	
Hormones	PICKCS_3	
history of abuse	OTHER	
had a baby.	PICKCS_6	Stressful life event
God	OTHER	
general outlook on life	OTHER	Don't know if this is stress or dep.
friends	PICKCS_6	Ext. stressor
Following the 7 steps of Radiant Recovery every single day of my life.	OTHER	
family socioeconomic situations	PICKCS_6	Ext. stressor
family history (but not genes so much)	PICKCS_4	
End of relationship	PICKCS_6	Stressful life event
diagnosed with epilepsy	PICKCS_5	Health-related
Combination of change of life and stress	PICKCS_6	Ext. stressor
Chronic pain issues	PICKCS_5	
Allergies	PICKCS_5	
All of the above	OTHER	
a major infection wrecking havok on my body	PICKCS_5	

- Participant responses are verbatim
- Action taken on "other" participant responses:

PICKCS_3	"response recoded into Chemical Imbalance category"
PICKCS_4	"response recoded into Genes/Family History category"
PICKCS_5	"response recoded into Poor Health category"
PICKCS_6	"response recoded into Stress category"
Other	"response provided unique cause recoded as Other"
Don't know 888	"response recoded into a new I Don't Know category"
No change	"response not related to question – not coded"

When you experience these changes in mood and/or behavior do you do any of the following?

Participant response to "other, please specify"*	Coder 1 MLT **	Coder 2 AMT **	Comment
Write poetry	5	5	

Watch TV to distract myself	2	2 6	Agreed coder 2
watch the sun come up in the morning	TX1_SUNAC	TX1_SUNAC	Activity increases access to natural light
Watch more TV	6	6	
wait for it to pass	10	10	
Visit my sister	TX2_FAM	TX2_FAM	
use light therapy	TX2_SUNLMP	TX2_SUNLMP	
try to keep it dark and shady, active at night	3 11	3	
try to keep focused on activities that I like and get out to interact with other people	2 TX2_FRND	2 TX2_FRND	
think of helping others less fortunate than myself	10	2	Agreed coder 1 b/c not actually doing it
These things are very effecient for my depression: 5htp, magnesium, sunlight These things are very effecient for my ADD: eliminating milk and sugar	TX1_VITMN/H TX1_DIET TX1_SUNAC	TX1_VITMN/H TX1_DIET TX1_SUNAC	
tell family & friends so they can help "push" me to do things & be social when I don't feel like it.	TX2_FAM TX2_FRND	TX2_FAM TX2_FRND	
talk to friends	TX2_FRND	TX2_FRND	
take time for myself, take a walk with the dogs, or go horsebackriding in solidarity	7 6	7 6	
Take hot showers or baths	6	6	
surround myself with positive feeling friends talk to my husband and sisters	TX2_FRND TX2_PRTNR TX2_FAM	TX2_FRND TX2_PRTNR TX2_FAM	
Stay out of sun/stay cool/drink lots of waterand liquids/close blinds or curtains/do most of my work at night	3 11 TX1_INSDE TX1_DIET	3 TX1_INSDE TX1_DIET	
Stay away from most of my friends so I don't freak them out.	8	8	
St. John's Wort	TX1_VITMN/H	TX1_VITMN/H	
sports	TX1_EX	TX1_EX	
Spend time with Friends and Family	TX2_FRND TX2_FAM	TX2_FRND TX2_FAM	
Spend time with family and friends	TX2_FRND TX2_FAM	TX2_FRND TX2_FAM	
Spend time alone reflecting and doing yoga and writing in my journal.	TX1_EX 9	TX1_EX 5	Coder 1 –journal more specific -added 6
spend more time with family	TX2_FAM	TX2_FAM	
Spend more time on my bipolar	1	5	Used all codes

Yahoo Group. I also tend to work when I'm feeling depressed-ish because productivity makes me happier. When manic, I avoid all stimulants like cafeen.	TX1_DIET	TX1_DIET	
self medicate with mind altering substances	TX1_NOTRX	TX1_NOTRX	
ride them out- i know they'll change	10	10	
ride my Harley	6	6	
recreational drugs	TX1_NOTRX	TX1_NOTRX	
Read, look for things to occupy my mind, write.	2	6 2 5	Coder 2 - Ind. activities
nothing different	10	TX1_NONE	Coder 2- Better code
Mostly, deal with them the best way(s) I know how.			Response doesn't provide info
Meditate (body-sensation-based Vipassana) more frequently	TX1_EX	5	Coder 2 – meditation not appropriate for ex. category
Listen to music and read more	6	6	
Lift weights at home, pitch and hit baseballs at home to hone my mental focusing faculties and grow my brain, juggle, use the EyeQ computer based speed reading program to hone focus and develop my brain otherwise, socialize on the internet along the lines of philosophy and psychology, journalize my notebooks and word processor with extensive notes on my philosophies in general, psychology, and inventions. If it were not for my uneasyness to the world I would not do these things instead of socialize. I also have a strict viewership to informatinoal TV programing, and govt. talk radio shows with govt. type TV programing such as CSPAN, CNN etc. This helps with my realisitic view of others and myself. The key here is knowing a healthy place in my world instead of believing I'm a scared and lonely scumbag which is too painful, and I cannot yet shake.	TX1_EX 2 1 9 6	TX1_EX 2 1 9 5	Took 5 "hone & dev. Brain"
Journal more. Talk to friends	9 TX2_FRND	9 TX2_FRND	
I've found that Yoga and physical activity helps me overcome these times.	TX1_EX	TX1_EX	

