

Running Head: SEASONAL AFFECTIVE DISORDER

Integrating the Cognitive-Specificity and Dual Vulnerability Hypotheses:  
Implications for vegetative and cognitive/affective differences in  
seasonal, nonseasonal, and sub-syndromal seasonal depression.

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## ABSTRACT

The present study compared seasonal affective disorder (SAD), nonseasonal depression (Depressed), sub-syndromal SAD (S-SAD), and Control groups on dysfunctional eating cognitions and behaviours, physical activity levels, cognitive content specificity to winter stimuli, interpersonal context-specificity, response styles to depressed mood, and general negative attitudes. Research participants ( $N = 179$ ) recruited from the undergraduate population and the general community were classified into the four groups: SAD ( $n = 67$ ), S-SAD ( $n = 24$ ), NSD ( $n = 30$ ), and Control ( $n = 64$ ). SAD and Control groups scored greater than 22, and S-SAD and Control scored less than 14 on a depression measure, the Hamilton Depression Rating Scale – 28 items (Rosenthal, Genhart, Jacobsen, Skwerer, & Wehr, 1987). SAD was high on Seasonality as defined by a Global Seasonality Score (GSS) greater than 11 on the SPAQ (Rosenthal, Bradt, & Wehr, 1987) with at least moderate seasonal impairment. S-SAD had either a GSS between 9 and 11 with at least mild seasonal impairment, or GSS greater than 11 with mild or no seasonal impairment (Kasper, Wehr, Bartko, Gaist, & Rosenthal, 1989). SAD showed the most atypical (vegetative) depressive symptoms among the groups, while both SAD and Depressed endorsed more typical (cognitive/ affective) depressive symptoms than either S-SAD or Control. SAD could be distinguished from Depressed, S-SAD, and Control on its higher belief that engaging in restrained eating is associated with a sense of accomplishment and self-worth, and greater rumination in response to depressed mood. It also showed cognitive content specificity to winter stimuli as evidenced in its greater dread of winter, more stress associated with the vegetative depressive symptoms, more

impairment during the winter, and greater negative affect during the winter months. SAD was more preoccupied with thoughts about food, about being thinner, avoiding carbohydrate-rich and high-caloric foods, and engaged in binge behaviours when compared to S-SAD and Control groups. SAD engaged in risky and impulsive activities, and in rigid weight regulation more than Control. In a sample consisting of individuals with SAD and nonseasonal depression who met the criteria for clinical depression, clinical SAD individuals were more sensitive to winter stimuli compared to clinical Depressed, and to age- and sex-matched S-SAD and Controls. Clinical SAD engaged in more rumination than S-SAD and Control individuals, and clinical Depressed ruminated more than did the Control group. Clinical SAD and clinical Depressed engaged in more risky and impulsive behaviours than Controls in response to a depressed mood. Finally, clinical SAD presented with more vegetative symptoms than S-SAD, and both clinical Depressed and clinical SAD had more vegetative symptoms than Controls. Similarly to the overall sample, clinical SAD and clinical Depressed presented with more cognitive/affective symptoms than S-SAD and Controls. Thus, the present study found that SAD could be discriminated from the three other groups based on dysfunctional eating cognitions and behaviours, cognitive-content related to winter-stimuli, and ruminative response styles to depressed mood. SAD and Depressed groups could be distinguished from the other groups on interpersonal context-specificity, ruminative and dangerous response styles to depressed mood, and general negative attitudes. Thus, these factors can contribute to group discrimination between seasonal and nonseasonal depression, sub-syndromal seasonal depression, and nondepressed control groups.

## INTRODUCTION

Seasonal affective disorder (SAD) is a clinical condition characterized by the regular onset and remission of depressive episodes that follow a seasonal pattern (Lee et al., 1998; Rosenthal, 1993; Rosenthal et al., 1984). The DSM-IV-TR (APA, 2000) describes SAD as a seasonal pattern specifier that can be applied to Major Depressive Episodes associated with Bipolar I and Bipolar II Disorder, as well as to Major Depressive Disorder, Recurrent. The pattern must have occurred during the previous two years, the number of seasonal depressive episodes must be substantially greater than the number of nonseasonal depressive episodes over the individual's lifetime, and the seasonal pattern cannot be attributed to seasonal stressors. Despite this recognition of SAD in the DSM-IV-TR, there is still some debate about the diagnostic validity of seasonal depression, particularly compared to nonseasonal depression, and individuals who experience subclinical symptoms of seasonal depression. Research continues to address the distinction between seasonal and nonseasonal depression in its clinical presentation, etiology, treatment response, and pathogenesis. There is also a need for researchers to use theoretical models to conceptualize and predict the similarities and differences between the two types of depression.

Seasonality, which refers to the seasonal change in mood, energy, sleep, appetite, food preference, and socialization patterns, has been considered the most defining feature of SAD (Bauer & Dunner, 1993). Research findings have shown that SAD has more atypical or vegetative symptoms compared to nonseasonal depression, whereas nonseasonal depression tends to have more typical or cognitive/affective symptoms

(Kasper, Rogers, et al., 1989; Kasper, Wehr, Bartko, Gaist, & Rosenthal, 1989; Lam, Tam, Yatham, Shiah, & Zis, 2001). The cognitive/affective symptoms include several symptoms such as depressed mood and inability to concentrate, whereas the vegetative symptoms reflect hyperphagia such as weight gain, increased appetite and carbohydrate craving, along with fatigue and increased sleep. The vegetative symptoms are defined as atypical because these symptoms are opposite to what nonseasonally depressed individuals normally present (i.e., decreased appetite, absence of carbohydrate craving, and insomnia). Hence, the evidence appears to support the view that seasonality is characterized by atypical (vegetative) symptoms of depression (Lam et al., 2001).

#### Prevalence

Numerous researchers have conducted prevalence studies involving seasonal depression (Lam & Levitt, 1999; Magnusson, 2000; Rosen et al., 1990). Early estimates placed the prevalence rate of seasonal affective disorder to be about 5% of the general American population (Rosen et al., 1990). In a later review, Lam and Levitt (1999) reported that the prevalence rates varied from 0.7% to 9.7% in North American community samples. European community studies estimate the prevalence to range from 1.3% to 3%, while Asian countries showed even lower rates that ranged from 0% to 0.9%. Recently, in a study to examine community-prevalence rates in the UK and Ireland in six communities, the prevalence of seasonal depression was found to be 6.7% (McConville, McQuaid, McCartney, & Gilmore, 2002).

One methodological limitation associated with the majority of these prevalence studies is that they depended solely on the Seasonal Pattern Assessment Questionnaire

(SPAQ, Rosenthal, Genhart, Sack, Skwerer, & Wehr, 1987) to establish the presence of seasonal depression. This measure was initially intended to be a screening questionnaire for seasonal depression in clinical populations and not a diagnostic tool. To compensate for the limitations of the SPAQ, more recent epidemiological studies have included measures that tapped into the severity of depressive symptoms and relied on the DSM criteria to establish the presence of clinical depression. Using these more stringent clinical criteria, estimates of the prevalence of seasonal depression dropped and were reported to vary between 0.8- 2.2% in North America, with specific estimates of 1-3% in Canada (Lam & Levitt, 1999).

There has been research on the factors that affect prevalence rates, including latitude, sex, age, culture, and the time of the year of the assessment (i.e., winter versus summer months; Agumadu et al., 2004; Imai, Kayukawa, Ohta, Li, & Nakagawa, 2003). The relationship between latitude and prevalence is explained by the photoperiod hypothesis of seasonal depression (Desan & Oren, 2001), where in vulnerable individuals, decreased period of daytime light (or increased latitude) contributed to the emergence of seasonal depressive symptoms. However, the supporting evidence for this hypothesis has been inconsistent. For instance, some researchers have found that seasonal depression is more prevalent in areas of higher latitude (Rosen et al., 1990). In contrast, other researchers have found that there was an inverse relationship between latitude and seasonal depression prevalence, such as in UK communities (McConville et al., 2002). As well, Magnusson and Stefansson (1993) found that an Icelandic community had lower rates of seasonal depression compared to American cities that were

at lower latitudes. Elbi et al. (2002) assessed the prevalence of SAD in eight different samples in Turkey across different latitudes, and found no relationship between latitude and prevalence. Thus, it is not a consistently supported finding of the relationship between latitude and prevalence.

Researchers suggest that sex and age variables may be better predictors of the prevalence of seasonal depression, with the female to male ratio found to be about 1.6 to 1 across studies (Lam & Levitt, 1999). Other researchers have found sex ratios to be more similar to that of nonseasonal depression, such as 3.3 to 1 (Lucht & Kasper, 1999). As a side note, researchers have begun to look at sex differences not only in prevalence rates, but also in the symptom presentation of seasonal depressive symptoms, and where applicable, these findings will be presented. Finally, there seems to be a consensus that assessments for seasonal depression completed in the winter months leads to higher prevalence rates compared to assessments completed in the summer months (Lam & Levitt, 1999). Thus, although many factors seem to affect the prevalence rates of seasonal depression, the majority of research has focused on the different assessment measures used. Next, this paper will examine more closely the assessment of seasonal depression.

#### Assessment

As stated earlier, the DSM-IV-TR (APA, 2000) provides the most widely accepted diagnostic criteria for seasonal affective disorder. It applies a “seasonal specifier” to the major depression and bipolar depression diagnoses to indicate that the depressive episodes in these depressive disorders follow a seasonal pattern. The seasonal



specifier requires that seasonal depressive episodes must have occurred within the last two years, that the number of seasonal depressive episodes must be substantially greater than the number of nonseasonal depressive episodes over the individual's lifetime, and that the seasonal pattern cannot be attributed to seasonal stressors. Assessment measures and procedures have been developed that capture this definition or that measure symptoms of seasonality and depression symptoms.

The SPAQ (Rosenthal et al., 1987), mentioned above, provides a self-report retrospective measure of seasonality symptoms. It assesses the magnitude of seasonal changes in sleep, socialization, mood, weight, appetite, and energy, with responses for each item ranging from no change to extremely marked seasonal change. A summation score for these six areas of seasonal change is produced, and yields a global seasonality score (GSS). The SPAQ also assesses a respondent's rate of impairment due to seasonal changes ranging from "no problem" to "disabling." The SPAQ has been commonly used as a screening tool, particularly in prevalence studies. In order to establish the presence of seasonal depression, Kasper, Wehr, et al. (1989) established a cut-off GSS score of 11 or higher with a response of at least moderate impairment.

In the past, several studies have examined the reliability, validity, and internal consistency of the SPAQ and have yielded mixed results (Lam & Levitt, 1999). Researchers have found mixed findings regarding the reliability of the SPAQ. For example, some researchers have found low test-retest reliability for the SPAQ (e.g.,  $r = .62$ ; Raheja, King, & Thompson, 1996). Alternatively, Young, Blodgett, and Reardon (2003) presented a summary of the test-retest reliabilities of the SPAQ and concluded

that they were adequate with results ranging from  $r = .87$  to  $.58$ . More recently, Mersch and colleagues (Mersch et al. 2004) examined the reliability and validity of the SPAQ in four diagnostic groups: seasonal depression, nonseasonal depression, nondepressed outpatients, and a nondepressed control group. The authors reported that the SPAQ had good internal consistency (Cronbach's alpha =  $.85$ ). Discriminant analyses showed that it was sufficiently able to classify subjects 81% of the time into the four groups based on the GSS scores. In another study examining the validity of the SPAQ, Nayyar and Cochrane (1996) have found that differences in seasonality symptoms experienced between the winter and summer months were more pronounced when using retrospective assessments compared to prospective assessments. Finally, regarding internal consistency, authors have also found that the SPAQ items have good internal consistency (alpha =  $.82$ ; Magnusson, Friis, & Opjordsmoen, 1997).

Given some of the limitations of the SPAQ outlined above, some researchers have used the Inventory for Seasonal Variation (ISV, Spont, Depue, & Krauss, 2001), which is another retrospective dimensional measure of seasonality. There are few studies that have examined its psychometric properties, although in a comparison between the SPAQ and the ISV, Young et al. (2003) found good psychometric properties for both measures (e.g., good test-retest reliability, internal consistency). The authors concluded that the SPAQ is advantageous over the ISV because of its long history of use in the research literature, its adequate psychometric properties, and its simplicity. Thus, the SPAQ continues to be the preferred measure of seasonality, although it has some psychometric and diagnostic limitations.

To measure the severity of depressive symptoms associated with seasonal depression, many researchers have used a modified version of the Hamilton Rating Scale for Depression (HDRS). The original HDRS (Hamilton, 1967) had 21-items that assessed typical depression symptoms. Rosenthal et al. (1987) added supplementary items to the HDRS to create a version of the HDRS that included the vegetative symptoms found in seasonal depression (e.g., items related to gaining weight, eating more sweets and starches). In order to make the measure more reliable, researchers also created a structured interview that included items on the modified version of HDRS called the Structured Interview Guide for the Hamilton Depression Rating Scale, SAD version or SIGH-SAD (William et al., 1988). Various cut-off scores on the expanded HDRS have been used in the literature to establish seasonal depression. For example, Eagles, McLeod, Mercer, and Watson (2000) defined SAD as having a minimum of 15 on the original HDRS plus at least six on the supplementary vegetative symptom scale. Other researchers have used a minimum score of 12 on the HDRS and a minimum score of 10 on the vegetative items (Moscovitch, et al., 2004). A review by Bagby, Ryder, Schuller, and Marshall (2004) found that the internal reliability, and convergent and discriminant reliability of the HDRS with supplementary items (the basis for most measures assessing SAD) were adequate, although conceptual and other psychometric properties could be improved.

In order to diagnose individuals with seasonal depression, researchers (e.g., (Rohan, Sigmon, & Dorhofer, 2003) have also used the Structured Clinical Interview for DSM-IV Axis I Disorders – Clinician Version (SCID-CV; First, Spitzer, Gibbon, &

Williams, 1995). The adoption of the DSM-IV diagnostic criteria for seasonal depression is advantageous in that it identifies individuals who are clinically depressed. However, the DSM performs less well in assessing degree of seasonality, and in identifying sub-clinical individuals who show seasonal changes. Thus, in order to capture more fully the depression and seasonal aspects of seasonal depression, the HDRS with its supplementary items, the SPAQ, and the DSM-IV diagnostic criteria are often used by researchers.

### Etiology

Numerous researchers have investigated the etiology of seasonal depression. Overall, the etiology of SAD is thought to be multifactorial and most likely involves biological and psychological factors. Many theories are related to changes in photoperiod or amount of daylight. This theory is used to explain latitude changes in the prevalence rates of seasonal depression, whereby as the amount of daylight decreases as one moves away from the equator, there are increases in seasonal depression rates. One major hypothesis that posits the involvement of photoperiod and of seasonal depression is the phase-shift circadian rhythm hypothesis (Lewy et al., 1986). This hypothesis predicts that individuals with seasonal depression have a “delay” in their circadian rhythm or internal daily clock that drives physiological processes (e.g., sleep-wake cycle, changes in daily production of neurotransmitters and hormones). According to this hypothesis, in order to treat seasonal depression, circadian rhythms need to be phase-advanced or moved forward to begin at an earlier time in the morning. Other hypotheses for the etiology of seasonal depression include the role of melatonin, a hormone that regulates the daily sleep-wake cycle, and has implications for the symptom of hypersomnia in

seasonal depression. In a review by Neto and Araujo (2004), the authors present research supporting the role of melatonin in seasonal depression and other mental disorders, citing evidence of daily fluctuations in melatonin, and its relation to photoperiod and other neurotransmitters, namely serotonin and norepinephrine. Related to the phase-shift hypothesis and the melatonin hypothesis in seasonal depression, the role of the visual system in seasonal depression has also been examined. Researchers have shown the light entering through the retina travels to and impacts the suprachiasmatic nucleus (SCN) of the hypothalamus in the brain (Pinel, 2003), and it is the SCN that functions as the circadian centre or “pacemaker” of the brain (Desan & Oren, 2001).