Isolate myself	8	8	
I usually get on the computer and look for learning tools, something to feed my mind and soul.	2 5	2 5	
i use natural supplements, not synthetic- 1 product to attain all vitimans/minerals I need, just to insure I am not lacking anything important- bloodwork confrims my levels are great- heat/humidity aggitates me, also damp cold weather- cold in general is good, although AC is too cold unless regulated by me.My body temp varies from 95 after activity degress to 101 on daily basis- a normal temp when I feel fine is 97.5. I eat very healthy, always have- am not vegetarian yet am selective in meats. fish and poltury i chose- organic- antibiotic free- non farm raised fish.	TX1_DIET TX1_VITMN/H 12	TX1_DIET TX1_VITMN/H	
I try to do anything safe that contributes to my self-care, such as talk with friends, do activities with friends, and do activities such as crafts.	TX2_FRND 5	TX2_FRND 5	
I try to bump myself out of these downward type feelings and emotions by usuing hobbies as a fall back to at least do something.	5 2	5 2	
I tend to shop too much	6	6	
I tell myself I have to get moving, but it's awfully difficult to break the spell of inertia.	10	10	
i have tried taking meds to help with sleep. sunlamp didnt work(just pissed me off)	TX1_RX TX1_SUNLMP	TX1_RX TX1_SUNLMP	
I have been embracing them. Why stop it?	10	10	
I get my nails done every two weeks in order to avoid feeling self-conscious.	6	6	
I end up playing multiplayer online games to relieve my stress on my brain. When I play games, I usually forget about my surroundings so I expierence a mood pretty much according to what's going on in the game.	2	5	Both codes apply
I do something creative like design a webpage or create digital art, write non fiction article, or study a	5	5	

completely new and different field/topic.			
Get rest. Talk to family and friends. Have fun. By the way, I don't know how to answer the questions about estimating the months in which mood changes start/end. I would select N/A but that's not a choice.	Tx2_FAM TX2_FRND 2	Tx2_FAM TX2_FRND 2	
Engage in nore sexual activity	4	4	
Drink alcohol	TX1_NOTRX	TX1_NOTRX	
cymbalta	TX1_ANTID	TX1_ANTID	
Be alone	8	8	

Participant response to "Other, please specify"*	**Coder 1 MLT ****	**Coder 2 AMT ****	**Comment**
write my feelings down in my note book	9	9	
write in online journal.	9	9	
Try to think and act in a positive manner. Set simpler daily goals.	10	10	
this year i have tried talking to my partner..didnt work and in march of this year started seeing a counselor and have changed my thinking about going to therapy.	TX2_PRTNR TX1_THPY/ST	TX2_PRTNR TX1_THPY/ST	
talk to my boyfriend	TX2_PRTNR	TX2_PRTNR	
spend more time with my dogs	7	7	
put dark blankets up on the windows in my bedroom.	3	3	
One years I saw my doctor, a naturopath	TX1_HOMEO	TX1_HOMEO	
meditate and yoga sometimes	TX1_EX	TX1_EX	Added 5 – ind. Creative activity
know that I've been through it a lot of times and that it will pass when the heat diminishes	10	10	
Journaling	9	9	
It usually happens when I am off of my medication			Response doesn't provide info
I talk to people about it but not for help. I talk because I am happy.	TX2_FRND	TX2_FRND	
I know I need counseling to figure out why I'm like this, but I've yet to make the call.	TX1_NONE	TX1_NONE	Has not yet acted
i just deal with it and pretend it's not there. I still have to earn a living and keep the house running.	10	10	
I basically keep everything in because I don't have any friends	10	TX1_NONE	Coder 1 - conscious of

and my kids father is in prison and he only get to call once or twice a week for 15 minutes and there's no way I can tell him everything in that amount of time.		effort to "keep everything in"
I am fortunite to have a very supportive husband who understands. I was recently discharged from the military because these symptoms became unbearable at times and there was no adequate support system to help me overcome these dark times so they were prolongued and I found myself doing things that were unhealthy, but more socially accepted, like drinking heavily.	TX2_PRTNR TX1_NOTRX	
go to 12 step meeting	TX2_NONMED	
Create a distraction.	2	
Blog on myspace or hi5	9	
am careful not to set off central nervous system - does not take much, but I walk over a mile, at a reasonable pace every day regardless of weather, releasing any frustrations I may have encountered and smelling the flowers- my dog helps me tremendously in my off days	TX1_EX 7 12	
Al-Anon meetings	TX2_NONMED	
Activity is very slow during depressed periods, which have relatively long duration. During hypomanic/manic phase activity is very high and includes impulsive spending and poor judgement, elevated libido, and elevated sense of self worth to include delusions of grandeur. Aggresiveness often accompanies manic state.	4 6	

- Participant responses are verbatim
- Action taken on "other" participant responses – highlighted codes selected

Categories included:

1	Chat online
2	Engage/distract oneself in an activity
3	Increase darkness
4	Increase sexual activity
5	Independent creative activity

6	Independent passive activity
7	Interact with pets/animals
8	Isolate
9	Journal
10	Wait it out”/ “be positive”
11	Active at night
12	Temperature regulation/body monitoring

Table AI1 *Frequency of qualitative responses to "Please list in rank-order the three most important factors that you believe caused your changes in mood and/or behavior" by coding category and rank-order* (N=324)

Code	Code Name	Explanation	1st n (%n)	2nd n (%n)	3rd n (%n)
1	Changes in Seasons/Weather	Reference to changes in seasonal or weather factors	16 (4.9)	23 (7.1)	20 (6.2)
2	Chemical Imbalance	Reference to chemical imbalance, problems with biological mechanisms	18 (5.6)	4 (1.2)	10 (3.1)
3	Genes/Family	Reference to genetic predisposition or family history	12 (3.7)	4 (1.2)	4 (1.2)
4	Physical Health	Reference to poor, health, illness, chronic disease, injury, pain	23 (7.1)	21 (6.5)	29 (9.0)
5	Relational Stress	Reference to stress arising from current relationships with family members, partner, and/or friends	50 (15.4)	57 (17.6)	47 (14.5)
6	Life Event Stress	Reference to stress arising from life events such as death of loved one, pregnancy, etc…	46 (14.2)	35 (10.8)	20 (6.2)
7	Stress	Reference to "stress" or nonspecific situations such as "work" or "finances"	84 (25.9)	97 (29.9)	83 (25.6)
8	Past Stress	Reference to stress arising from memories, trauma, or events that occurred in the past	18 (5.6)	5 (1.5)	5 (1.15)
9	Self	Reference to self-assessment (personality or behavior)	28 (8.6)	39 (12.0)	62 (19.1)
10	Psychiatric	Reference to psychiatric diagnosis and/or treatment	16 (4.9)	14 (4.3)	12 (3.7)
11	Negative World View	Reference to negative, global perceptions of experiences/life	4 (1.2)	5 (1.5)	3 (0.9)
888	"I don't know"	Reference to not knowing or "?"	3 (0.9)	1 (0.03)	3 (0.9)
999	No answer	---	6 (1.19)	19 (5.9)	26 (8.0)

Appendix J. Attribution Variables

Three different methods for attribution were used in the analyses as to determine the best way to gather participants' perceptions regarding the cause of changes in mood and behavior (Table 1).

1. Qualitative responses to the question "Please list in rank-order the three most important factors that you believe caused your changes in mood and/or behavior" were coded using thematic analysis (See Appendix I). Derived themes such as Attribution to the Environment were then transformed into binary variables. In the case of qualitative attribution to the environment, the value of 1 referred to qualitative attribution to the physical environment and the value of 0 to qualitative attribution to other causes. Because environmental attributions were made infrequently, rank order was ignored and all instances of qualitative environmental attributions were collapsed into a single qualitative variable.
2. Attribution data were also gathered through categorical responses to the quantitative question "What is the primary cause of your changes in mood and/or behavior?" Categorical responses were transformed into binary variables for each of the response options. To analyze this hypothesis, the quantitative environmental attribution response option was transformed into a binary variable such that a value of 1 indicates participants' attribution of their changes in mood and behavior to the physical environment and a value of 0 indicates attribution to other causes.
3. A summary binary variable was constructed to represent any attribution to the environment regardless of qualitative or quantitative source. The collapsed variable represents making an environmental attribution versus not making an environmental attribution in one binary variable such that one equals "yes" to either attribution question and that zero equals "no" to both.

Table 1 *Frequency of Environmental Attribution* (*N=324)*

	Environmental Attribution	
	n	*%n*
Qualitative report	51	15.7
Quantitative report	24	7.4
Any report	64	19.8

I computed correlations between the response types in an effort to understand whether the way participants reported environmental attributions indicates an underlying conceptually different interpretations of the questions (Table AH1.1). The correlation between qualitative and quantitative responses was statistically significant with a moderate correlation of 0.23.

Table AH1.1 *Correlations Between Environmental Attribution Variables* (*N* = 324)

	Quantitative	*Qualitative*	*Any*
Quantitative	---	0.23**	0.57**
Qualitative	---	---	0.87**
Any	---	---	---

** p <.01

I ran Chi-square analyses to determine if there were group differences between those who did/not attribution recent changes in mood and/or behavior to the environment (Table AH1.2). No significant difference within gender, age, race, Latin heritage, education, psychiatric diagnosis, health insurance, region of residence, or urbanicity categories in relationship to environmental attribution.

Table AH1.2 *Differences in Socio-Demographic Characteristics by Attribution Treatment* (*N*=324)

	Quantitative (n=24)	*Qualitative (n=51)*	*Any (n=64)*
Gender	1.81, 1, 0.180 [a]	0.39, 1, 0.696	0.12, 1, 0.723
Age	5.38, 4, 0.251	4.67, 4, 0.323	3.75, 4, 0.442
Race	0.14, 1, 0.809	0.07, 1, 0.862	1.18, 1, 0.339
Latin Heritage	7.48, 1, 0.165	3.17, 1, 0.090†	0.00, 1, 1.000
Education	2.00, 5, 0.850	11.66, 5, 0.040*	8.53, 4, 0.139
Previous Psychiatric Diagnosis	0.02, 1, 1.000	0.67, 1, 0.446	0.47, 1, 0.575
Health Insurance Status	4.89, 4, 0.299	6.78, 4, 0.149	7.01, 4, 0.136
Region of Residence	6.38, 9, 0.701	6.71, 9, 0.667	4.98, 9, 0.836
Self-Reported Level of Urbanicity	2.76, 6, 0.838	10.64, 6, 0.100	5.42, 6, 0.492

[a] χ^2, df, p

† p<.10; *p<.05

Appendix K. Addition Analyses Related to Hypothesis Testing

Hypothesis I

Additional analyses to select H1 covariates
Covariates were selected on the basis of two reduction techniques: backwards entry logistic regression and manual removal. While the backwards entry method has a reasonably good likelihood of coming up with the best predictor model, manually extracting socio-demographic variables from the predictor model for environmental attribution allowed me to see how each variable's presence or absence impacted the model overall. By reducing predictor models two ways, I was able to make an informed decision as to which covariates would remain in the final analyses.