Additional research furthers the understanding of the role of neurotransmitters in seasonal depression. For example, in the research literature, the monoamines neurotransmitters (e.g., serotonin and catecholamines such as dopamine) have been implicated in the etiology of seasonal depression, nonseasonal depression, and eating disorders (Neumeister, 2004). Hebert, Beattie, Tam, Yatham, and Lam (2004) have also hypothesized that dopamine dysregulation is related to retinal hyposensitivity. Finally, in a review of neurotransmitter depletion studies, Neumeister (2004) argued that there is not a direct relationship between serotonin depletion and SAD symptoms, but demonstrated that these complex etiological systems also involve dopamine. Thus, these researchers provide support for the importance of understanding the psychological symptoms of the seasonality and depression dimensions together, and then the physiological symptoms together (Pinel, 2003). In other words, given the complexity of neurotransmitter systems, it is unlikely that a simple deficit in one level of a system (i.e., biological vulnerability) is

directly related to a deficit in another level of a system (i.e., cognitive/affective).

Other important etiological theories related to seasonal depression are the role of genetics (Lam & Levitan, 2000; Levitan et al., 2004). For example, in a review of the pathophysiology of seasonal depression, Lam and Levitan (1999) emphasized that twin and heritability studies (i.e., investigating descendents of Icelandic populations who have lower prevalence rates of seasonal depression) indicate a genetic component to seasonal depression, including genetic predispositions to vegetative symptoms. Matsushita, Nakamura, Nishiguchi and Higuchi (2002) demonstrated the role of genes that lower serotonin levels that contributed to increased vegetative-related symptoms (i.e., dysfunctional eating behaviours as measured by Eating Attitude Test –26, EAT-26; Garner, Olmsted, Bohr, & Garfinkel, 1982). Levitan et al. (2004) showed a relation between dopamine gene and binge eating and weight gain in individual with SAD. Thus, these are the most researched hypotheses associated with the etiology of seasonal depression. The commonalities among them involve the role of genetic predisposition to vegetative symptoms and light on circadian rhythms and subsequent daily cycles of brain neurotransmitters (Lam & Levitan, 1999).

There is one hypothesis that attempts to bring together these heterogeneous etiological theories of seasonal depression. The Dual Vulnerability Hypothesis (DVH; Lam et al., 2001; Young, Watel, Lahmeyer, & Eastman, 1991) proposes that SAD can be distinguished from nonseasonal depression and controls on two dimensions, namely seasonality and depression. This hypothesis was developed by Young and colleagues (Young et al., 1991) who retrospectively tracked the emergence of seasonal depression

symptoms in individuals with seasonal depression during a depressive episode in the winter months. The researchers hypothesized that if different symptoms in seasonal depression have different temporal onsets, then the etiological mechanisms underlying the symptoms would coincide with clusters of symptoms that appear together. The researchers found that individuals with seasonal depression reported that vegetative symptoms (i.e., fatigue, hypersomnia, and increased appetite) were related to the onset of a depressive episode, and decreased rapidly over time. The depressive symptoms showed a different pattern, in that they were unrelated to the onset or the course of the depressive episode. The researchers proposed a model whereby individuals who are vulnerable to depression may develop cognitive/affective symptoms in response to the stress associated with vegetative symptoms that occur at the onset of a depressive episode. Limitations of this study were that it relied on retrospective self-reports of presenting symptoms, and it has been replicated only once by McCarthy, Tarrier, and Gregg (2002).

Other researchers have provided empirical support for the DVH (Chotai, Smedh, Nilsson, & Adolfsson, 2004; McCarthy et al., 2002). For example, McCarthy et al. (2002) completed a longitudinal study of the emergence of depression and vegetative symptoms from September to March. The results indicated that depression scores increased gradually until a peak around the months of January and February, whereas the vegetative symptoms appeared earlier in the winter than the depression symptoms. A limitation of this study is that it did not use any control groups.

Lam et al. (2001) used the DVH to conceptualize how seasonal depression varies from other disorders based on the degree to which they load on the seasonal and

depression dimensions. Specifically, the researchers conceptualized SAD, individuals who do not meet the full DSM diagnostic criteria for SAD (referred to as sub-syndromal SAD), and nonseasonal depression on two dimensions: seasonality and depression. Individuals with SAD have high loadings on both seasonality and depression, whereas the disorder of depression loads low on seasonality but high on the depression dimension; and an opposite pattern is hypothesized for sub-syndromal SAD, which loads high on seasonality but low on depression. Finally, low loading on both dimensions are said to characterize the nondepressed-nonseasonal individuals (see Figure 1). Lam and colleagues (Lam et al., 2001) elaborated on the model and proposed that both dimensions could be associated with genetic/vulnerability traits and external environmental influences (e.g., reduced photoperiod in the case of seasonal depression).

One limitation of the DVH literature is that there have been no published reviews that clearly describe the model and delineate how it fits with the existing seasonal depression research. For this reason, some researchers have interpreted the model to mean that there is a biological vulnerability that explains the seasonality dimension, and a psychological vulnerability that explains the cognitive/affective symptoms (Rohan, Sigmon, Dorhofer, & Boulard, 2004). However, it may be more meaningful and informative to elaborate on the biological and psychological correlates of both seasonal and cognitive/affective dimensions. For example, it may be useful to examine vegetative-related cognitions and physiological (e.g., gaining weight, increasing appetite) symptoms that are associated with the seasonality dimension. This elaboration of the DVH is in line with Lam and colleagues (Lam et al., 2001) interpretation of the model.



Another criticism of the DVH is that it proposes to be an etiological model describing the causes of the seasonality and depression dimensions. For instance, the model suggests that retinal sensitivity and light deprivation are etiological factors for the seasonality dimension that directly influences the emergence of vegetative symptoms (Lam et al., 2001). The model also implies that seasonality and cognitive/affective symptoms are mutually exclusive or orthogonal factors. However, it may be that there is overlap between the etiology of the depression and seasonality dimensions and the DVH model is overly simplistic. This is supported by neurochemical evidence that seasonality (e.g., craving carbohydrates) and depression (e.g., low mood) symptoms are both related to serotonergic factors (Neumeister, 2004). In other words, the DVH may be best conceptualized as a model of classifying overt symptoms and not mutually exclusive etiological factors per se.

Before examining the DVH in more detail, the treatment literature on seasonal depression will be briefly presented, followed by an elaboration of the DVH, including sub-syndromal seasonal depression, and areas of research that are implicated by conceptualizing seasonal depression on two dimensions, namely seasonality and depression.

### Treatment

Regarding treatment, light therapy has been the most researched area with positive results (Levitt, Lam, & Levitan, 2002; Golden et al., 2005). For example, Golden and colleagues (Golden et al., 2005) completed a meta-analysis of randomized controlled trials using light therapy to treat seasonal and nonseasonal depression. The

authors concluded that light therapy (effect size = 0.84) and dawn stimulation (light source mimicking morning increases in sunlight, effect size = 0.73) produced a significant improvement in atypical depression symptoms in eight studies. Bright light therapy was also effective in treating the atypical symptoms in four studies that looked at nonseasonal depression (effect size = 0.53). The authors also concluded the need for more studies that use rigorous methodological designs. Light therapy is in line with etiological models of seasonal depression that posit that a decrease in photoperiod (light) is related to the pathophysiology of SAD specifically as it relates to the atypical symptoms. Other treatments for seasonal depression include melatonin (Lam & Levitt, 1999) and pharmacotherapy. Recently, researchers have begun to use pharmacotherapy, specifically the selective serotonin reuptake inhibitors (SSRIs), in randomized controlled trials to treat seasonal depression. Results have been positive, but additional randomized controlled studies are needed (Moscovitch et al., 2004). Researchers have also used light therapy with sub-syndromal seasonally depressed individuals (Kasper et al., 1988).

#### Sub-syndromal Seasonal Depression

Related to the DVH, as mentioned earlier, some individuals experience SAD symptoms that do not meet the full DSM-IV-TR criteria described above. For example, they may have seasonal episodes of depressive symptoms but they present with mild or no impairment in their functioning. In the research literature, these individuals have been characterized as sub-syndromal SAD or S-SAD (Kasper, Wehr, et al., 1989). Epidemiological studies indicate that the prevalence of S-SAD ranges from 10%-20% (Kasper, Wehr, et al., 1989). S-SAD is characterized by a shorter and milder depressive

episode. The diagnosis of S-SAD relies mainly on the use of SPAQ criteria, as there are no DSM-IV diagnostic criteria associated with this syndrome. The SPAQ criteria for S-SAD are a score of 9-11 and at least moderate impairment, and above 12 with no or mild impairment (Kasper, Wehr, et al., 1989). These criteria have been used by many researchers investigating seasonal and S-SAD (Rohan et al., 2003). According to Lam et al. (2001), S-SAD loads low on the depression dimension and high on the seasonality dimension.

In the research literature, S-SAD can also be described in terms of the seasonality continuity hypothesis (Rohan, Sigmon, Dorhofer, & Boulard, 2004). In other words, seasonal depression and S-SAD are hypothesized to vary in terms of quantity (i.e., frequency) and not quality (i.e., type of symptoms) of different degrees of seasonality. S-SAD is thought to be subclinical levels of seasonal depression, and is characterized by the presence of mild to moderate vegetative symptoms during the fall and winter months and does not experience significant levels of depression (Kasper, Rogers, et al., 1989). Emerging research studying individuals with S-SAD seems to support this hypothesis. For example, Rohan and colleagues (Rohan et al., 2004) prospectively assessed 24 S-SAD women in the winter and nonwinter (i.e., April or September) months, and compared them to 22 individuals in a nondepressed control group. The results supported the seasonality continuity hypothesis, in that women with S-SAD experienced more automatic negative thoughts and emotional and psychophysiological reactivity to light-relevant stimuli than controls. A limitation of this study is that it has a small sample size. Another study by Rohan et al., (2003) found that individuals with a clinical history of

SAD had more frequent negative thoughts than controls. Taken together, a limitation of these studies is that there was no direct comparison between seasonal and sub-syndromal seasonal depression. Other studies have also found support for this continuity hypothesis including S-SAD having less severe impairment in overall health, well-being, daily activities, social activities, and pain compared to individuals with seasonal depression (Schlager, Froom, & Jaffe, 1995).

Other researchers have found that seasonal and S-SAD vary “qualitatively” from each other. Lam et al. (2001) provided evidence that S-SAD may not be a milder version of SAD, but instead may be a different clinical disorder. For example, the researchers found that compared to individuals with seasonal depression, individuals with sub-syndromal seasonal depression present with lower rates of vegetative (insomnia, weight gain, appetite increase) and depressive symptoms (anxiety, panic attacks, suicidal ideation) and lower rates of family history of a mood disorder.

Ambiguity surrounding the validity of the seasonality continuity hypothesis could be attributed to a few factors. First, in comparison to the study by Rohan et al. (2004,  $N = 46$ ), Lam et al. (2001) had a greater sample size ( $N = 192$ ), thus perhaps having more power to detect group differences. A second explanation might be that specific symptoms do vary between groups, and that this may be better detected in studies that use different groups (e.g., SAD, S-SAD, depressed, and controls) that vary on all dimensions of seasonality and depression, such as in Lam et al (2001)’s study.

In addition to the identification of a S-SAD group, other areas of research implicated by the DVH are seasonality of other symptoms (i.e., eating disorders), and

psychological variables, namely cognitive specificity, response styles to depression, winter-stress appraisal, and specific cognitive vulnerabilities related to depression including general negative attitudes and interpersonal context-specificity.

### Seasonality and Eating Disorders

Research findings indicate that there is a relationship between seasonality and disordered eating. For example, researchers have found seasonal patterns in the presentation of eating disorder symptoms, particularly bulimia nervosa (BN; e.g., Ghadirian, Marini, Jabalpurwala, & Steiger, 1999; Gruber & Dilsaver, 1996; Lam, Goldner, & Grewal, 1996; Lam, Solyom, & Tompkins, 1991; Levitan, Kaplan, & Rockert, 1996; Perry, Silvera, Rosenvinge, Neilands, & Holte, 2001; Yamatsuji, Yamashita, Ariei, Tatara, & Fukui, 2003). Perry and colleagues (Perry et al., 2001) randomly sampled 6313 young adult women in the winter months, and found a correlation between seasonality scores (measured by the SPAQ) and eating disturbances (as measured by the Eating Dissatisfaction Scale, EDS-5, Rosenvinge et al., 2000). In other words, increased dysfunctional eating cognitions (e.g., feeling guilty about eating, feeling necessity to use a strict diet to control eating) were related to increased seasonal variations in mood and vegetative symptoms. In a longitudinal study, Perry et al. (2001) had 972 women complete monthly ratings on the SPAQ and EDS-R for one year. The results indicated that scores on the EDS-S fluctuated throughout the year, with higher scores in the winter months and lower scores in the summer months. Additional researchers have found that prevalence rates of SAD in bulimic individuals were reported to be 27% (Ghadirian et al., 1999) and 25% (Gruber & Dilsaver, 1996), suggesting

additional evidence for the relationship between seasonality and eating disturbances.

Given that eating disorders are associated with seasonality and with dysfunctional eating attitudes (e.g., Mizes, 1992, 1988, 1991; Mizes et al., 2000), it seems reasonable to assume that some individuals with SAD would similarly exhibit dysfunctional eating attitudes. For instance, Berman, Lam, and Goldner (1993) administered the Eating Disorders Inventory (EDI; Garner, 1991), a self-rating questionnaire that assesses abnormal eating attitudes and behaviours to 30 SAD females, 30 individuals with Bulimia Nervosa (BN), and 30 non-clinical participants. The researchers found that although the BN individuals had higher psychopathology scores than the SAD group on all subscales with the exception of three (Body Dissatisfaction, Perfectionism, and Maturity Fears), the SAD group had higher scores than the non-clinical participants on all of the EDI subscales, except Perfectionism. The Eating Attitudes Test-26 (EAT-26; Garner et al., 1982) was also administered to provide an overall assessment of eating symptoms (e.g., binge eating, vomiting, use of laxatives and diuretics) found in eating disorders to the SAD and control groups. The results indicated that the EAT-26 scores were significantly higher in the SAD group than in the non-clinical comparison group. Five out of the 30 (17%) SAD individuals had scores that were indicative of clinically significant eating pathology. Thus, research indicates that significant dysfunctional eating attitudes and behaviours may be associated with SAD, but these dysfunctional attitudes may be lower than those found in BN (Berman et al., 1993).

The presence of dysfunctional eating cognitions in eating disorders is in line with the cognitive specificity hypothesis, which is a component of Beck's cognitive theory

underlying emotional disorders (Clark & Beck, 1989; Kendall & Ingram, 1989). This theory postulates that affective states can be discriminated on the basis of unique cognitive processes including cognitive content and attributional styles. For example, it has been found that depressive cognitive content, such as themes of general negative attitudes towards oneself and others is more related to depression than anxiety, which is characterized by worries about the future and fears related to panic attacks, among other worries and fears (Beck & Perkins, 2001). This theory is also supported in the eating disorder literature, where individuals with disordered eating experience dysfunctional eating cognitions, such as rigid weight regulation and weight being the basis for approval by others (Mizes, 1992). Thus, it may be useful to apply the cognitive specificity hypothesis to the seasonal depression literature, where this group may also experience dysfunctional eating cognitions related to vegetative symptoms.

In addition to being related to dysfunctional eating cognitions, the vegetative symptoms in seasonal depression might also be related to negative appraisals of winter-related stimuli (e.g., cold temperatures). The DVH implicates winter stress appraisal associated with the seasonal presentation of vegetative symptoms. This position was corroborated by a study that found SAD individuals to differ from depressed individuals in their greater aversion to winter-related stimuli (Dew & Tan, 2003). The SAD individuals ruminated more on winter-related stresses, found the vegetative symptoms to be more impairing, and perceived themselves to be less capable of coping with winter. This suggests that cognitive differences between SAD and depression may exist with respect to specific content such as those associated with winter.

If eating disorders are associated with physical activities to address concerns with weight gain (e.g., Davis, Kennedy, Ravelski, & Dionne, 1994; Davis, Woodside, Olmsted, & Kaptein, 1999; Penas-Lliedo, Vaz Leal, & Waller, 2002; Solenberger, 2001), it is possible that individuals with SAD might also use physical activities to cope with the vegetative symptoms. To date, there are only a few studies examining the role of physical activity in seasonal depression. For example, Leppamaki, Partonen, Hurme, Haukka, and Lonnqvist (2002) found that bright-light exposure and aerobic exercise decreased vegetative symptoms in individuals with sub-syndromal seasonal depression. Thus, it would be useful to investigate this relationship further.