Selecting covariates: Backwards entry
Tables AH1.4a-c display the significant covariates remaining in each model.

Table AH1.4a *Seasonality Score Predicts Likelihood of Quantitative Environmental Attribution Controlling for Socio-demographic Characteristics (step 24)*

	ß	S.E.	Wald	df	p	OR	95% CI
Seasonality Score	0.10	0.04	6.57	1	0.010	1.11	1.03-1.20
Latin Heritage	1.03	0.56	3.36	1	0.067	2.81	0.93-8.48
Age: 50-59	1.50	0.54	6.57	1	0.010	4.48	1.42-14.12
U.S. Region of Residence: Mountain	1.40	0.72	3.86	1	0.050	4.07	1.00-16.52
constant	-4.20	0.63	43.87	1	0.000	0.02	

Selection of environment-related attributions from a prescribed list of possible causes (quantitative) was significantly predicted by seasonality scores and confounded by age, Latin heritage, and U.S. place of residence (Table AH1.4a). "Mountain" region residents, (living in Arizona, Colorado, Idaho, Montana, New Mexico, Nevada, Utah and Wyoming), were about four times more likely than "Pacific" region residents to make environmental attributions ($p=0.05$) as were those aged 50-59 as compared to participants aged 18-29 ($p=0.01$). Participants with Latin heritage were more 2.8 times more likely than non-Latinos to see their changes in mood and/or behavior as environmentally-related ($p<0.10$). When variables revealed in the "best fit" model were entered stepwise into the regression model, age 50-59, Mountain region of residence, and Latin heritage remained significant predictors of quantitative-style reporting of environmental attribution.

Table AH1.4b *Seasonality Score Predicts Likelihood of Qualitative Environmental Attribution Controlling for Socio-demographic Characteristics (step 24)*

	ß	S.E.	Wald	df	p	OR	95% CI
Seasonality Score	0.40	0.14	7.75	1	0.005	1.49	1.13-1.98
Quadratic Seasonality Score	-0.01	0.01	4.58	1	0.032	0.99	0.98-1.00
Latin Heritage	-2.28	1.04	4.79	1	0.029	0.10	0.01-0.79
Education	-1.67	0.77	4.66	1	0.031	0.19	0.04-0.86
Urbanicity: Small City	1.16	0.43	7.32	1	0.007	3.18	1.38-7.35
constant	-4.35	0.90	23.37	1	0.000	0.01	

Self-generated environmental attributions (qualitative) were also significantly predicted by seasonality scores. This relationship was significantly confounded by educational achievement and urbanicity and, to a lesser degree, Latin heritage (Table AH1.4b). People claiming to live in a "small city" were nearly three times more likely to make environmental attributions than people describing their place of residence as a "big city" ($p<0.10$). Higher educational achievement predicted the likelihood of an environmental attribution such that a one unit increase in education corresponded to a 1.6 increase in odds of environmental attribution ($p<0.05$). When variables revealed in the "best fit" model were entered stepwise into the regression model, they remained significant predictors of qualitative-style reporting of environmental attribution.

Table AH1.4c *Seasonality Score Predicts Likelihood of Any Environmental Attribution Controlling for Socio-demographic Characteristics (step 25)*

	ß	S.E.	Wald	df	p	OR	95% CI
Seasonality Score	0.33	0.12	7.97	1	0.005	1.39	1.11-1.75
Quadratic Seasonality Score	-0.01	0.01	4.34	1	0.037	0.99	0.98-1.00
Education	1.00	0.57	3.11	1	0.078	0.37	0.12-1.12
U.S. Region of Residence: Mountain	0.63	0.40	2.52	1	0.112	1.88	0.86-4.08
constant	-3.65	0.71	26.28	1	0.000	0.03	

Education also significantly confounded the relationship ($p<0.10$) between seasonality and the odds of making any kind of environmental attribution (Table AH1.4c). When variables revealed in the "best fit" model were entered stepwise into the regression model, education remained a significant predictor of any kind of environmental attribution.

Selecting covariates: Manual removal

Tables AH1.5a, b, and c illustrate that seasonality remains a significant predictor of environmental attribution, regardless of reporting style, when covariates were added to the models. In the end, reduced models contained the following (Table 12):

- Quantitative environmental attribution: Age 50-59 years (Latin heritage and Mountain region of residence weakly significant at $p<0.10$)
- Qualitative environmental attribution: Living in a small city and Education (Latin heritage weakly significant at $p<0.10$)
- Any environmental attribution: Education

Table AH1.5a *Seasonality Predicts Quantitative Environmental Attribution, Covariate Model*

	ß	S.E.	Wald	df	p	OR	95% CI
Seasonality score	0.11	0.04	7.02	1	0.008	1.11	1.03-1.20
Latin heritage	0.98	0.56	3.05	1	0.081	2.66	0.89-8.01
U.S. region of residence: Mountain	1.42	0.72	3.94	1	0.047	4.14	1.02-16.82
Age 50-59	1.50	0.58	6.57	1	0.010	4.47	1.42-14.04
Constant	-4.26	0.63	45.20	1	0.000	0.01	

Table AH1.5b *Seasonality Predicts Qualitative Environmental Attribution, Covariate Model*

	ß	S.E.	Wald	df	p	OR	95% CI
Seasonality Score	0.44	0.15	9.21	1	0.002	1.55	1.17-2.06
Quadratic Seasonality Score	-0.01	0.01	5.12	1	0.024	0.99	0.98-1.00
Latin Heritage	-1.50	0.78	3.66	1	0.056	0.22	0.05-1.04
Education	0.48	0.13	13.41	1	0.000	1.62	1.25-2.10
Urbanicity: Small City	1.08	0.42	6.63	1	0.010	2.95	1.29-6.72
constant	-6.67	1.12	35.54	1	0.000	0.00	

Table AH1.5c *Seasonality Predicts Any Environmental Attribution, Covariate Model*

	ß	S.E.	Wald	df	p	OR	95% CI
Seasonality Score	0.37	0.12	9.67	1	0.002	1.45	1.15-1.82
Quadratic Seasonality Score	-0.01	0.01	5.13	1	0.025	0.99	0.98-1.00
Education	0.39	0.12	10.76	1	0.001	1.47	1.17-1.85
constant	-5.54	0.91	36.73	1	0.000	0.00	

Manual removal produced outcomes similar to those generated by the backwards regression analyses (Table 12). Because significant socio-demographic predictors of environmental attribution overlapped when style of attribution report was varied, I looked at bivariate analyses between the variables and environmental attribution. Analyses revealed that Latin heritage produced very small cell sizes and I removed it from future analyses. All models investigating the association between seasonality and attribution

including the following: age, education, living in a small city and Mountain region of residence.

Hypothesis II

Table AH2.1 *Correlations Among Light Exposure Behavior Items and Seasonality (GSS)* (N=324)

	L1	L2	L3	L4	L5	GSS
L1. How important is it for you to be exposed to natural light each day?	---	0.40***	0.57***	-0.13*	0.04	-0.27***
L2. On an average day, how much time do you spend exposed to natural light?		---	0.58***	0.16**	0.07	-0.05
L3. If you could choose, how much of your day would you prefer to be exposed to natural light?			---	-0.08	-0.05	-0.08
L4. How much control do you have over your natural light exposure?				---	0.07	0.07
L5. How sensitive are you to bright light?					---	-0.08
Seasonality						---
Mean [a]	2.52	3.33	2.15	2.77	3.30	10.94
SD	1.31	1.20	1.23	1.07	1.30	5.52

*p<.05 ; ** p<.01; ***p<.001 (2-tailed)

[a] Responses to L1-L5 ranged from 1-5; to GSS 0-24

Hypothesis III

Table AH3.1 *Correlations Between IPQ Items and Environmental Attribution* (*N*=324)

	IPQ 1	IPQ 2	IPQ 3	IPQ 4	IPQ 5	IPQ 6	IPQ 7	IPQ 8	Quantitative	Qualitative	Any
IPQ 1	---	0.46***	-0.25***	0.10†	0.61***	0.58***	0.03	0.59***	-0.10	-0.06	-0.11*
IPQ 2		---	-0.32***	-0.09	0.46***	0.37***	-0.07	0.35***	-0.12*	0.07	0.00
IPQ 3			---	0.22***	-0.28***	-0.26***	0.28***	-0.18**	0.01	-0.06	-0.04
IPQ 4				---	0.14*	0.21***	0.26***	0.11*	0.02	0.09	0.06
IPQ 5					---	0.57***	0.04	0.54***	-0.03	0.04	-0.01
IPQ 6						---	-0.05	0.54***	-0.08	-0.03	-0.07
IPQ 7							---	0.05	0.10	0.06	0.07
IPQ 8								---	-0.09	-0.08	-0.11
Quantitative									---	0.23***	0.57***
Qualitative										---	0.87***
Any											---
Mean	7.18	6.96	4.67	5.38	6.28	6.74	6.22	7.50	---	---	---
SD	2.21	2.72	2.36	2.53	2.15	2.60	2.60	2.19	---	---	---

†p<.10; *p<.05 ; ** p<.01; ***p<.001 (2-tailed)

The outcome of the three-factor solution led to an ad hoc hypothesis: Are those more likely to make an environmental attribution also more likely to say that their mood and mood-related behavior changes impact their lives? To investigate this question, "impact" Brief IPQ summary scores were employed in logistic regressions to predict attribution. As seen in Table AH3.2, higher Brief IPQ "impact" scores did not predict likelihood of making environmental attributions, except when the attribution was made quantitatively. Bivariate analyses revealed similar outcomes with quantitative attribution and "impact" scores slightly negatively correlated, ($r = -0.11$; $p < .05$).

Table AH3.2 *IPQ Items Related to "Impact of Changes" on Well-Being Associated with Environmental Attribution* (*N*=324)

	ß	S.E.	Wald	df	p	OR	95% CI
			Quantitative				
Impact factor	-0.04	0.02	3.76	1	0.052	0.96	0.92-1.00
Constant	-1.12	0.72	2.39		0.122	0.33	
			Qualitative				
Impact factor	-0.00	0.02	0.05	1	0.831	1.00	0.95-1.03
Constant	-1.56	0.59	6.95	1	0.008	0.21	
			Any				
Impact factor	-0.02	0.02	1.68	1	0.195	0.98	0.95-1.01
constant	-0.74	0.52	2.01	1	0.156	0.48	

Hypothesis IV

Table AH4.1 *Correlations between Potential Covariates for Hypothesis IV*

	Clinical Labeling	Previous Psychiatric Diagnosis	In Treatment for Psychological Disorder	Clinical Treatment-Seeking
Clinical Labeling	---	0.27***	0.28***	0.24***
Previous Psychiatric Diagnosis		---	0.68***	0.51***
In Treatment for Psychological Disorder			---	0.68***
Clinical Treatment-Seeking				---

***p<.001 (2-tailed)

Tables AH4.2a, b, c *Environmental Attribution and Severity of Depressive Symptoms Do Not Interact to Predict Clinical Labeling*