#### Psychological Variables Related to Depression

Another line of research that is implicated in the DVH relates to psychological factors commonly linked to depression in the literature. Tracing similarities and differences in these factors would help to illuminate the distinction between seasonal and nonseasonal depression. Within the past 10 years, researchers have only begun to apply contemporary depression theories to seasonal depression. To date, theories applied to the seasonal depression literature are response styles to depressed mood, and general negative attitudes. Another theory that may be interesting to apply to seasonal depression is interpersonal context-specificity. Each area will be elaborated below.

#### *Response styles to Depressed Mood*

Nolen-Hoeksema and colleagues (Nolen-Hoeksema, 1990, 1991; Nolen-Hoeksema & Morrow, 1991) proposed that an individual's response to his or her depressed mood could influence the duration and severity of a depressive episode. The



researchers proposed that individuals who ruminate on their depressed mood (e.g., repetitively focus on the fact that they are depressed, their depressive symptoms, and the causes, interpretations, and consequences of their depressed mood) are more likely to have a longer duration of a depressed episode compared to individuals who do not ruminate on their depressed mood. The authors also state that ruminative responses can be differentiated from trying to solve a depressed mood, in that while ruminating, a person is passively focusing on a negative emotional state, and not on identifying alternatives ways of thinking or responding to a depressed mood. According to Nolen-Hoeksema (1991), more positive responses to a depressed mood are appropriate distraction techniques, including participating in leisure activities with friends, or concentrating on one's work. Inappropriate distraction techniques include participating in violent or dangerous behaviours, including engaging in illegal substance use or risky sexual practices. There is a plethora of research in the depression literature that demonstrates a positive relationship between ruminative response style and severity of depression in both normal (e.g., Butler & Nolen-Hoeksema, 1994; Nolen-Hoeksema, Parker, & Larson, 1994; Schwatz & Koenig, 1996) and clinical populations (e.g., Just, Abraham, & Alloy, 2001; Nolen-Hoeksema et al., 1994). For example, Butler and Nolen-Hoeksema (1994) completed a prospective study using 125 male and 74 female undergraduate students. At pre-test, females were more likely to have a ruminative response style to depressed mood compared to females. Ruminative response style was also a significant predictor of depression scores at follow-up.

Recently, researchers have begun to investigate the response style to depressed

mood in individuals with seasonal depression (Dew & Tan, 2003; Rohan et al., 2003; Young & Azam, 2003). Young and Azam (2003) completed a prospective study investigating the relationship between ruminative response style and severity of vegetative symptoms. In this study, 18 individuals with a previous diagnosis of SAD completed for 14-consecutive days an expanded version of the Beck Depression Inventory-II that included cognitive/affective and vegetative depressive symptoms (Beck, Ward, Mendelson, Mock, & Erbaugh, 1996). Participants also completed the Daily Emotions Records (Nolen-Hoeksema & Morrow, 1993), which asks about the duration and severity of sad mood that day, and about the use of rumination and distractive response styles. This was done in both September and January months. The results indicated that an individual's ruminative response style in the fall (September) predicted severity of winter (January) depression symptoms. The authors also found that the relationship between fall vegetative symptoms and winter cognitive symptoms increased as a function of ruminative response style. In other words, keeping in line with the DVH, the greater a ruminative response style and vegetative symptoms in the fall, the greater likelihood of developing cognitive symptoms of seasonal depression in the winter months. A limitation of this study is that it used the BDI to measure depressive symptoms, which is not as comprehensive as the HDRS (Rosenthal, et al., 1987) that includes atypical depressive symptoms found in SAD,, and it did not use the comprehensive Response Style Questionnaire (RSQ, Nolen-Hoeksema & Morrow, 1991), which includes a measure of dangerous or reckless methods of responding to a depressed mood. Thus, it would be informative to investigate response styles to depressed mood

using the RSQ and the HDRS.

Another study compared seasonal and nonseasonal depression on ruminative response styles (Dew & Tan, 2003). The authors hypothesized that individuals high on the depression dimension (i.e., seasonal and nonseasonal depression) would have similar ruminative response styles to depressed mood, but these would be higher than individuals characterized as low on the depression dimension (i.e., S-SAD and nondepressed groups). This hypothesis was supported in that depressed and individuals with SAD did not differ significantly in their ruminative response style to depressed mood, and these levels were significantly greater than individuals categorized as S-SAD and nondepressed (Dew & Tan, 2003). These results suggest that both seasonal and nonseasonal depression are characterized by a ruminative response style to depressed mood. Additional research is needed to replicate these results.

#### *General Negative Attitudes*

As mentioned above, a psychological theory implicated in the depression literature is Beck's cognitive model of depression (Beck, 1987). Here, the author proposes that dysfunctional attitudes are vulnerability factors that can play a role in the development and maintenance of a depressed mood. Dysfunctional attitudes refer to rigid and perfectionistic standards of judging oneself and others (e.g., "I need to be perfect to be loved"; "If someone disagrees with me, it probably indicates that they do not like me"; and "If I fail partly, it is as bad as being a complete failure"). Beck (1987) also proposes that individuals develop depression when these negative attitudes interact with stressful events. For example, an individual may have the dysfunctional negative

attitudes that “I am worthless if I am not in a romantic relationship,” and may subsequently become depressed when they experience a relevant stressor (relationship ending), and that produces other negative cognitions related to depression (e.g., “If this person ends a relationship with me, no one will want to be in a relationship with me”). Researchers have found support for the role of negative attitudes in depression (Dykman & Joh II, 1998).

Recently, in the seasonal depression literature, Hodges and Marks (1998) found that both individuals with SAD and depression had similar levels of negative attitudes and negative automatic thoughts, which were greater than the levels found in the control (nondepressed) group. Also, some researchers have also found no significant differences between nonseasonal and seasonal depression on negative attributional style (Levitan, Rector, & Bagby, 1998), whereas others have found a significant difference (Michalak et al., 2002). Thus, additional research would be useful in confirming the role of general negative attitudes in seasonal and nonseasonal depression, and determining if other more specific types of attitudes or cognitions may differentiate seasonal depression from other groups, such as those related to eating.

#### *Interpersonal Context-Specificity*

Similarities between seasonal and nonseasonal depression may be also associated with interpersonal context-specificity, which is a contemporary theory found in the depression literature. The role of interpersonal context-specificity in depression is based on the view that depression is mediated by two relatively stable individual differences in motivation: sociotropy and autonomy (Clark & Beck, 1989). Individuals who are highly

sociotropic are particularly invested in positive interchange with other people, social acceptance, and intimacy, and are particularly vulnerable to develop depression when they perceive the specific context of a loss or rejection in social relationships (Beck, 1983, 1987, 1991). Conversely, individual who are highly autonomous are considered to be vulnerable to develop depression when they perceive the context of an achievement failure or lack of personal control over their environment. Numerous researchers have supported the role of the social rejection in depression (Allen, Horne, & Trinder, 1996; Clark, Beck, & Browne, 1992; Hammen, Ellicott, Gitlin, & Jamison, 1992; Leary, 2001; Leary, Koch, & Hechenbleikner, 2001; Marcus & Nardone, 1992; McBride, Bacchiochi, & Bagby, 2005). For example, McBride et al. (2005) replicated a consistent finding in the research literature that 202 clinically depressed women were more sociotropic than 118 men, with no sex differences found for the autonomy dimension. To date, there are no published studies investigating the role of interpersonal context-specificity in seasonal and nonseasonal depression, and it may be useful in differentiating seasonal depression from other groups.

#### Summary and Conclusion

In summary, there is equivocal evidence on the similarities and differences among individuals with seasonal depression, nonseasonal depression, S-SAD, and nondepressed nonseasonal (controls). Research findings indicate that SAD differs from depression in the seasonal pattern of the depressive episodes. Furthermore, SAD is characterized by vegetative symptoms whereas depression is characterized more by cognitive/affective symptoms. On a psychological level, SAD and depression may be indistinguishable on

the basis of their response to depression (rumination) and cognitive vulnerability to depression as indicated on their dysfunctional attitudes and negative automatic thoughts. However, research examining potential differences between depression and SAD may find it useful to use the DVH (Lam et al., 2001; Young et al., 1991) as a theoretical framework where the two groups are postulated to vary on the dimensions of seasonality. A review of the research suggests that the cognitive specificity hypothesis may also help distinguish SAD and depression. Individuals categorized as high on the seasonality dimension may endorse cognitions and behaviours related to the associated vegetative symptoms, and may be more sensitive to winter-related stimuli than individuals low on the seasonality dimension (depressed). Furthermore, given the overlap between SAD and eating disorders, it is possible that SAD may also be distinguished from depression on the basis of dysfunctional eating cognitions and behaviours, and engagement in physical activity to deal with the vegetative symptoms of weight gain. Finally, categorizations based on loadings on the depression dimension may shed light on the similarities and differences between these four groups including interpersonal context-specificity, general negative attitudes, and response styles to depressed mood.

### Present Study

#### *Purpose*

The present study compared four groups, as categorized by a combination of their loadings on the seasonality and depression dimensions, on six main conceptual areas. Three of these areas that were reasoned to be linked to the seasonality dimension were dysfunctional eating cognitions and behaviours, winter-related stress, and physical

activity levels. The remaining three areas were reasoned to be linked to the depression dimension and included interpersonal context-specificity, response style to depressed mood, and general negative attitudes. The four groups that were compared were SAD (high seasonality - high depression), S-SAD (high seasonality - low depression), Depressed (low seasonality – high depression), and Control (low seasonality – low depression). Although sex of participants was not a primary factor of investigation, it was also examined because the composition of the sample permitted the sex comparison.

This study addresses some limitations and research gaps in the previous seasonal depression literature. First, it will compare and contrast four groups (i.e., SAD, Depressed, S-SAD, Control) that are not generally examined in one study. Generally, SAD is compared to a nonseasonal nondepressed group, and infrequently to nonseasonal depressed and S-SAD groups. Second, this study addresses the gap in the research literature to examine eating attitudes characterized by Eating Disorders in individuals with seasonal depression. This is particularly relevant given that similar to individuals with Eating Disorders, individuals with seasonal depression are also characterized by vegetative symptoms. Third, this study addresses another gap in the research literature to examine cognitive/affective variables associated with depression (i.e., interpersonal context-specificity, general negative attitudes, and response styles to depressed mood) that may differentiate the four groups. Thus, these are some of the limitations and gaps in the research literature that this study addresses.

### *Hypotheses*

The following hypotheses were made:

1. It was hypothesized that individuals who are categorized as high on the seasonality dimension (i.e., SAD and S-SAD) would have greater dysfunctional eating cognitions and behaviours when compared to those who are categorized as low on the seasonality dimension (i.e., Depressed and Controls). However, SAD would report greater dysfunctional eating cognitions and behaviours than the S-SAD, as SAD has a higher seasonality score than S-SAD. This hypothesis is in line with the cognitive content specificity hypothesis, whereby seasonality is associated with unique cognitive content related to vegetative symptoms.
2. It was hypothesized that individuals categorized as high on the seasonality dimension (i.e., SAD and S-SAD) would have greater stressfulness of their vegetative symptom during winter, and poorer perceived winter-stress appraisal such as greater dread of winter, greater impairment in functioning during winter, and poorer perceived ability to cope with winter. SAD would report greater impairments in these areas compared to S-SAD. This hypothesis is also predicted by the cognitive content hypothesis whereby seasonality is associated with stress related to vegetative symptoms.
3. It was hypothesized that individuals categorized as high on the seasonality dimension (i.e., SAD and S-SAD) would have greater physical activity levels when compared to those who score low on the seasonality dimension (Depressed and Control). SAD would report greater physical activity levels than the S-SAD. Individuals with SAD were expected to have higher physical activity levels because, similar to individuals with eating disorders who also experience vegetative symptoms, they may engage in physical activity to compensate for increased weight gain.



4. It was hypothesized that individuals who were categorized as high on the depression dimension (i.e., SAD and Depressed) would have greater interpersonal cognitive-specificity (e.g., sociotropy) when compared to individuals categorized with low depression (i.e., S-SAD and Control groups). This hypothesis is also predicted by the cognitive specificity hypothesis whereby depression is associated with interpersonal context-specificity.
5. It was expected that individuals who were categorized as high on the depression dimension (i.e., SAD and Depressed) would use more rumination in response to their depressed mood when compared to individuals categorized with low depression (i.e., S-SAD and Control groups). This is also in line with the cognitive specificity hypothesis, whereby the depression is associated with a ruminative response style to a depressed mood.
6. It was predicted that individuals who were categorized as high on the depression dimension (i.e., SAD and Depressed) would have greater negative attitudes when compared to individuals categorized with low depression (i.e., S-SAD and Control groups). This is predicted by the cognitive content specificity hypothesis whereby depression is associated with negative attitudes associated with a depressed mood.

Analyses to look for group differences were also completed on the two subscales of the Hamilton Depression Rating Scale (HDRS): atypical (vegetative) and typical (cognitive/affective) symptoms of depression. As will be elaborated later, the HDRS is a measure of the severity of depression symptoms and consists of an overall score (HDRS-T) and two subscales: typical (HDRS-A) and atypical (HDRS-B) depression symptoms.

The four groups used in this study (i.e., SAD, Depressed, S-SAD, and Control) were categorized based on HDRS-T scores. However, there may be differences between the groups on the two subscales, as they have been shown to differentiate depressed and SAD groups in the research literature. For instance, Tam, Lam, Robertson, Stewart, Yatham, and Zis (1997) found that compared to non-seasonally depressed individuals, seasonally depressed individuals had more atypical symptoms, namely hyperphagia (overeating) and hypersomnia (oversleeping). As well, researchers have found that after a trial of light therapy, atypical symptoms (e.g., carbohydrate craving) were more responsive to light therapy than typical symptoms (e.g., insomnia, weight loss; Terman, Amira, Terman, & Ross, 1996). Thus, there is empirical support that atypical and typical symptoms may differentiate SAD from nonseasonal depression as well as be differentially responsive to light therapy.

Exploratory analyses were also completed involving the small number of individuals in the SAD and Depressed groups who met the DSM-IV-TR criteria for major depressive episode (MDE), current. Identification of these individuals was done through a self-report measure that was based directly on MDE clinical criteria. These statistical explorations might help to ascertain whether the group differences found in the main analyses remain when only clinical samples are used.

## METHOD

### Participants

Three hundred eighteen individuals were recruited from Lakehead University student (including Introductory Psychology classes), Lakehead University faculty and

staff, the general community, and clinical populations in Thunder Bay, and completed questionnaires. Based on their scores on the seasonality and depression dimensions (see section *Measures* below for more information), 179 participants were categorized in the SAD ( $n = 67$ ; 13 males, 54 females), S-SAD ( $n = 24$ ; 7 males, 17 females), Depressed ( $n = 30$ ; 8 males, 22 females), and Control ( $n = 58$ ; 18 males, 46 females) groups. More detailed demographic information on the sample is presented in the Results section on page 58.

### Classification

Table 1 outlines and explains the criteria used in the categorization of the groups and this classification is elaborated below.

### Measures

#### *Demographic and General Information (see Appendix A)*

Information on demographics, residence pattern (i.e., duration of residence at permanent address and areas of annual dwelling that may contribute to seasonal changes), and substance use pattern (including alcohol, drugs, and medication) that may account for some of the depressive symptoms were collected in this section. Background Affiliation information was collected, indicating whether a participant was a student or non-student (i.e., university faculty or staff, or community member).