	ß	S.E.	Wald	df	p	OR	95% CI
Quantitative Attribution	2.01	1.25	2.57	1	.109	7.46	0.64-86.94
Severity of Depressive Symptoms (CES-D)	0.01	0.02	0.09	1	.765	1.01	0.97-1.04
CESD*Quantitative Attribution	-0.08	0.05	2.12	1	.146	0.93	0.84-1.03
Distress (K6)	0.00	0.04	0.01	1	.933	1.00	0.93-1.09
Prev. Psych. Diag.	1.63	0.42	15.36	1	.000	5.10	2.26-11.51
Age	0.35	0.13	7.80	1	.005	1.42	1.11-1.82
constant	-3.74	0.62	36.11	1	.000	0.02	

	ß	S.E.	Wald	df	p	OR	95% CI
Qualitative Attribution	1.73	0.94	3.36	1	.067	5.61	0.89-35.51
Severity of Depressive Symptoms (CES-D)	0.01	0.02	0.12	1	.728	1.01	0.97-1.05
CESD*Qualitative Attribution	-0.03	0.03	0.60	1	.440	.98	0.92-1.04
Distress (K6)	0.01	0.04	0.08	1	.776	1.01	0.93-1.10
Prev. Psych. Diag.	1.63	0.42	15.08	1	.000	5.12	2.25-11.67
Age	0.33	0.13	6.78	1	.009	1.40	1.09-1.79
constant	-4.05	0.67	36.26	1	.000	0.02	

	ß	S.E.	Wald	df	p	OR	95% CI
Any Environmental Attribution	2.07	0.90	5.22	1	.022	7.89	1.34-46.39
Severity of Depressive Symptoms (CES-D)	0.02	0.01	0.56	1	.456	1.02	0.98-1.05
CESD*Environmental Attribution	-0.05	0.03	2.35	1	.125	0.95	0.90-1.01
Distress (K6)	0.00	0.04	0.00	1	.962	1.00	0.92-1.09
Previous Psychiatric Diagnosis	1.65	0.42	15.31	1	.000	5.20	2.28-11.88
Age	0.34	0.13	7.07	1	.008	1.41	1.09-1.81
constant	-4.17	0.69	36.98	1	.000	0.02	

Table AH4.3a, b, c *Psychological Distress and Environmental Attribution Interact to Associate with Clinical Labeling*

	ß	S.E.	Wald	df	p	OR	95% CI
Quantitative Environmental Attribution	0.98	0.70	1.95	1	.163	2.65	0.67-10.44
Distress (K6) cut-point (binary)	0.25	0.42	0.36	1	.551	1.28	0.57-2.90
Distress* Quantitative Attribution	-1.94	1.31	2.20	1	.138	0.14	0.01-1.87
Severity of Depressive Symptoms (CES-D)	-0.00	0.02	0.04	1	.834	1.00	0.97-1.03
Prev. Psych. Diag.	1.69	0.42	16.42	1	.000	5.42	2.39-12.27
Age	0.33	0.12	7.00	1	.008	1.39	1.09-1.77
Constant	-3.55	0.61	34.41	1	.000	0.03	

	ß	S.E.	Wald	df	p	OR	95% CI
Qualitative Environmental Attribution	1.58	0.89	3.14	1	.077	4.83	0.85-27.61
Distress (K6) cut-point (binary)	0.22	0.42	0.28	1	.594	1.25	0.55-2.93
Distress* Qualitative Atribution	-0.05	0.08	0.41	1	.520	0.95	0.82-1.10
Severity of depressive symptoms (CES-D)	0.00	0.02	0.03	1	.864	1.00	0.97-1.04
Prev. Psych. Diag.	1.65	0.42	15.40	1	.000	5.18	2.28-11.79
Age	0.33	0.13	6.61	1	.010	1.39	1.08-1.78
constant	-3.89	0.64	36.81	1	.000	0.02	

	ß	S.E.	Wald	df	p	OR	95% CI
Any Environmental Attribution	2.04	0.79	6.69	1	.010	7.69	1.64-36.10
Distress (K6) cut-point	0.33	0.42	0.61	1	.436	1.39	0.61-3.20
Distress*Any Environmental Attribution	-0.11	0.06	3.10	1	.078	0.89	0.79-1.01
Severity of depressive symptoms (CES-D)	0.00	0.02	0.05	1	.819	1.00	0.97-1.04
Previous Psychiatric Diagnosis	1.69	0.42	15.98	1	.000	5.43	2.37-12.44
Age	0.33	0.13	6.57	1	.010	1.39	1.08-1.78
constant	-3.98	0.65	38.02	1	.000	0.02	

Hypothesis V

After controlling for age, race, and gender; attribution of recent mood and behavior change to stress was negatively associated with clinical treatment-seeking (OR=0.23, p<0.001); attributions to genetic predisposition (OR=2.27, p=<0.05) or chemical imbalance (OR=4.40, p<0.001) were associated with an increased likelihood of seeking clinical treatment.

Table AH5.1 Attribution associated with clinical treatment-seeking when controlling for age, race, and gender

	ß	S.E.	Wald	df	p	OR	95% CI
Chemical imbalance	1.48	0.31	23.44	1	.000	4.40	2.42-8.02
constant	-1.15	0.28	17.54	1	.000	0.32	
Environment	0.08	0.44	0.03	1	.861	1.08	0.45-2.57
constant	-0.92	0.26	12.25	1	.000	0.40	
Genetic predisposition	0.82	0.34	5.74	1	.017	2.27	1.16-4.43
constant	-1.05	0.27	15.10	1	.000	0.35	
Poor health	0.25	0.50	0.25	1	.615	1.28	0.48-3.40
constant	-0.91	0.26	12.35	1	.000	0.40	
Stress	-1.46	0.25	34.12	1	.000	0.23	0.14-0.38
constant	-0.19	0.30	0.42	1	.517	0.83	

Hypothesis VI

Exploration of association between K6 and treatment-seeking

In the analysis of hypothesis six, the K6 scale (measuring nonspecific psychological distress) was significantly associated with clinical treatment-seeking when entered into a bivariate regression model and multivariable models (with or without covariates), and treated as a continuous and clinically-relevant binary variable (cut-point 13+).