#### *Seasonal Pattern Assessment Questionnaire*

*(SPAQ; Rosenthal, Bradt et al., 1987; see Appendix B)*

The SPAQ was developed to assess an individual's seasonal variations in mood and other behaviours related to seasonal affective disorders. Items in this section were

geared towards the assessment of seasonality. Question 1 ascertained the pattern of seasonality with respect to typical and atypical depressive symptoms. Respondents were asked to indicate the months of the year that they experience the listed vegetative (e.g., eat most, crave carbohydrates most) and cognitive/affective symptoms (e.g., feel best, feel worst). Question 2 and 3 determined the respondent's pattern of seasonality over the past six years were added to the SPAQ by Wesner and Tan (1999). Question 4 assessed the degree of seasonality by summing the degree of change scores over six symptoms. The degree of change is rated on a 5-point scale where 0 indicates no change and 4 indicates extremely marked change. The sum of the ratings yields a Global Seasonality Score (GSS) where a score of 0 to 7 suggests no seasonality and a score of 12 or more suggests high seasonality. Question 5 is derived from the SPAQ to assess degree of impairment with the seasonal changes. Note that to assess high seasonality in SAD and S-SAD groups, the GSS and degree of impairment are considered jointly. As indicated in Table 1, SAD group must have a GSS of 12 or more combined with at least moderate level of impairment. This is similar to other researchers who have used a GSS score of greater than 11 to indicate seasonality, although some did not mention of impairment (Shen, Kennedy, Levitan, Kayumov, & Shapiro, 2005) and others require at least moderate impairment (Kasper, Wehr, et al, 1989; Magnusson, 1996). In contrast, the S-SAD needs to have a GSS of 9 to 11 coupled with at least mild impairment, or a GSS of 12 or more combined with no or mild impairment (Kasper, Wehr, et al., 1989; Kasper, Rogers, et al, 1988). Many researchers have diagnosed seasonality using the SPAQ criteria (Hebert, Dumont, & Lachapelle, 2002; Magnusson, 2000). Question 6 and 7

were developed by Wesner and Tan (1999) to assess for the presence of seasonal stressors as the DSM-IV-TR (APA, 2000) criteria specifiers that the seasonal changes could not be accounted for by seasonal stressors. Both SAD and S-SAD groups have to show no seasonal stressors.

*Hamilton Depression Rating Scale – 28 item*

*(HDRS-28; Rosenthal, Genhart, Jacobsen, Skwerer, & Wehr, 1987; see Appendix C)*

The HDRS-28 was used to assess the severity of depressive symptoms and classify participants on the depression dimension. The first 21 items assessed the typical or cognitive/affective symptoms, and the final 7 items assessed the atypical or vegetative symptoms. Each item on the HDRS-28 is rated on a 5-point scale that ranges from 0 (not at all) to 4 (marked or severely). An overall score summed across all 28 items that is 23 or greater (i.e., SAD and Depressed) was considered high whereas a score of 13 or less (i.e., S-SAD, Control) was considered low. The HDRS-28 is essentially the Self-Assessment Mood Scale for SAD (SAM-SAD, Rosenthal, 1993) that in turn, is adapted from the Structured Interview Guide for the Hamilton Depression Rating Scale - Seasonal Affective Disorder version (SIGH-SAD, William et al., 1988). The HDRS-28 was derived originally from the 21-item Hamilton Depression Rating Scale (Hamilton, 1960, 1967). In the present study, this 21-item scale is referred to as the HDRS-A. However, the original scale was considered to be inadequate for the assessment of SAD because it failed to consider the vegetative symptoms (Wirz-Justice & Anderson, 1990). Consequently, seven items (referred to in this study as the HDRS-B) relating to vegetative symptoms were added to expand the scale to the HRDS-28. In the present

study, the HDRS with 28-items is referred to as the HDRS-Total (HDRS-T). In a review of the psychometric properties of the HDRS-A, Bagby, Ryder, Schuller, and Marshall (2004) concluded that the majority of the scale items have adequate reliability and the scale has good test-retest reliability across studies (coefficients alpha range from .81 to .98).

#### *Dysfunctional Attitudes Scale*

*(DAS; Weissman, 1979; Weissman & Beck, 1978; see Appendix D)*

The DAS – Form A is a 40-item self-report questionnaire designed to measure enduring general negative attitudes in the respondent (see Appendix C). Items are presented as statements with which respondents are asked to rate their agreement on a 7-point scale. The scores range from 40-280. A high endorsement of a large number of items reflects maladaptive attitudes. The DAS demonstrates good internal consistency and test-retest reliability over an 8-week period ( $r = .84$ ; Dobson & Breiter, 1983; Weissman, 1979). It has been found to discriminate between depressed college students and clinically depressed individuals from non-depressed controls (Eaves & Rush, 1984; Hodges & Marks, 1998; Weissman, 1979). It has also differentiated individuals with SAD and nonseasonal nondepressed controls, although DAS scores did not differentiate seasonal from nonseasonal depression (Hodges & Marks, 1998).

#### *Mizes Anorectic Cognitions Scale - Revised*

*(MACS-R; Mizes et al., 2000; see Appendix E)*

The MACS-R was used to assess core cognitive factors in eating disorders. The original MACS (Mizes & Klesges, 1989) was a 33-item self-report inventory designed to

assess the beliefs and attitudes characteristic of individuals with anorexia and bulimia. Participants indicate the extent to which they agree with each statement by selecting a number from 1 (strongly agree) to 5 (strongly disagree). The MACS contained three subscales. First, Rigid Weight Regulation measures the belief that strict weight regulation is related to controlled eating and fears of weight gain. Items include “No matter how much I weigh, fats, sweets, bread, and cereals are bad food because they always turn into fat,” “When I eat desserts, I get fat. Therefore, I must never eat desserts so I won’t be fat,” and “If I can cut out all carbohydrates, I will never be fat.” Second, the Self-control and Self-esteem subscale (hereafter referred to as Self-Control) measures the belief that restrained eating is related to a sense of accomplishment and self-worth. Items include “I am proud of myself when I control my urge to eat,” “If my weight goes up, my self-esteem goes down,” and “When I am overweight, I am not happy with my appearance.” Third, the Weight and Approval subscale measures the belief that weight and appearance are the basis for judgment by others. Items include “No one likes fat people; therefore, I must remain thin to be liked by others,” “How much I weigh has little to do with how popular I am” (reverse scored), and “People like you because of your personality, not whether you are overweight or not (reverse scored).”

The MACS has been shown to discriminate between clinical and non-clinical groups (Mizes, 1988), between eating disordered and psychiatric controls (Mizes, 1992), as well as between those who do or do not place a great deal of emphasis on weight and its regulations (Mizes, 1991). The MACS correlates significantly with the Eating Attitudes Test (Garner et al., 1982), and irrational thoughts assessed by the Rational

Behaviour Inventory (Mizes, 1991) as well as subjective measures of ideal weight, and Ruff and Barrio's subjective body image index (Mizes & Klesges, 1989). Acceptable internal consistency for the MACS (coefficient alpha = .91) and its subscales (.89, .78, and .75 for Rigid Weight Regulation, Self-Control, and Weight and Approval, respectively; Mizes & Klesges, 1989) and test-retest reliability ( $r = .78$ ; Mizes, 1991) has been reported for the overall measure (i.e., summation of all three scales). In a sample of undergraduate students, Osman, Chiros, Gutierrez, Kopper, and Barrios (2001) also found acceptable internal consistencies (Self-Control, coefficient alpha = .89; Rigid Weight Regulation, coefficient alpha = .75; Weight and Approval, coefficient alpha = .72; and overall score, coefficient alpha = .90).

To address the low internal consistency results for the Weight and Approval scale, the MACS developers administered 24 new items to 205 eating disordered patients from five eating disordered programs (Mizes et al., 2000). Factor analysis of the large pool of items and item reduction resulted in a final 24-item version, the MACS-Revised (MACS-R; Appendix D), which is used in the present study. Reliability was improved in the MACS-R, including the total score (coefficient alpha = .90), Self-Control (coefficient alpha = .84), Weight and Approval (coefficient alpha = .85), and Rigid Weight Regulation (coefficient alpha = .82). As a measure of criterion-related validity, the Self-Control subscale discriminated the most between empirically defined subclinical eating disorders and control participants (Bonifazi, Baker, Crowther, & Mizes, 1992) whereas the original MACS did not.



*Physical Health Scale (PHS; Yardley, Zarebski, & Goodstadt, 1996; see Appendix F)*

The Physical Health Scale was derived from the Youth Leisure Survey (Yardley et al., 1996), which assessed the substance use, recreational activities, and general functioning of youth in high schools across Ontario, Canada. The questionnaire has been changed in this study in order to be used in general adult populations, by removing references to “school” activities. This measure asks questions related to a person’s involvement in individual and team activities that are of low, medium, and high intensity. Individual activities refer to activities that are performed individually, such as running, in-line skating, and aerobics. Team activities refer to sports performed in a group such as soccer, hockey, and curling. High-intensity physical activities involve heavy perspiration, heavy breathing, and few rests. Medium-intensity activities involve some perspiration, faster than normal breathing, and some rests. Low-intensity activities involve little perspiration, normal breathing, and plenty of rests. Thus, the survey asks questions related to six different types of physical activities: low-intensity individual, medium-intensity individual, high-intensity individual, low-intensity team, medium-intensity team, and high-intensity team.

An individual’s involvement in each of the six aforementioned physical activities is measured in three ways as reflected by three survey parts. Part A measures how often (referred to hereafter as *frequency* of physical activity) in the last month the respondent has participated in each of the six types of physical activities. The respondent answers each question on a 7-point Likert scale where 0 = not at all, 1 = less than once a month, 2 = 1-3 times a month, 3 = once a week, 4 = 2-3 times a week, 5 = 4-6 times a week, and 6

= every day.

Part B measures on the average, the duration of time (in hours) the respondent engages in each type of physical activity (referred to hereafter as *duration* of physical activity). This would yield the following variables: Duration of High-intensity Individual, Duration of Medium-Intensity Individual, Duration of Low-Intensity Individual, Duration of High-Intensity Team, Duration of Medium-Intensity Team, and Duration of Low-Intensity Team. To facilitate data analyses, the respondent's number of hours was converted to minutes.

For the purpose of the present study, an additional duration variable (Average Duration) was derived to assess on the average, how much time the respondent engaged in physical activities. Hence Average Duration was calculated as the average of duration times across all six types of physical activity. Its computational formula is Average Duration = (Duration of High-intensity Individual + Duration of Medium-Intensity Individual + Duration of Low-Intensity Individual + Duration of High-Intensity Team + Duration of Medium-Intensity Team + Duration of Low-Intensity Team) / 6.

Part C measures changes in participation level for each type of physical activity over the past year (referred to hereafter as *change* of physical activity). Participants circled their response from one of three options: Increased, Decreased, or Stayed the Same. Hence, Part C yielded six change variables, namely Change in High-Intensity Individual, Change in Medium-Intensity Individual, Change in Low-Intensity Individual, Change in High-Intensity Team, Change in Medium-Intensity Team, and Change in Low-Intensity Team.

In summary, the Physical Health Scale yielded six *frequency* variables, six *duration* variables and six *change* variables to cover the six types of physical activity delineated jointly by whether it was a team or individual activity, and whether it was a low-, medium-, or high-intensity activity. An additional variable called Average Duration was computed to determine the average duration of time spent across all six types of physical activity. Table 2 lists a description of each of the physical activity variables used.

*Sociotropy-Autonomy Scale – Revised*

*(SAS-R; Clark, Steer, Beck, & Ross, 1995; see Appendix G)*

The SAS-R is a self-report measure used to measure interpersonal context-specificity and consists of 59 items of which 30 load on the Autonomy dimension and the remaining 29 items on the Sociotropy dimension. The Autonomy dimension is assessed with two subscales: Solitude (13 items) and Independence (17 items). The items on the Autonomy dimension reflect achievement orientation, concern with the possibility of personal failure, and maximization of control over the environment (e.g., “When I have a problem, I like to go off on my own and think it through rather than being influenced by others,” “I tend to be direct with people and say what I think.” The items on the Sociotropy scale assesses the degree of investment in positive interactions with others, with highly sociotropic individuals placing excessive value on close interpersonal relationships and believing they must be loved and accepted by others (e.g., “Being able to share experiences with other people makes them much more enjoyable for me,” “It is important to be liked and approved of by others”). Respondents are asked to indicate

what percentage of time each item applies to him or her: 0%, 25%, 50%, 75%, or 100%. Internal consistency is adequate for the three subscales: Sociotropy (Cronbach's alpha = .88), Solitude (Cronbach's alpha = .78), and Independence (Cronbach's alpha = .74, Clark et al., 1995).

### *Response Style Questionnaire*

*(RSQ, Nolen-Hoeksema & Morrow, 1991; see Appendix H)*

The RSQ contains 41 items designed to assess dispositional coping styles to depressive episodes (Nolen-Hoeksema, 1990). It is composed of four subscales that assess Ruminative coping (22 items), Distractive coping (11 items), Problem-Solving coping (4 items), and Dangerous Activities coping (4 items). The Rumination Scale assesses the tendency to focus on self, symptoms, and possible causes and consequences of depressive mood (Cronbach's alpha = .89, Nolen-Hoeksema & Morrow, 1991). The Distraction Scale included items designed to assess the tendency to engage in pleasant and benign distractive activities in response to a depressed mood (Cronbach's alpha = .80, Nolen-Hoeksema & Morrow, 1991). The Dangerous Activities Scale assesses the tendency to engage in reckless or dangerous activities in response to the participant's depressive symptoms. The Problem Solving Scale describes actively solving problems that were related to the participant's depressive symptoms. Empirical evidence indicates that the RSQ shows acceptable test-retest reliability (test-retest correlation = .67 for Rumination Scale; Nolen-Hoeksema, 2000) and predictive validity (Nolen-Hoeksema, 2000).

*Winter Stress Scale (WSS; Dew & Tan, 2003; see Appendix I)*

The WSS was developed to investigate winter-stress appraisal including the respondent's dread of winter (item 1), stressfulness of vegetative symptoms during the winter (item 2), degree of impairment caused by the vegetative symptoms experienced during the winter (item 3), rumination strategy used to cope with the winter atypical symptoms (item 4), and psychological stress in the winter/fall (item 6; Dew & Tan, 2003). Explanations of each item are described below.

*Item 1: dread of winter (W-Dread).* This item assessed the participant's dread of winter on a 5- point Likert scale: 1 = not of all, 2 = a little, 3 = moderately, 4 = very, and 5 = extremely. Higher scores were reflective of greater levels of dread.

*Item 2: stress associated with winter atypical symptoms (W-Atypical).* W-Atypical measures the degree of stress that a person experiences related to the changes in vegetative symptoms (i.e., carbohydrate craving, weight loss, energy loss, increased sleep, and other) during the winter. The participant is requested to rate the stressfulness of each vegetative symptom on a 5-point Likert scale: 0 = does not apply, 1 = not stressful at all, 2 = quite stressful, 3 = moderately stressful, 4 = very stressful, and 5 = extremely stressful. Participants are also given an opportunity to write additional information about any changes in vegetative symptoms during the winter months.

*Item 3: impairment during winter (W-Impair).* W-Impair measured the degree of impairment caused by the winter vegetative symptoms. Specifically, the item inquired about how winter changes in vegetative symptoms interfere with the participant's ability to cope with daily life difficulties. Respondents were asked

to respond on a 5-point Likert scale: 1 = not at all, 2 = a little, 3 = moderately, 4 = very, and 5 = extremely.

*Item 4: ruminative coping style in winter (W-Ruminate).* W-Ruminate was measured by six questions that assessed the participant's endorsement of a rumination coping strategy during fall/winter [i.e., During the winter, I find myself thinking about how any changes in mood and behaviour that I experience may (or actually do) affect my life]. Each question was rated on a 5-point Likert scale (i.e., 1 = never, 2 = rarely, 3 = sometimes, 4 = often, and 5 = always). The six questions were totaled to create the W-Ruminate score. These questions were based on Nolen-Hoeksema's (1987) theory that people experiencing depression tend to ruminate on the negative and engage in wishful thinking, which may in turn maintain or exacerbate their depression.

*Item 6: Winter Perceived Stress Scale (WPSS).* The WPSS, which was based on the Perceived Stress Scale (PSS, Cohen, Kamarck, & Mermelstein, 1983), measured the extent to which the respondent felt life to have been more unpredictable, uncontrollable, and unmanageable in the fall/winter than usual. The questions in the WPSS were almost identical to the PSS with the exception of two differences. While the PSS used a frequency scale of measurement (i.e., how often), the WPSS measured the degree of impairment with the statement on a 5-point scale. The time frame assessed by the PSS was within the last month whereas the WPSS compared the fall/winter functioning of the respondent against his/her usual functioning. The PSS has been found to predict psychological outcomes

independently of psychopathology and its predictive validity has been supported (Cohen, 1986; Cohen et al., 1983). Item 6 has eight questions that were negatively worded (questions a, b, c, h, i, k, l, and n) and six questions that were positively worded (questions d, e, f, k, and m) and needed to be reverse-scored. Ratings across the fourteen items were then summed, after the appropriate reverse scoring had been performed. Higher summed scores reflected greater perceived stress in the fall/winter.

*Eating Attitudes Test - 26 (EAT-26; Garner & Olmstead, 1984; see Appendix J)*

The EAT-26 is a self-report questionnaire that provides an overall assessment of eating behaviour by examining the broad range of symptoms found in the eating disorders. High scores indicate maladaptive eating behaviours but are not synonymous with a diagnosis of an eating disorder. Participants indicate how often they engage in the behaviour by selecting one of the following responses: 3 = always, 2 = usually, 1 = often, and 0 is used for three different nondisordered responses, namely sometimes, rarely, or never.

The EAT-26 contains three subscales. First, the bulimia and food preoccupation (Bulimia) subscale refers to the preoccupation with thoughts about food and attempts to vomit food during a binge. Items include “Find myself preoccupied with food,” “Have gone on binges where I feel I may not be able to stop,” and “Vomit after I have eaten.” Second, the Oral Control subscale describes attempts to maintain self-control while eating and the perceived pressure from others to gain weight. Items include “Avoid eating when I am hungry,” “Feel others would prefer that I ate more,” and “Other people

think I'm too thin." Third, the Dieting subscale describes the preoccupation with being thinner and avoidance of fattening foods. Items include "Feel extremely guilty after eating," "Am preoccupied with a desire to be thinner," and "Engage in dieting behaviours." The EAT-26 has been found to have acceptable reliability ( $\alpha = .76$  and  $.89$ , for males and females, respectively; Koenig & Wasserman, 1995). It has been used with Canadian participants (Johnson & Bedford, 2004). For a review of the psychometric properties of the EAT-26 see Garfinkel and Newman (2001) and Garner, Olmsted, Bohr, and Garfinkel (1982).

*Self-Report Measure of DSM-IV-TR Major Depressive Episode, Current*

*(see Appendix K)*

This measure was used in the exploratory analyses, where in addition to the above mentioned classification criteria (see Table 1), seasonal and nonseasonal depression met the diagnostic criteria for current major depressive episode as defined by the DSM-IV-TR (APA, 2000). This 23-item measure was created by Dew and Tan (2003). 19-items were based on the DSM-IV-TR criteria for a Major Depressive Episode. The first 19-items inquire about a specific DSM-IV-TR depressive symptom (e.g., "In the past 2 weeks, I have experienced an increase in appetite"; "In the past 2 weeks, nearly every day, I have been sleeping too much"). Response options for each question are "yes" or "no." An additional 4-items were included to assess impairment of presenting depressive symptoms (e.g., effect work, social, personal, and family functioning), and exclusionary criteria of depressive symptoms due to the death of someone or something close to you, a medical condition, or the use of medication, drugs, or alcohol. Keeping in line with the



DSM-IV diagnostic criteria, in order for an individual to be diagnosed with a major depressive episode, an individual has to answer yes to either Item 1 (“In the last two weeks nearly every day, I have felt sad, blue, or depressed”) or Item 2 (“In the last two weeks I have lost all interest in things like work or hobbies or thing I usually like to do for fun”). As well, an individual would have to respond “yes” to five or more major depressive symptoms (items 3 to 19), and report the symptoms to be an impairment on their life.

#### Procedure

Prior to recruiting participants, ethical approval was obtained from the Lakehead University Research Ethics Board. Participants in this study were recruited during the winter months (January to March). To recruit university students, the experimenter spoke to them in class after obtaining approval from the instructor. The study was presented as an investigation into the emotional, cognitive, and behavioural experiences of people during the wintertime. Information regarding informed consent (see Consent Form, Appendix L) was disclosed. Those who were interested in the study were given the measures to complete outside of class time and drop them off in a collection box in the Psychology Main Office. Introductory Psychology students were given one bonus point towards their course marks for their participation. Non-Introductory Psychology students and Introductory Psychology students who had already collected the maximum number of bonus points in their course were entered into three \$100 random prize draws.

To recruit nonstudent members of the university community, a notice regarding the study (see Appendix M) was emailed out to them via the Community Bulletin, a

weekly university-wide email that describes events occurring in the university. Those who responded were sent the measures along with a cover letter providing them with details of the study (see Appendix N). The completed measures were mailed back to the experimenter or dropped off in the collection box in the Psychology Main Office.

To access the community, physicians were mailed letters (see Appendix O) along with six copies of the recruitment poster (see Appendix M). The letter presented the study and asked the physicians to place the poster in their reception room so that their patients can be made aware of the study. As well, the posters were featured on the community channel of the local cable television (i.e., Shaw Cable), in the Chronicle Journal, and in public places such as grocery and convenience stores.

Individuals who were interested in the study were directed to contact the experimenter who informed them of the study and obtained verbal informed consent. Copies of the measures were mailed out to them along with a cover letter (see Appendix N), a consent form (see Appendix L), and a postage-paid return envelope for them to return their questionnaires. Community participants were entered into the three \$100 random prize draws.

For all participants, they received a copy of the summary of results upon request. Furthermore, they also received a debriefing form and a list of counseling/therapy resources in the community (see Appendix P). They were given the telephone number of the experimenter should they have any questions. The supervisor of the project was also available for consultation and assistance should the need arise.

## RESULTS

### Design

The study involved a two-way factorial design with Group (SAD, Depressed, S-SAD, Control) and Sex (male, female) as the independent variables. The dependent variables included eating cognitions, eating behaviours, response styles to depressed mood, interpersonal context-specificity, winter-stress appraisal, and physical activity levels (described below).

1. Eating cognitions were measured by the three subscales of the MACS-R: Rigid Weight Regulation, Self-control and Self-esteem (Self-Control), and Weight and Approval.
2. Eating behaviours were assessed by the three subscales of the EAT-26: Bulimia and Food Preoccupation (Bulimia), Oral Control, and Dieting.
3. Response style to depressed mood was measured by the four subscales on the RSQ: Rumination, Distraction, Problem-Solving, and Dangerous Activities.
4. Interpersonal context-specificity was measured by the four subscales of the SAS-R: Sociotropy, Autonomy, Solitude, and Independence.
5. Winter stress appraisal was measured the WSS and included the following variables: perceived dread of winter (W-Dread), perceived stressfulness of atypical depressive symptoms (W-Atypical), perceived impairment associated with the experience of atypical symptoms during the winter (W-Impair), ruminative coping style specifically associated with winter (W-Ruminate), and perceived ability to cope with winter, as measured by the Winter Perceived Stress

Scale (WPSS).

6. General negative attitudes were measured by the Dysfunctional Attitudes Scale.
7. Physical health was measured by 19 variables derived from the Physical Health Scale. Of these, six related to frequency of participation in different physical activities and were named Frequency of High-Intensity Individual, Frequency of Medium-Intensity Individual, Frequency of Low-Intensity Individual, Frequency of High-Intensity Team, Frequency of Medium-Intensity Team, and Frequency of Low-Intensity Team. Another six variables related to the duration of participation in different physical activities, and were labeled Duration of High-Intensity Individual, Duration of Medium-Intensity Individual, Duration of Low-Intensity Individual, Duration of High-Intensity Team, Duration of Medium-Intensity Team, and Duration of Low-Intensity Team. One variable, Average Duration, which was derived for the present study, measured the average duration of time spent across all the different types of physical activity. The final six variables assessed the change in participation in different physical activities within the last year, and were referred to as Change in High-Intensity Individual, Change in Medium-Intensity Individual, Change in Low-Intensity Individual, Change in High-Intensity Team, Change in Medium-Intensity Team, Change in Low-Intensity Team.

Analyses were also done on the two subscales of the Hamilton Depression Rating Scale: HDRS-A and HDRS-B. As discussed above, this was done because in the main analyses, the total HDRS scores was used to define the different groups used in the study

(i.e., SAD, Depressed, S-SAD, Control). Research has shown that the two subscales, atypical (vegetative) and typical (cognitive/affective) symptoms may differentiate the groups as well, and for this reason were used in the exploratory analyses.

Exploratory analyses were also completed on a subset of participants who met the DSM-IV-TR criteria for Major Depressive Episode, Current, in the SAD and Depressed groups. The individuals in the S-SAD and Control groups were matched on sex and age against the individuals in the clinical SAD and clinical Depressed groups. The exploratory analyses undertaken with these four groups focused on the same dependent variables that were in the main study, namely eating cognitions and behaviours, winter-related stress, physical activity levels, general negative attitudes, interpersonal context-specificity, and response style to depressed mood. The difference between these exploratory analyses and the main analyses is that due to insufficient number of males in the clinical Depressed group, sex of participants was excluded as a factor in the exploratory analyses.

### Sample Description

A total of 318 individuals were recruited from Lakehead University student and non-student (i.e., community and Lakehead University faculty, and staff) populations. Of these, 179 (Age  $M = 26.30$ , Age  $SD = 11.17$ ) met the seasonality and depression inclusion criteria of the four groups as specified previously in Table 1. Descriptive statistics of the seasonality (GSS) and depression (HDRS) factors are presented in Table 3. The remaining 139 participants who did not meet the inclusion criteria were excluded from all the analyses.

Overall, there were 46 males (age  $M = 26.65$ , age  $SD = 10.26$ ) and 133 females (age  $M = 26.17$ ,  $SD = 11.51$ ). There were 141 student (age  $M = 22.01$ ,  $SD = 6.31$ ) and 38 non-student (age  $M = 42.18$ ,  $SD = 10.99$ ) participants. The respondents were categorized into SAD ( $n = 67$ ; age  $M = 30.73$ , age  $SD = 13.56$ ), Depressed ( $n = 30$ ; age  $M = 23.67$ , age  $SD = 8.56$ ), S-SAD ( $n = 24$ ; age  $M = 26.25$ , age  $SD = 9.65$ ), and Control ( $n = 58$ ; age  $M = 22.55$ , age  $SD = 7.81$ ) groups. The SAD group had 13 males and 54 females, as well as 43 university students and 24 non-student participants. Depressed had 8 males and 22 females, and 21 students and 3 non-student participants. S-SAD had 7 males and 17 females, and 25 student and 5 non-student participants. Finally, the Control group had 18 males and 46 females, including 52 students and 6 non-students. A detailed description of the cell sizes, means, and standard deviations are presented in Table 4.

An ANOVA performed on HDRS-T as a function of Group revealed a significant Group effect,  $F(3, 166) = 140.62$ ,  $p < .001$ ,  $\eta^2 = .72$ , power  $< .99$ . Post-hoc Tukey test showed that SAD ( $M = 41.80$ ,  $SD = 1.30$ ) scored higher than Depressed ( $M = 34.04$ ,  $SD = 1.99$ ), S-SAD ( $M = 9.25$ ,  $SD = 2.03$ ), and Control ( $M = 7.71$ ,  $SD = 1.31$ ). As well, Depressed scored higher than S-SAD and Control. All other mean comparisons were nonsignificant.

An ANOVA performed on GSS as a function of Group revealed a significant Group effect,  $F(3, 177) = 230.44$ ,  $p < .001$ ,  $\eta^2 = .80$ , power  $< .99$ . Post-hoc Tukey test showed that SAD ( $M = 16.90$ ,  $SD = 2.99$ ) scored significantly higher than Depressed ( $M = 7.20$ ,  $SD = 2.44$ ), S-SAD ( $M = 13.36$ ,  $SD = 2.01$ ), and Control ( $M = 5.33$ ,  $SD = 2.45$ ). S-SAD scored higher than Depressed and Control, and Depressed scored higher than

Control. All other mean comparisons were nonsignificant.

A chi-square analyses between Group and Background Affiliation (i.e., student, non-student) indicated a significant relationship between these variables,  $\chi^2(3) = 14.11, p = .003$ . An examination of group percentages indicated that the SAD group had a greater percentage of non-student (36%) participants than the other three groups (i.e., Depressed, 17%; S-SAD, 13%; Control, 10%).

An ANOVA was conducted on Age as a function of Group (i.e., SAD, Depressed, S-SAD, Control), Sex (i.e., male, female), and Background Affiliation (i.e., students, nonstudents). The results revealed a significant Background Affiliation main effect,  $F(1, 163) = 91.81, p < .001, \eta^2 = .36, \text{power} < .99$ . An examination of the cell means showed that the non-students ( $M = 42.18, SD = 10.99$ ) were significantly older than the students ( $M = 22.01, SD = 6.31$ ).

#### Software Used in the Statistical Analyses

The computerized statistical program, Statistical Package for the Social Sciences - Version 11.0 (SPSS-11.0), was used in both the pre-analyses issues (see section titled *Pre-analysis Issues* below) and main analyses (see section titled *Main Analyses*) that included Multivariate Analyses of Variance, (MANOVA), Discriminant Function Analysis (DFA), Analyses of Variance (ANOVA), Chi-Square analyses, and Principal Components Analysis (PCA).

#### Overview of the Analyses

##### *Multivariate Analyses of Variance (MANOVA)*

Separate 4 (Group: SAD, Depressed, S-SAD, Control) by 2 (Sex: male, female)

factorial MANOVAs were conducted on the following sets of dependent variables:

1. three MACS-R subscales: Self-Control, Weight and Approval, and Rigid Weight Regulation
2. three EAT-26 subscales: Dieting, Bulimia, and Oral Control
3. four RSQ scales: Rumination, Distraction, Problem-Solving, and Dangerous Activities.
4. four SAS-R scales: Sociotropy, Solitude, Independence, and Autonomy.
5. two WPSS factors: Negative Affect and Perceived Ability to Cope (described below).

The primary reason that MANOVA was utilized in the present study was to control for inflated Type I error (Tabachnick & Fidell, 2001, p. 323) given that multiple dependent variables consisting of possibly correlated subscales within a scale were analyzed. Pillai's trace was chosen as the multivariate statistic to identify significant omnibus multivariate effect because it is the most robust criterion to violation of the homogeneity of the variance-covariance matrices assumption and can be used in cases of unequal group sizes (Tabachnick & Fidell, 2001, p. 348). It is also noted that by default the SPSS MANOVA program adjusts for unequal cell group sizes (Tabachnick & Fidell, 2001, p. 356), and it is not encouraged to artificially equalize group sizes, as this may distort the differences and decrease generalizability of findings (Tabachnick & Fidell, 2001, p. 47). The strength of association between the set of independent variables and set of dependent variables was denoted by  $\eta^2$ , the proportion of variance accounted for in the linear combination of dependent variables (i.e., the proportion of variance in the linear



combination of the DVs that is associated with group or sex differences (Tabachnick & Fidell, 2001, p. 338-339). Observed power was also reported.

Significant multivariate effects were followed-up with two types of tests to determine the dependent variables that contributed to group discrimination. The first test is the Discriminant Function Analyses (DFA), which investigates whether the combination of dependent variables can be used to predict group membership (Tabachnick & Fidell, 2001). It yields loading scores, which are the correlations between the predictors (dependent variables) and discriminant functions (the linear combination of dependent variables that maximally separates the groups). The loading matrices were examined where the dependent variables with loadings of .33 or greater were interpreted (Tabachnick & Fidell, 2001, p. 485) to determine their relative importance to group discrimination. The advantage of using DFA is that it is robust to unequal sample sizes (Tabachnick & Fidell, 2001, p. 324). While MANOVA determines whether the groups' mean differences on the combined dependent variables occur on a level smaller than expected by chance, DFA asks if there is one or more linear combination of dependent variables that can separate the groups reliably.

The second test is the univariate  $F$ -tests with a Bonferroni-type split to protect against Type I error. The important dependent variables are those that have significant univariate  $F$ 's, (Tabachnick & Fidell, 2001, p. 348). However, because the individual dependent variables within a set may be correlated with one another, alpha ( $\alpha$ ) levels that are more stringent than the standard .05 level are used. Utilizing the Bonferroni-type split approach, the standard  $\alpha$ -level of .05 is divided by the number of dependent

variables to arrive at the more conservative level that is then used to evaluate for significance of results. For example, the  $\alpha$ -level to evaluate the significance of univariate  $F$ -tests for response style to depressed mood (RSQ) that contains four subscales (e.g., Rumination, Distraction, Problem Solving, and Dangerous Activities) would be  $.05/4 = .0125$ . Thus, a subscale would be evaluated against an alpha level of .0125 and would be deemed important if it obtains a  $p$ -value less than .0125. Tabachnick and Fidell (2001) note that the interpretation of MANOVAs solely through univariate ANOVAs is not recommended because the procedure assumes that pooled within-group correlations among dependent variables are zero, which is usually not the case. For this reason, other procedures were used to test the relative importance of the dependent variables such as DFA (described above). It should be noted that although the Roy-Bargmann Stepdown Analysis can be used to address correlated dependent variables, it was not adopted in the present study because the dependent variables could not be assigned on a prior theoretical or practical importance.