This was particularly interesting because I did not generate the same significant findings with the CES-D, measuring severity of depression symptoms. The scales, treated continuously, were correlated $r=0.73$, $p<0.01$. Treated as binary variables representing clinical cut-points, the scales were correlated $r=0.29$, $p<0.01$. In an effort to understand what drove the significant associations between the K6 and clinical treatment-seeking, I deconstructed the K6 through an exploratory factor analysis.

Question: During the last 30 days, about how often did you feel…

1 Nervous
2 Hopeless
3 Restless or fidgety
4 So depressed that nothing could cheer you up
5 That everything was an effort
6 Worthless

Response options: 5 All of the time, 4 most of the time, 3 some of the time, 2 a little of the time, 1 none of the time (scores were reverse coded for ease of interpretation

Scores ranged from 0 (indicating low general psychological distress) to 24 (indicating very high psychological distress generally associated with a serious mental illness). The mean score for this sample was 11.45. Out of 324 participants, 135 (41.7%) had K6 scores of 13 or higher indicating a possible serious mental illness.

A principal components factor analysis with promax rotation was conducted to determine the relationship between the K6 items. This rotation allows for the possibility that the factors are correlated. One component was revealed using the eigenvalues greater than one criterion. The one factor explained 59.09% of the total item variance (Table AH6.1).

Table AH6.1 *Factor Analysis Structure Matrix for K6, Eigenvalues >1.00* [a]

During the last 30 days, about how often did you feel…	Component 1
Nervous	.661
Hopeless	.837
Restless or fidgety	.656
So depressed that nothing could cheer you up	.849
That everything was an effort	.764
Worthless	.821

[a] Principal Component Analysis extraction method with Promax rotation

I expanded the model in an effort to separate anxiety and depression items. The two-factor solution explained 73.30% of the total item variance. A forced two-factor solution separated "nervous" and "restless" items from the depression-related items onto a new component (Table AH6.2).

Table AH6.2 *Factor Analysis Structure Matrix for K6, Forced Two-Factor Solution*

During the last 30 days, about how often did you feel…	Component 1	Component 2
Nervous	.476	.872
Hopeless	.852	.520
Restless or fidgety	.474	.863
So depressed that nothing could cheer you up	.875	.502
That everything was an effort	.811	.398
Worthless	.857	.462

The two dimensions of the K6 scale were significantly correlated with the CES-D (Table AH6.3). The depression-related K6 items (2, 4, 5, and 6) are correlated r=0.71 with the CES-D measuring depressive symptom severity while the "nervous" and "restless" items are only correlated r=0.54. These correlations suggest the anxiety items may be driving the significant associations found in the various logistic regression models throughout these analyses.

Table AH6.3 *Component Correlation Matrix with CES-D*

	K6: "Depression"	K6: "Anxiety"	CES-D
K6: "Depression" items	---	0.55***	0.71***
K6: "Anxiety" items		---	0.54***
CES-D			---

***p<.001

Clinical treatment-seeking was significantly, moderately correlated to each of the K6 items (Table AH6.4). All of the inter-item correlations were positive and statistically significant.

Table AH6.4 *K6 Item Inter-Correlations with Clinical Treatment Seeking*

	Clinical Treatment Seeking	K6 Q1	K6 Q2	K6 Q3	K6 Q4	K6 Q5	K6 Q6
Clinical Treatment Seeking	---	0.20***	0.26***	0.14*	0.28***	0.31***	0.26***
K6 Q1		---	0.48***	0.51***	0.43***	0.35***	0.39***
K6 Q2			---	0.40***	0.67***	0.57***	0.67***
K6 Q3				---	0.43***	0.39***	0.41***
K6 Q4					---	0.63***	0.68***
K6 Q5						---	0.56***
K6 Q6							---

*p<0.05; **p<.01; ***p<.001

Entered separately, all of the K6 items were significantly associated with clinical treatment-seeking. When entered into a multivariate logistic regression, only one of the K6 items was significantly associated with clinical treatment-seeking (Table AH6.5). The "perceived effort" item was positively associated, such that the more participants felt that "everything was an effort," the more likely they were to seek clinical treatment.

Table AH6.5 *K6 Item, Effort, Predicts Clinical Treatment Seeking*

	ß	S.E.	Wald	df	P	OR	95% CI
K6 Q1	0.17	0.15	1.29	1	.256	1.19	0.88-1.60
K6 Q2	0.09	0.16	0.36	1	.546	1.10	0.81-1.49
K6 Q3	-0.10	0.14	0.46	1	.499	0.91	0.69-1.20
K6 Q4	0.12	0.15	0.59	1	.444	1.12	0.83-1.52
K6 Q5	0.39	0.15	7.27	1	.007	1.48	1.11-1.97
K6 Q6	0.10	0.13	0.62	1	.431	1.11	0.86-1.44
Constant	-2.72	0.51	28.01	1	.000	0.07	

I isolated the "everything was an effort" item to see if it was significantly associated with clinical treatment-seeking when covariates were included in the model. Higher "effort" scores, perceiving things as consistently "more of an effort," were significantly associated with an increased likelihood to seek clinical treatment (Table AH6.6).