Post-hoc tests were also conducted as a follow-up to significant multivariate effects. After determining which dependent variables contributed to group discrimination, post-hoc Tukey's HSD test, which is a means pairwise comparison test that is used to detect groups that may differ from each other on specific dependent variables (Tabachnick & Fidell, 2001, pp. 484-488) was used. It is preferred over other post-hoc procedures because of its power in pairwise comparisons and ability to maintain familywise error rate. Familywise error rates refer to the probability of making one or more Type 1 errors when making a set of pairwise comparisons. Also, the Tukey test is

the most conservative pairwise comparison test, in that it exercises the greatest control over the erroneous rejection of the null hypothesis.

#### *Univariate Analyses of Variance (ANOVA)*

Separate 4 (Group: SAD, Depressed, S-SAD, Control) by 2 (Sex: male, female) factorial ANOVAs were conducted on the following individual dependent variables: W-Dread, W-Atypical, W-Impair, W-Ruminate, Dysfunctional Attitudes, and seven physical activity variables (i.e., Duration of High-Intensity Individual, Duration of Medium-Intensity Individual, Duration of Low-Intensity Individual, Duration of High-Intensity Team, Duration of Medium-Intensity Team, Duration of Low-Intensity Team, Average Duration of Physical Activity). The strength of association between the independent variables and the dependent variables was indicated by  $\eta^2$  (Tabachnick & Fidell, 2001, p. 52). The observed power was also reported. Post-hoc Tukey HSD comparison test was used to follow up on significant main effects and interactions (i.e., Group by Sex) to determine how the groups differ from each other.

#### *Principal Components Analysis and MANOVA*

A Principal Components Analysis was performed on the Perceived Winter Stress Scale to determine the number of underlying components. A Group x Sex MANOVA was then performed on the principal components derived in accordance to the procedures outlined above for MANOVAs.

#### *Log-Linear and Chi-Square Analyses*

To analyze the data for the physical activity variables relating to the frequency and change in physical activity, Log-Linear Analysis, which is an extension of Multiway

Frequency Analysis, was initially considered as a possible statistical technique because all the variables to be analyzed (Group, Sex, frequency of physical activity variables, change in physical activity variables) were categorical in nature (Tabachnick & Fidell, 2001, p. 219). Log-Linear Analysis is recommended over several two-way Chi-Square analyses because the Chi-Square analyses do not detect three-way or higher interactions and do not simultaneously detect pairwise relationships (Stevens, 2001).

However, to use Log-Linear Analysis, the number of cases should be five times that of the number of cells in the research design (Tabachnick & Fidell, 2001, p. 223). Calculations were undertaken to see if this requirement was met for both the frequency and change physical activity variables. For the frequency of physical activity variables, the present study has 56 cells (= 4 Groups x 2 Sex x 7 response options for frequency variables) where the seven response options were not at all, less than once a month, 1-3 times a month, once a week, 2-3 times a week, 4-6 times a week, and every day. To meet the requirement of a sample size that exceeds the number of cells by five fold, this present study would require 280 subjects (= 56 cells x 5). The available sample size of 179 falls short of the required 280. Hence, a 2 way (Group x response options) chi-square analyses were utilized to analyze the data for frequency of physical activity to determine whether there was an association between Group and the response options for frequency of physical activity. To ascertain whether male and females differed in the frequency of their physical activity, a second 2-way (Sex by Response options) chi-square analysis was undertaken. Finally, to investigate the interaction effect of Group by Sex to determine whether the males and females in the groups differed on the frequency

of physical activity, seven separate 2-way (Group by Sex) chi-square analyses were undertaken at *each* level of the response options. This pattern of conducting chi-square analyses was repeated for all the types of physical activity, namely low-intensity individual, medium-intensity individual, high-intensity individual, low-intensity team, medium intensity team, and high-intensity team.

For the change in physical activity variable, the present study has 24 cells (= 4 Group x 2 Sex x 3 response options for change variables) where the response options were increased, decreased, and stayed the same. This sample size meets the requirement of Log-Linear Analysis, as it exceeds the requirement of 120 participants (computed as 24 cells x 5 = 120). However, since Log-Linear analysis is a test between observed and expected frequencies, a requirement is that expected frequencies are large enough (Tabachnick & Fidell, 2001). It is required that the expected frequencies for all two-way associations are all greater than one, and that no more than 20% are less than five. Inadequate expected cell frequencies can drastically reduce power. An examination of expected cell frequencies comparing the two-way associations between the levels of Group, Sex, and each change in physical activity variable indicated that approximately 50% of the expected cell frequencies were less than five. Thus, this requirement for Log-Linear analysis was not met and Log-Linear analysis was not completed. Hence, similar to the physical activity variables relating to the frequency of physical activity (described above), 2 way (Group x response options) chi-square analyses were utilized to analyze the data for change of physical activity to determine whether there was an association between Group and the response options for change of physical activity. To ascertain

whether male and females differed in the change of their physical activity, a second 2-way (Sex by Response options) chi-square analysis was undertaken. Finally, to investigate the interaction effect of Group by Sex to determine whether the males and females in the groups differed on the change of physical activity, three separate 2-way (Group by Sex) chi-square analyses were undertaken at *each* level of the response options (increase, decrease, stayed the same). This pattern of conducting chi-square analyses was repeated for all the types of physical activity, namely low-intensity individual, medium-intensity individual, high-intensity individual, low-intensity team, medium intensity team, and high-intensity team.

#### *Pre-analysis Issues*

##### *Missing Data*

Missing values on the variables that defined the groups (i.e., HDRS-Total, GSS, impairment over the last two years) were handled by substituting the grand or overall mean value for that item (Tabachnick & Fidell, 2001, p. 62). Overall mean values were generated by the SPSS Replace Missing Values Procedure. Missing values on the remaining dependent variables were substituted by the group (i.e., SAD, Depressed, S-SAD, Control) mean values. Each group mean value was calculated manually and substituted into missing dependent variables.

##### *Internal Consistency of Scales*

Table 5 reports the Cronbach's alpha, a measure of internal consistency, for the scales of the measures used in the study. Cronbach's alpha measure how well a set of items measure a single unidimensional construct. Acceptable Cronbach's alpha are

greater than 0.70 (Nunnally, 1978). With the exception of two SAS-R subscales, Dangerous Activities (Cronbach's alpha = .55) and Problem-Solving (Cronbach's alpha = .48), all subscales had a Cronbach's alpha of above .68 with the majority being above .80.

#### *Univariate Outliers*

Univariate outliers are cases with an extreme value on one variable. According to Tabachnick and Fidell (2001, p. 67), within-group univariate outliers, defined as cases with standardized scores greater than  $z = \pm 3.29$ , should be identified and their raw scores recoded to one unit larger than the next most extreme score in their distribution (p. 71). In the present study, no univariate outliers were identified.

#### *Multivariate Outliers*

Multivariate outliers are cases with an unusual combination of scores on two or more values (Tabachnick & Fidell, 2001, p. 67). Within-group multivariate outliers were identified using Mahalanobis distance and Cook's D. Mahalanobis distance refers to the distance from the centroid of all remaining cases within a group is greater than a critical value defined by a  $\chi^2$  critical value (Tabachnick & Fidell, 2001, p. 68). This critical value is dependent upon the group size, number of dependent variables involved, and the alpha level and can be looked up in a table provided by Stevens (1986, p. 93). The Cook's D procedure identifies a multivariate outlier with a Cook's distance greater than 1.00 (Stevens, 2001). These cases are considered outliers by virtue of their influence and deviancy when compared against the other cases within the group (Tabachnick & Fidell, 2001, p. 69). In the present student, a multivariate outlier was identified as a case that exceeded both the critical value for the Mahalanobis distance and Cook's D, and would

be deleted if found. However, no multivariate outliers were found, and thus, no cases were deleted.

#### *Principal Components Analysis (PCA)*

A PCA with varimax rotation was performed on the WPSS that measured perceived winter stress. This was done to determine whether the modified items constituting the WPSS demonstrated similar factor properties to those evidenced in the original Perceived Stress Scale (PSS; Hewitt, Flett, & Mosher, 1992; Pbert, Doerfler, & DeCosimo, 1992). As well, using PCA in this study may support the two-factor solution suggested by Dew and Tan (2003) when the researcher used PCA on the WPSS. A demonstrated factorial similarity between the two scales would suggest that the interpretation offered by previous researchers would apply to both scales.

The results from the WPSS were similar to the PSS reported by Pbert et al. (1992) and Hewitt et al. (1992) and to the WPSS reported by Dew and Tan (2003). In the present study, there were two factors, each accounting for 40% and 23% of the variance, respectively (see Table 6). As in the PSS, Factor One was composed of items related to negative affect and Factor Two consisted mainly of perceived ability to cope with stressors. Dew and Tan (2003) interpreted Factor One on the WPSS as Negative Affect occurring during the fall or winter and Factor Two as Perceived Ability to Cope with stressors occurring during fall or winter. Examples of items that loaded on Negative Affect were “I get more upset than usual because of something that happened unexpectedly,” and “I feel more nervous and “stressed” than usual.” Examples of items that loaded on Perceived Ability to Cope were “I am less able to cope than usual with



things that I have to do,” and “I am more confident than usual about my ability to handle my personal problems,” which is reverse scored.

#### *Multicollinearity and Singularity*

Multicollinearity and singularity were examined through correlation matrices of dependent variables for correlations in excess of .90 (Tabachnick & Fidell, 2001 pp. 82-83). As can be seen from Table 7 (Pearson correlations between continuous variables) and Table 8 (Spearman correlations between discrete variables), only one case involving multicollinearity and singularity was found. There was a correlation of  $r(179) = .91, p < .001$  between the WPSS and one of its components/factors, namely Negative Affect. Since the WPSS score was not used in this study (as mentioned above), and instead was analyzed using its two factors, this case of multicollinearity was not relevant.

#### *Main Analyses*

The within-cell descriptive statistics of the dependent variables are presented in Tables 9 to 15 and depicted in Figures 2 to 15. The results of the statistical analyses are discussed below.

#### *Mizes Anorectic Cognition Scale-Revised*

A MANOVA carried out on the three MACS-R scales namely, Self-Control, Weight and Approval, and Rigid Weight Regulation, showed a significant omnibus multivariate Group effect,  $F(9, 513) = 2.88, p = .002, \eta^2 = .05, \text{power} = .97$ . DFA showed one significant discriminant function,  $\chi^2(9) = 34.63, p < .001$ , that accounted for 97% of the between group variability. The loading matrix indicated that Self-Control (loading = .93), Rigid Weight Regulation (loading = .67), and Weight and Approval

(loading = .59) contributed to the linear combination separating the groups. Univariate  $F$ -tests, each evaluated at  $\alpha = .0167$  to keep the overall Type I error rate at  $\alpha = .05$ , revealed that Self-Control [ $F(3, 171) = 8.46, p < .001, \eta^2 = .13, \text{power} = .99$ ] and Rigid Weight Regulation [ $F(3, 171) = 3.52, p = .016, \eta^2 = .06, \text{power} = .78$ ] contributed significantly to Group differences. Post-hoc Tukey test showed that on Rigid Weight Regulation, SAD ( $M = 20.34, SD = 5.92$ ) scored higher than Control ( $M = 16.02, SD = 6.26$ ). On Self-Control, SAD ( $M = 29.28, SD = 6.35$ ) scored higher than Depressed ( $M = 24.20, SD = 8.21$ ), S-SAD ( $M = 24.38, SD = 6.44$ ), and Control ( $M = 22.47, SD = 6.13$ ; see Table 9).

There was also a significant omnibus multivariate Sex effect,  $F(3, 169) = 3.92, p = .01, \eta^2 = .07, \text{power} = .82$ . DFA also showed that one significant discriminant function,  $\chi^2(3) = 10.20, p = .017$ , accounted for 100% of the between sex variability. The loading matrix indicated that Self-Control (loading = .66) contributed to the linear combination separating the sexes. Univariate  $F$ -tests indicated that Self-Control [ $F(1, 171) = 6.05, p = .015, \eta^2 = .03, \text{power} = .69$ ] contributed significantly to Sex differences. A comparison of cell means showed that females ( $M = 26.24, SD = 7.42$ ) scored higher than males ( $M = 23.61, SD = 6.29$ ) on the Self-Control scale (see Table 9).

#### *Eating Attitudes Test - 26 (EAT-26)*

A MANOVA performed on the three EAT-26 subscales (i.e., Dieting, Bulimia, and Oral Control) as a function of Group and Sex yielded a significant omnibus multivariate Group effect,  $F(9, 513) = 4.35, p < .001, \eta^2 = .07, \text{power} = .998$ . DFA showed that there was one discriminant function that significantly contributed to group

discrimination,  $\chi^2(9) = 45.87, p < .001$ , and that accounted for 89% of the between-group variability. The loading matrix showed that the dependent variables that contributed to group discrimination were Bulimia (loading = .90), Dieting (loading = .82), and Oral Control (loading = .36). Univariate  $F$ -tests, each evaluated at  $\alpha = .0167$  indicated that Dieting [ $F(3, 171) = 7.10, p < .001, \eta^2 = .11, \text{power} = .98$ ], Bulimia [ $F(3, 171) = 8.34, p < .001, \eta^2 = .13, \text{power} = .99$ ], and Oral Control [ $F(3, 171) = 4.83, p = .003, \eta^2 = .08, \text{power} = .90$ ] contributed significantly to Group differences. Post-hoc Tukey tests revealed that on the Dieting and Bulimia subscales, SAD ( $M = 8.61, SD = 8.22$ ;  $M = 3.30, SD = 3.04$ , respectively) scored higher than S-SAD ( $M = 3.17, SD = 4.00$ ;  $M = 0.79, SD = 1.61$ , respectively) and Control ( $M = 2.52, SD = 4.85$ ;  $M = 0.97, SD = 1.72$ , respectively). On the Oral Control subscale, Depressed ( $M = 2.37, SD = 2.70$ ) scored higher than S-SAD ( $M = 0.62, SD = 0.82$ ; see Table 10). No other significant mean differences were found.

#### *Response Styles Questionnaire*

A MANOVA performed on the four coping styles (Rumination, Distraction, Problem-Solving, and Dangerous Activities) as a function of Group and Sex showed a significant omnibus multivariate Group effect,  $F(12, 510) = 5.41, p < .001, \eta^2 = .04$ ,  $\text{power} < .99$ . DFA showed one significant discriminant function that accounted for 93% of the between group variability,  $\chi^2(12) = 84.17, p < .001$ . The loading matrix indicated that Rumination (loading = .98) and Dangerous Activities (loading = .50) contributed to the linear combination separating the groups.

Univariate  $F$ -tests, each evaluated at  $\alpha = .0125$ , indicated that Rumination [ $F(3,$

171) = 20.93,  $p < .001$ ,  $\eta^2 = .27$ , power  $< .99$ ] and Dangerous Activities [ $F(3, 171) = 6.77, p < .001, \eta^2 = .11$ , power = .97] contributed significantly to Group differences. Tukey's HSD tests indicated that on the Rumination subscale, SAD ( $M = 57.43, SD = 9.68$ ) scored higher than Depressed ( $M = 46.77, SD = 9.25$ ), S-SAD ( $M = 40.62, SD = 7.10$ ), and Control ( $M = 37.53, SD = 8.78$ ), while Depressed scored higher than Control. On the Dangerous Activities subscale, SAD ( $M = 7.18, SD = 2.12$ ) scored higher than Control ( $M = 5.64, SD = 1.60$ ; see Table 11). There were no other significant mean differences.

#### *Sociotropy-Autonomy Scale - Revised*

A MANOVA carried out on the four SAS-R subscales (i.e., Sociotropy, Solitude, Independence, and Autonomy), showed a significant omnibus multivariate Group effect,  $F(12, 510) = 1.81, p = .043, \eta^2 = .04$ , power = .89. DFA showed one significant discriminant function,  $\chi^2(12) = 26.55, p = .009$ , that accounted for 82% of the between group variability. The loading matrix indicated that Sociotropy (loading = .95) and Independence (loading = -.35) contributed to the linear combination separating the groups. Keeping  $\alpha$  at .0125, univariate  $F$ -tests, each evaluated at  $\alpha = 0125$ , indicated that Sociotropy made a significant contribution to Group differences,  $F(3, 171) = 5.26, p = .002, \eta^2 = .08$ , power = .92. Post-hoc Tukey test showed that on Sociotropy, SAD ( $M = 61.12, SD = 15.54$ ), and Depressed ( $M = 63.30, SD = 15.82$ ) scored higher than Control ( $M = 50.72, SD = 14.80$ ; see Table 12).

Furthermore, a significant omnibus multivariate Sex effect was found,  $F(4, 168) = 3.11, p = .017, \eta^2 = .07$ , power = .81. DFA showed one significant discriminant function

that accounted for 100% of the between sex variability,  $\chi^2(4) = 15.48, p = .004$ . The loading matrix indicated that Autonomy (loading = .77), Solitude (loading = .61), Independence (loading = .55), and Sociotropy (loading = -.44) contributed to the linear combination separating the sexes. Univariate  $F$ -tests, each evaluated at  $\alpha = .0125$ , revealed no significant results.

Finally, there was a significant omnibus multivariate Group by Sex effect,  $F(12, 510) = 2.60, p = .002, \eta^2 = .06, \text{power} = .98$ . DFA showed two significant discriminant functions,  $\chi^2(28) = 73.15, p < .001$  and  $\chi^2(18) = 40.15, p = .002$ , that accounted for 46% and 34%, respectively, of the between Group by Sex variability. The loading matrix indicated that for the first function, Sociotropy (loading = .67) and Solitude (loading = -.42), and on the second function Sociotropy (loading = .59), Solitude (loading = .48), and Independence (loading = -.66) contributed to the linear combinations separating the groups. Univariate  $F$ -tests, each evaluated at  $\alpha = .0125$ , revealed no significant results. No other significant means were found.

#### *Winter Stress Scale*

*Dread of Winter (W-Dread)*. An ANOVA performed on W-Dread as a function of Group and Sex revealed a significant Group effect,  $F(3, 170) = 16.25, p < .001, \eta^2 = .22, \text{power} < .99$ . Post-hoc Tukey test showed that SAD ( $M = 3.26, SD = 1.13$ ) scored higher than Depressed ( $M = 1.97, SD = 1.03$ ), S-SAD ( $M = 2.25, SD = 1.07$ ), and Control ( $M = 1.84, SD = 0.95$ ; see Table 13).

Also, there was a significant Group by Sex effect,  $F(3, 170) = 2.90, p = .037, \eta^2 = .05, \text{power} = .68$ . Post-hoc Tukey tests indicated that SAD males ( $M = 3.23, SD = 0.83$ )

and SAD females ( $M = 3.26, SD = 1.20$ ) scored higher than Depressed females ( $M = 1.81, SD = 0.85$ ), S-SAD females ( $M = 1.94, SD = 1.03$ ), Control females ( $M = 1.98, SD = 1.03$ ), and Control males ( $M = 1.56, SD = 0.7p0$ ). Also, S-SAD males ( $M = 3.00, SD = 0.82$ ) scored higher than Control males (see Table 13). All other means comparisons were nonsignificant.

*Stress Associated with Winter Atypical Symptoms (W-Atypical).* An ANOVA on W-Atypical as a function of Group and Sex yielded a significant Group effect,  $F(3, 171) = 42.88, p < .001, \eta^2 = .43, \text{power} < .99$ . Post-hoc Tukey test showed that SAD ( $M = 12.40, SD = 4.80$ ) scored higher than Depressed ( $M = 5.47, SD = 3.45$ ), S-SAD ( $M = 5.29, SD = 2.90$ ), and Control ( $M = 3.38, SD = 3.32$ ; see Table 13). There was also a significant Sex effect,  $F(1, 171) = 5.08, p = .026, \eta^2 = .03, \text{power} = .61$ . Cell means indicated that females ( $M = 8.07, SD = 5.51$ ) experienced more stress associated with winter atypical (vegetative) symptoms than males ( $M = 5.33, SD = 5.29$ ; see Table 13). All other means comparisons were nonsignificant.

*Impairment During Winter (W-Impair).* An ANOVA performed on W-Impair as a function of Group and Sex resulted in a significant Group effect,  $F(3, 163) = 33.60, p < .001, \eta^2 = .38, \text{power} < .99$ . Post-hoc Tukey tests indicated that SAD ( $M = 3.36, SD = 0.97$ ) scored higher than Depressed ( $M = 2.00, SD = 1.14$ ), S-SAD ( $M = 1.88, SD = 0.85$ ), and Control ( $M = 1.34, SD = 0.76$ ). As well, Depressed scored higher than Control (see Table 13). No other significant mean differences were found.

*Ruminative Coping Style in Winter (W-Ruminate).* An ANOVA performed on W-Ruminate as a function of Group and Sex resulted in a significant Group effect,  $F(3, 171)$

= 41.91,  $p < .001$ ,  $\eta^2 = .42$ , power  $< .99$ . Post-hoc Tukey tests indicated that SAD ( $M = 21.07$ ,  $SD = 4.44$ ) scored higher than Depressed ( $M = 13.80$ ,  $SD = 4.72$ ), S-SAD ( $M = 13.92$ ,  $SD = 4.10$ ), and Control ( $M = 11.15$ ,  $SD = 3.51$ ). As well, Depressed and S-SAD scored higher than Control (see Table 13). No other significant mean differences were found.

*Perceived Stress During the Winter (Winter Perceived Stress Scale, WPSS).*

A MANOVA was performed on Negative Affect (Factor One) and Perceived Ability to Cope (Factor Two) as a function of Group and Sex. Pillai's Trace indicated a significant multivariate Group effect,  $F(6, 342) = 13.09$ ,  $p < .001$ ,  $\eta^2 = .19$  power  $< .99$ . DFA showed that there was one discriminant function that contributed significantly to group discrimination,  $\chi^2(6) = 105.16$ ,  $p < .001$ , which accounted for 96% of the between-group variability. An examination of the loading matrix showed that both Negative Affect (loading = .92) and Perceived Ability to Cope (loading = .40) loaded on the discriminant function. Thus, the DFA showed that both factors were responsible for group discrimination. Univariate  $F$ -tests, each evaluated at  $\alpha = .025$ , indicated that both Negative Affect [ $F(3, 171) = 23.54$ ,  $p < .001$ ,  $\eta^2 = .29$ , power  $< .99$ ] and Perceived Ability to Cope [ $F(3, 171) = 7.80$ ,  $p < .001$ ,  $\eta^2 = .20$ , power = .99] contributed significantly to Group differences.

Post-hoc Tukey test revealed that on Negative Affect, SAD ( $M = 29.62$ ,  $SD = 4.65$ ) scored higher than Depressed ( $M = 22.43$ ,  $SD = 8.42$ ), S-SAD ( $M = 20.83$ ,  $SD = 5.87$ ), and Control ( $M = 18.51$ ,  $SD = 6.08$ ). Depressed also scored higher than Control. On Perceived Ability to Cope, SAD ( $M = 23.02$ ,  $SD = 3.07$ ) and Depressed ( $M = 22.90$ ,

$SD = 4.20$ ) scored higher than S-SAD ( $M = 20.08$ ,  $SD = 4.91$ ) and Control ( $M = 20.09$ ,  $SD = 3.81$ ; see Table 13). All other comparisons were nonsignificant.

*Dysfunctional Attitude Scale*

An ANOVA performed on the DAS as a function of Group and Sex revealed a significant Group effect,  $F(3, 171) = 3.47$ ,  $p = .017$ ,  $\eta^2 = .06$ , power = .67. Post-hoc Tukey test showed that SAD ( $M = 132.10$ ,  $SD = 39.88$ ) and Depressed ( $M = 130.27$ ,  $SD = 38.03$ ) scored higher than S-SAD ( $M = 105.08$ ,  $SD = 24.20$ ) and Control ( $M = 109.21$ ,  $SD = 29.65$ ; see Table 14). All other means comparisons were nonsignificant.

*Physical Health Scale (Duration of Physical Activity Variable)*

Separate Group by Sex ANOVAs were performed on the duration variable within each type of physical activity, (i.e., Duration of High-Intensity Individual, Duration of Medium-Intensity Individual, Duration of Low-Intensity Individual, Duration of High-Intensity Team, Duration of Medium-Intensity Team, Duration of Low-Intensity Team, and Average Duration). The results are reported below.

*Duration of high-intensity individual activities.* There was a significant Sex effect,  $F(1, 169) = 4.56$ ,  $p = .034$ ,  $\eta^2 = .03$ , power = .57. A comparison of means indicated that on average males ( $M = 78.87$ ,  $SD = 10.78$ ) spent a longer time per occasion in high-intensity individual activities than females ( $M = 51.88$ ,  $SD = 6.58$ ).

*Duration of medium-intensity individual activities.* There was a significant Group by Sex effect,  $F(3, 169) = 2.82$ ,  $p = .041$ ,  $\eta^2 = .05$ , power = .67. Post-hoc Tukey tests yielded no significant pairwise comparisons.

*Duration of low-intensity individual activities.* No significant effects were found.



*Duration of high-intensity team activities.* There was a significant Sex effect,  $F(1, 171) = 8.69, p = .004, \eta^2 = .05, \text{power} = .83$ . A comparison of means indicated that on average males ( $M = 44.82, SD = 7.49$ ) spent a longer time per occasion in high-intensity team activities than females ( $M = 18.99, SD = 4.55$ ).

*Duration of medium-intensity team activities.* There was a significant Group by Sex effect,  $F(3, 170) = 2.71, p = .047, \eta^2 = .05, \text{power} = .65$ . Post-hoc Tukey tests indicated that on average, Control males ( $M = 78.33, SD = 77.78$ ) engaged in longer per-occasion time in medium-intensity team physical activities than S-SAD females ( $M = 7.06, SD = 19.92$ ), SAD females ( $M = 28.89, SD = 72.08$ ), and Control females ( $M = 26.28, SD = 45.59$ ).

*Duration of low-intensity team activities.* There was a significant Group effect,  $F(3, 170) = 2.89, p = .037, \eta^2 = .05, \text{power} = .68$ . There were no significant post-hoc Tukey pairwise comparisons.

*Average Duration.* Finally, an ANOVA performed on Average Duration of Physical Activity yielded a significant Group effect,  $F(3, 171) = 3.04, p = .030, \eta^2 = .05, \text{power} = .71$ . Post-hoc Tukey tests indicated that no group means were significantly different from each other (see Table 15).

A significant main effect for Sex,  $F(1, 171) = 4.94, p = .028, \eta^2 = .03, \text{power} = .60$ , was also found. An examination of cell means showed that males ( $M = 68.92, SD = 48.76$ ) scored higher than females ( $M = 47.71, SD = 42.92$ ; see Table 12). All other mean comparisons were nonsignificant.

Finally, there was also a significant Group by Sex effect,  $F(3, 171) = 2.94, p =$

.035,  $\eta^2 = .05$ , power = .69. Post-hoc Tukey tests showed that Control males ( $M = 94.95$ ,  $SD = 49.22$ ) scored higher than SAD males ( $M = 45.77$ ,  $SD = 31.60$ ), and SAD ( $M = 51.02$ ,  $SD = 48.63$ ), Depressed ( $M = 39.92$ ,  $SD = 40.57$ ), S-SAD ( $M = 47.25$ ,  $SD = 44.70$ ), and Control females ( $M = 47.71$ ,  $SD = 35.58$ ; see Table 14). All other means comparisons were nonsignificant.

*Physical Health Scale (Frequency of Physical Activity Variable)*

Separate Group and Sex Chi-Square analyses were completed for each frequency of physical activity variable. There was a significant relationship between Sex and the Frequency of Low-Intensity Team variable,  $\chi^2 (6) = 16.32$ ,  $p = .012$ . Figure 2 illustrates this relationship. More males (52%) engaged in low-intensity team sports compared to females (42%). More males (16%) also participated 1-3 times a month in low-intensity team sports compared to females (7%).

Seven separate 2-way (Group by Sex) chi-square analyses were also undertaken at *each* response option (i.e., not at all, less than once a month, 1-3 times a month, once a week, 2-3 times a week, 4-6 times a week, and every day) of the frequency of physical activity variable. This pattern of conducting chi-square analyses was repeated for each of the types of physical activity (high-intensity individual activity, medium-intensity individual activity, low-intensity individual activity, high-intensity team activity, medium-intensity team activity, and low-intensity team activity). Although no other significant results were found, for the interested reader, Figures 2 to 8 depict the relation between Group and each frequency of physical activity variable. Group relationships, as opposed to Sex relationships, were depicted in the figures, as Group was the primary

variable of interest in this study.

*Physical Health Scale (Change in Physical Activity Variable)*

Separate Group and Sex Chi-Square analyses were completed for each change in physical activity variable. There was a significant relationship between Sex and the Change in High-Intensity Individual physical activity variable,  $\chi^2(3) = 9.17, p = .027$ . Figure 9 illustrates this relationship. The females were distributed approximately evenly across the three levels (32% reported an increase over the past year, 34% decrease, 34% stayed the same). For males, a different pattern emerged where twice as many males had no change in their level of high-intensity individual activities (52%) compared to those who had an increase (24%) and decrease (24%) in these activities. Although no other significant results were found, for the interested reader, Figures 10 to 15 depict the relation between Group and each change in physical activity variable.

*Hamilton Depression Rating Scale (HDRS)*

A Group by Sex MANOVA carried out on the two HDRS subscales, HDRS-A and HDRS-B, showed a significant Group effect,  $F(6, 342) = 34.97, p < .001, \eta^2 = .38$ , power  $< .99$ . DFA showed that there were two significant discriminant functions that contributed to group discrimination,  $\chi^2(6) = 242.84, p < .001$ . After removal of the first discriminant function, there was still a significant association between Group effect and the second linear discriminant function consisting of the linear combination of dependent variables,  $\chi^2(2) = 13.12, p = .001$ . The two discriminant functions accounted for 97% and 3%, respectively, of the between-group variability. An examination of the loading matrix showed that the only factor that loaded on the first discriminant function was

HDRS-A (loading = .80), whereas the only factor that loaded on the second discriminant function was HDRS-B (loading = .71). In short, the DFA showed that both HDRS-B and HDRS-A symptoms were responsible for group discrimination. These results were further supported by univariate  $F$ -tests, whereby evaluating each test at  $\alpha = .025$ , the analyses indicated that both HDRS-B [ $F(3, 171) = 52.95, p < .001, \eta^2 = .48, \text{power} < .99$ ] and HDRS-A [ $F(3, 171) = 96.25, p < .001, \eta^2 = .63, \text{power} < .99$ ] contributed significantly to Group differences. Finally, post-hoc Tukey tests showed that on HDRS-B vegetative symptoms, SAD ( $M = 13.28, SD = 5.97$ ) scored higher than Depressed ( $M = 7.93, SD = 5.09$ ), S-SAD ( $M = 2.93, SD = 1.76$ ), and Control ( $M = 1.76, SD = 1.64$ ). As well, Depressed scored higher than S-SAD and Control. Results also indicated that on the HDRS-A symptoms of depression, SAD ( $M = 28.37, SD = 10.67$ ) and Depressed ( $M = 25.97, SD = 10.95$ ) scored higher than S-SAD ( $M = 6.42, SD = 2.73$ ) and Control ( $M = 5.95, SD = 5.00$ ; see Table 4).

There was also a significant Sex effect,  $F(2, 170) = 6.35, p = .002, \eta^2 = .07, \text{power} = .90$ . DFA showed one significant discriminant function,  $\chi^2(2) = 13.16, p = .001$ , that accounted for 100.0% of the between sex variability. The loading matrix indicated that only HDRS-B scores (loading = .75) contributed to the linear combination separating the sexes. Univariate  $F$ -tests, each evaluated  $\alpha = .025$ , indicated that HDRS-B scores contributed to Sex differences,  $F(1, 171) = 5.51, p = .020, \eta^2 = .03, \text{power} = .65$ . An examination of cell means indicated that on the HDRS-B scores, females ( $M = 8.05, SD = 7.02$ ) scored higher than males ( $M = 4.93, SD = 5.92$ ; see Table 4).