Table AH6.6 *K6 Item, Effort, Significantly Associated with Clinical Treatment Seeking, Covariate Model*

	ß	S.E.	Wald	df	P	OR	95% CI
K6 Effort	0.46	0.14	10.19	1	.001	1.58	1.19-2.09
Prior Psychiatric Diagnosis	1.67	0.35	23.30	1	.000	5.33	2.70-10.52
Prescription Drug Use	1.88	0.34	30.64	1	.000	6.58	3.38-12.83
Medicare/Medicaid	-0.49	0.45	1.20	1	.274	0.61	0.25-1.48
Uninsured	-0.72	0.40	3.23	1	.072	0.49	0.22-1.07
Constant	-3.35	0.53	39.90	1	.000	0.04	

I ran interaction models to see if there was a significant interaction between the effort item and environmental attribution (Table AH6.7a, b, c). Reporting environmental attribution quantitatively or regardless of repose style, the effort item was significantly associated with clinical treatment.

Table AH6.7a, b, c *Perceived Effort and Environmental Attribution Interact to Associate with Treatment Seeking*

	ß	S.E.	Wald	df	p	OR	95% CI
K6 Effort	0.37	0.15	6.24	1	.012	1.45	1.08-1.95
Quantitative attribution	-3.59	2.42	2.20	1	.138	0.03	0.00-3.18
Effort * quantitative attribution	1.47	0.82	3.23	1	.072	4.33	0.88-21.41
Prev. Psych. Diag.	1.63	0.35	21.57	1	.000	5.12	2.57-10.20
Prescription drug use	1.98	0.35	32.49	1	.000	7.21	3.65-14.22
Medicaid/Medicare	-0.54	0.45	1.40	1	.237	0.59	0.24-1.42
Uninsured	-0.73	0.41	3.19	1	.074	0.48	0.22-1.07
Constant	-3.14	0.55	32.72	1	.000	0.04	

	ß	S.E.	Wald	df	p	OR	95% CI
K6 Effort	0.37	0.15	6.13	1	.013	1.45	1.08-1.96
Qualitative attribution	-2.38	1.59	2.23	1	.136	0.09	0.00-2.10
Effort*Qualitative Attribution	0.76	0.51	2.24	1	.134	2.14	0.79-5.82
Prev. Psych. Diag.	1.67	0.35	23.07	1	.000	5.33	2.69-10.56
Prescription drug use	1.92	0.34	31.20	1	.000	6.79	3.47-13.30
Medicaid/Medicare	-0.51	0.45	1.25	1	.264	0.60	0.25-1.47
Uninsured	-0.74	0.41	3.32	1	.068	0.48	0.21-1.06
Constant	-3.08	0.56	30.66	1	.000	0.05	

	ß	S.E.	Wald	df	p	OR	95% CI
K6 Effort	0.33	0.16	4.43	1	.035	1.39	1.02-1.89
Any Env. Attribution	-2.36	1.40	2.85	1	.091	0.09	0.01-1.45
Effort * Env. Attribution	0.88	0.44	3.97	1	.046	2.42	1.01-5.76
Prev. Psych. Diag.	1.61	0.35	21.12	1	.000	4.99	2.52-9.91
Prescription drug use	1.98	0.35	32.78	1	.000	7.26	3.68-14.31
Medicaid/Medicare	-0.49	0.45	1.18	1	.278	0.61	0.25-1.48
Uninsured	-0.71	0.41	2.99	1	.084	0.49	0.22-1.10
Constant	-3.00	0.57	27.76	1	.000	0.05	

Exploration of CES-D cut-point and treatment-seeking

The binary CES-D variable representing a clinically-relevant cut-point to differentiate more problematic experiences was significantly associated with clinical treatment-seeking when entered as a single predictor variable into a logistic regression (OR=1.90, df=1, p=0.05, CI 1.00-3.61).

In order to determine if CES-D scores differentiated treatment-seeking behavior at any point, I created a new variable with a cut-point of 20, increasing the cut-point of 16 by the maximum score of one item. In a single predictor model, the new cut-point was significantly associated with clinical treatment-seeking (OR=2.08, df=1, p=0.01, CI 1.20-3.61) with a stronger odds ratio than when the cut-point was 16. In a model controlling for prior psychiatric diagnosis, prescription drug use, age, and health insurance status, cut-points at 16 and 20 did not differentiate treatment behavior at the $p<0.05$ level. It was not until the cut-point was increased to 30 that it differentiated clinical treatment-seeking ($p<.05$; Table AH6.7) indicating that it is not until depression symptoms are consistent and fairly problematic do people seek clinical assistance. CES-D cut-point 30 did not interact with attribution to predict odds of seeking clinical assistance.

Table AH6.7 *CES-D Cut-Point of 30 Predicts Clinical Treatment Seeking, Covariate Model*

	ß	S.E.	Wald	df	p	OR	95% CI
CES-D cut-point 30	0.67	0.31	4.54	1	.033	1.94	1.06-3.58
Prev. Psych. Diag.	1.77	0.34	26.36	1	.000	5.85	2.98-11.48
Prescription drug use	1.91	0.34	32.16	1	.000	6.77	3.49-13.10
Age	0.00	0.13	0.00	1	.984	1.00	0.78-1.29
Medicare/Medicaid	-0.59	0.47	1.61	1	.204	0.55	0.22-1.38
Uninsured	-0.89	0.42	4.54	1	.033	0.41	0.18-0.93
constant	-2.26	0.39	33.62	1	.000	0.10	

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