Finally, there was a significant Group by Sex effect,  $F(6, 342) = 2.38, p = .029, \eta^2$

= .04, power = .81. DFA showed that there were two significant discriminant functions that contributed to group by sex discrimination,  $\chi^2(14) = 265.78, p < .001$ . After removal of the first discriminant function, there was still a significant association between Group by Sex effect and the second linear discriminant function consisting of the linear combination of the dependent variables,  $\chi^2(6) = 37.61, p < .001$ . The two discriminant functions accounted for 92% and 8%, respectively, of the between-group variability. An examination of the loading matrix showed that the same factors significantly loaded on the both discriminant functions, namely HDRS-A (loading = .83, loading = -.56, respectively) and HDRS-B (loading = .72, loading = .69, respectively). Keeping each test at  $\alpha = .025$ , follow-up univariate *F*-tests revealed no significant results.

Post-hoc Tukey tests indicated that on the HDRS-B subscale, SAD males ( $M = 11.15, SD = 4.10$ ) and SAD females ( $M = 13.80, SD = 6.27$ ) scored higher than Depressed males ( $M = 4.75, SD = 4.80$ ), and males and females in the S-SAD ( $M = 3.00, SD = 1.83; M = 2.76, SD = 1.79$ , respectively) and Control ( $M = 1.28, SD = 1.07; M = 1.98, SD = 1.80$ , respectively) groups. As well, SAD females ( $M = 13.80, SD = 6.27$ ) scored higher than Depressed females ( $M = 9.09, SD = 4.78$ ). Depressed females also scored higher than S-SAD males ( $M = 3.00, SD = 1.83$ ), Control males ( $M = 1.28, SD = 1.07$ ), and Control females ( $M = 1.98, SD = 1.80$ ). On the HDRS-A subscale, SAD males and females ( $M = 33.38, SD = 16.43; M = 27.17, SD = 8.54$ , respectively), and Depressed males and females ( $M = 31.25, SD = 9.65; M = 24.05, SD = 10.96$ , respectively) scored higher than S-SAD males and females ( $M = 7.00, SD = 3.27; M = 6.18, SD = 2.56$ , respectively) and Controls males and females ( $M = 1.28, SD = 1.07; M = 1.98, SD = 1.80$ ,

respectively). As well, SAD males ( $M = 33.38$ ,  $SD = 16.43$ ) scored higher than Depressed females ( $M = 24.05$ ,  $SD = 10.96$ ; see Table 4).

*Exploratory analysis – clinical sample.* Using the DSM-IV-TR MDE criteria, 26 out of the 67 (39%) individuals categorized as SAD meet clinical diagnostic criteria for seasonal affective disorder (currently experiencing a major depressive episode). Nine out of 30 (30%) individuals categorized as Depressed were experiencing a major depressive episode. Consequently, nine individuals from each of the SAD, S-SAD and Control groups were matched on sex and age to the nine individuals from the Depressed group. In this subsample, the mean age of the clinical SAD group was 27.89 ( $SD = 12.47$ ), the S-SAD group was 27.67 ( $SD = 11.58$ ), the clinical Depressed group was 27.44 ( $SD = 12.24$ ) and the Control group was 28.78 ( $SD = 13.03$ ).

Since the groups were categorized based on scores on the Hamilton Depression Rating Scale – Total (HDRS-T) and Global Seasonality Score (GSS), ANOVAs as a function of group were completed on these scores to determine significant group differences on these measures. An ANOVA performed on HDRS-T as a function of Group revealed a significant Group effect,  $F(3, 33) = 34.14$ ,  $p < .001$ ,  $\eta^2 = .77$ , power < .99. Post-hoc Tukey test showed that SAD ( $M = 44.44$ ,  $SD = 13.45$ ) and Depressed ( $M = 45.14$ ,  $SD = 16.67$ ) scored significantly higher than Control ( $M = 8.33$ ,  $SD = 4.30$ ) and S-SAD ( $M = 8.22$ ,  $SD = 2.17$ ). All other mean comparisons were nonsignificant.

An ANOVA performed on GSS as a function of Group revealed a significant Group effect,  $F(3, 33) = 46.65$ ,  $p < .001$ ,  $\eta^2 = .81$ , power < .99. Post-hoc Tukey test showed that SAD ( $M = 17.56$ ,  $SD = 3.50$ ) scored significantly higher than Depressed ( $M$

= 6.56,  $SD = 2.79$ ), S-SAD ( $M = 13.00$ ,  $SD = 1.66$ ), and Control ( $M = 4.44$ ,  $SD = 2.24$ ), and S-SAD scored higher than Depressed and Control. All other mean comparisons were nonsignificant.

Similar sets of analyses on the dependent variables as those performed previously were completed for these four groups. However, due to the small number males (two per group), sex of participants was collapsed within group and only Group effect was investigated in the analyses. Hence, MANOVAs as a function of Group were completed for the following dependent variables: eating cognitions (MACS-R), eating cognitions and behaviours (EAT-26), response style to depressed mood (RSQ), cognitive vulnerability to interpersonal rejection (SAS-R), two winter-stress appraisal factors, namely Negative Affect, and Perceived Ability to Cope, and the HDRS subscales. Separate Group ANOVAs were carried out on W-DREAD, W-Atypical, W-Impair, W-Ruminate, Dysfunctional Attitudes, and the seven duration of physical activity variables. Finally, Group Chi-Square analyses were used to compare frequency of physical activity and change in physical activity variables. Only significant findings are reported below.

A MANOVA performed on the four coping styles (Rumination, Distraction, Problem-Solving, and Dangerous Activities) as a function of Group showed a significant omnibus multivariate Group effect,  $F(12, 93) = 1.99$ ,  $p = .03$ ,  $\eta^2 = .21$ ., power = .89. DFA showed one significant discriminant function that accounted for 92% of the between group variability,  $\chi^2(12) = 25.96$ ,  $p = .01$ . The loading matrix indicated that Rumination (loading = .97) and Dangerous Activities (loading = .59) contributed to the linear combination separating the groups.

Univariate  $F$ -tests, each evaluated at  $\alpha = .0125$ , indicated that Rumination [ $F(3, 36) = 7.45, p = .001, \eta^2 = .41, \text{power} = .97$ ] and Dangerous Activities [ $F(3, 36) = 5.79, p = .008, \eta^2 = .35, \text{power} = .92$ ] contributed significantly to Group differences. Tukey's HSD tests indicated that on Rumination subscale, clinical SAD ( $M = 55.33, SD = 2.96$ ) scored higher than S-SAD ( $M = 42.89, SD = 2.96$ ) and Control ( $M = 38.89, SD = 2.96$ ), and clinical Depressed ( $M = 53.78, SD = 2.96$ ) scored higher than Control. On the Dangerous Activities subscale, clinical SAD ( $M = 8.11, SD = 0.54$ ) and clinical Depressed ( $M = 7.33, SD = 0.54$ ) scored higher than Control ( $M = 5.11, SD = 0.54$ ). There were no other significant group differences.

An ANOVA performed on W-Dread as a function of Group resulted in a significant effect,  $F(3, 36) = 5.22, p = .005, \eta^2 = .33, \text{power} = .89$ . Post-hoc Tukey tests indicated that individuals with clinical SAD ( $M = 3.56, SD = 0.35$ ) scored significantly higher than S-SAD ( $M = 1.89, SD = 0.35$ ), clinical Depressed ( $M = 2.00, SD = 0.35$ ), and Control ( $M = 2.00, SD = 0.35$ ).

An ANOVA performed on W-Atypical revealed a significant effect,  $F(3, 36) = 8.00, p < .001, \eta^2 = .43, \text{power} = .98$ . Individuals with clinical SAD had significantly higher scores ( $M = 12.44, SD = 5.53$ ) compared to S-SAD ( $M = 5.11, SD = 4.17$ ), clinical Depressed ( $M = 4.89, SD = 3.66$ ), and Control ( $M = 3.44, SD = 3.54$ ).

An ANOVA on W-Impair yielded a significant effect,  $F(3, 34) = 12.92, p < .001, \eta^2 = .56, \text{power} < .99$ . Individuals with clinical SAD had significantly higher scores ( $M = 3.56, SD = 0.25$ ) compared to S-SAD ( $M = 2.22, SD = 0.25$ ), clinical Depressed ( $M = 2.00, SD = 0.25$ ), and Control ( $M = 1.29, SD = 0.29$ ).



An ANOVA on W-Ruminate was significant,  $F(3, 36) = 19.30, p < .001, \eta^2 = .64$ , power  $< .99$ . Individuals with clinical SAD had significantly higher scores ( $M = 22.67, SD = 1.30$ ) than S-SAD ( $M = 14.11, SD = 1.30$ ), clinical Depressed ( $M = 15.33, SD = 1.30$ ), and Control ( $M = 8.78, SD = 1.30$ ). In addition, clinical Depressed and S-SAD scored significantly higher on W-Ruminate compared to Control.

A MANOVA was performed on the two subscales of the *Winter Perceived Stress Scale*, namely Negative Affect and Perceived Ability to Cope. Pillai's Trace indicated a significant multivariate effect,  $F(6, 36) = 3.88, p = .002, \eta^2 = .27$  power = .95. DFA showed that there was one discriminant function that contributed significantly to group discrimination,  $\chi^2(6) = 23.54, p = .001$ , which accounted for 96% of the between-group variability. An examination of the loading matrix showed that Negative Affect (loading = .96) loaded on the discriminant function. Thus, the DFA showed that only Negative Affect was responsible for group discrimination. Univariate  $F$ -tests, each evaluated at  $\alpha = .025$ , indicated that Negative Affect [ $F(3, 36) = 10.44, p < .001, \eta^2 = .50$ , power = .99] contributed significantly to Group differences.

Post-hoc Tukey test revealed that on Negative Affect, clinical SAD ( $M = 31.67, SD = 2.24$ ) scored higher than S-SAD, ( $M = 20.78, SD = 2.24$ ). Clinical SAD and clinical Depressed ( $M = 27.89, SD = 2.24$ ) scored higher than Control ( $M = 15.44, SD = 2.24$ ). All other comparisons were nonsignificant.

A MANOVA carried out on the two HDRS subscales, HDRS-A and HDRS-B, showed a significant effect,  $F(6, 56) = 8.70, p < .001, \eta^2 = .48$ , power  $< .99$ . DFA showed that there were two significant discriminant functions that contributed to group

discrimination,  $\chi^2(6) = 58.72, p < .001$ . After removal of the first discriminant function, there was still a significant association between Group effect and the second linear discriminant function consisting of the linear combination of dependent variables,  $\chi^2(2) = 10.25, p = .006$ . The two discriminant functions accounted for 91% and 10%, respectively, of the between-group variability. An examination of the loading matrix showed that the only factor that loaded on the first discriminant function was HDRS-A symptoms (loading = .99), whereas the only factor that loaded on the second discriminant function was HDRS-B symptoms (loading = .87). In short, the DFA showed that both HDRS-B and HDRS-A symptoms were responsible for group discrimination.

These results were further supported by univariate *F*-tests, whereby evaluating each test at  $\alpha = .025$ , the analyses indicated that both HDRS-B [ $F(3, 36) = 5.96, p = .003, \eta^2 = .39, \text{power} = .93$ ] and HDRS-A [ $F(3, 36) = 25.08, p < .001, \eta^2 = .73, \text{power} < .99$ ] contributed significantly to Group differences. Post-hoc Tukey tests showed that on HDRS-B symptoms, clinical SAD ( $M = 10.96, SD = 1.75$ ) scored higher than S-SAD ( $M = 2.70, SD = 1.75$ ). Clinical SAD and clinical Depressed ( $M = 6.04, SD = 1.75$ ) scored higher than the Control ( $M = 1.39, SD = 1.75$ ).

Results also indicated that on the HDRS-A symptoms of depression, clinical SAD ( $M = 32.25, SD = 3.26$ ) and clinical Depressed ( $M = 36.96, SD = 3.26$ ) scored higher than S-SAD ( $M = 4.93, SD = 3.25$ ) and Control ( $M = 8.43, SD = 3.26$ ).

## DISCUSSION

### Overview of the Present Study

The present study attempted to delineate the distinctions between seasonal and

nonseasonal depression by comparing four groups: seasonal affective disorder (SAD), nonseasonal depression (depressed), sub-syndromal SAD (S-SAD) and nonseasonal nondepressed (controls). These four groups were defined by a combination of their loadings on the seasonality and depression dimensions, and were examined for differences in six conceptual areas. These areas are dysfunctional eating cognitions and behaviours, cognitive content specificity to winter stimuli (winter-related stress), levels of physical activity, general negative attitudes, response styles to depressed moods, and interpersonal context-specificity.

The study bridges two psychological theories: the cognitive specificity hypothesis (Clark & Beck, 1989; Kendall & Ingram, 1989) and the Dual Vulnerability Hypothesis (DVH, Lam et al., 2001; Young et al., 1991). The cognitive specificity hypothesis, which is a component of Beck's cognitive theory underlying emotional disorders, postulates that affective states can be discriminated on the basis of unique cognitive processes including cognitive content and attributional styles (Clark & Beck, 1989; Kendall & Ingram, 1989). For example, it has been found that depressive cognitive content, such as themes of general negative attitudes towards oneself and others is more related to depression than anxiety, which is characterized by worries about the future and fears related to panic attacks, among other worries and fears (Beck & Perkins, 2001). This theory can be extended to the eating disorder literature, which finds that individuals with disordered eating report dysfunctional eating cognitions, such as rigid weight regulation and weight being the basis for approval by others (Mizes, 1992).

The Dual Vulnerability Hypothesis (DVH, Lam et al., 2001; Young et al., 1991)

conceptualizes SAD, S-SAD, depression, and controls to be differentiated on dimensions of seasonality and depression. SAD is proposed to load high on both seasonality and depression dimensions, while depression is theorized to load low on seasonality but high on depression. Hence SAD and depression are viewed to be similar in that they are both depressive disorders, but they differ in one critical aspect: SAD has a seasonal pattern to its depressive episodes whereas depression does not. S-SAD is viewed to be similar to SAD except that its depressive severity is considerably less and there is mild or no impairment associated with it. Hence S-SAD is conceptualized to load high on seasonality but low on the depression dimension. The last group consisting of the healthy controls load low on both the seasonality and depression dimensions. Seasonality was assessed with the widely-used Seasonality Pattern Assessment Questionnaire (SPAQ; Rosenthal, Bradt, et al., 1987) and depression was assessed with the Hamilton Depression Rating Scale – 28 (HDRS-28; Rosenthal, Genhart, et al., 1987). High seasonality had to be accompanied by at least moderate impairment associated with seasonal changes. A sub-group of SAD and depressed participants who met the DSM-IV-TR criteria for major depressive episode, current, were matched on sex and age to S-SAD and control individuals in an exploratory analysis to investigate whether the same pattern of findings from the main study would hold for a clinical sample.

The variables that were examined in the present study were chosen for their relationship to the seasonality and depression dimensions. Three of the areas investigated were reasoned to link to the seasonality dimension: dysfunctional eating cognitions and behaviours, winter-related stress or cognitive content specificity to winter stimuli, and

physical activity levels. The remaining three areas were linked to the depression dimension and included interpersonal context-specificity, response style to depressed mood, and general negative attitudes.

The rationale for investigating dysfunctional eating cognitions and behaviours and winter-related stress is based on the theoretical link between the cognitive specificity hypothesis and the DVH. Given that nonseasonal depression has been found to be associated with unique and specific cognitive content (Beck & Perkins, 2001), it was proposed that cognitive content specificity might also be present in SAD, specifically as it relates to winter-related stimuli, to eating-related symptoms (e.g., the classic carbohydrate craving and weight gain during the winter), and to physical activity (e.g., fatigue, longer sleep length in the winter). Hence the seasonality dimension was proposed to be related eating cognitions and behaviours, winter-related stress, and physical activity levels. The depression dimension was proposed to relate to factors (i.e., interpersonal context-specificity, response styles to depressed moods, and general negative attitudes) that have been well-researched and proven to be dominant in nonseasonal depression.

In summary, given that the four groups investigated in the present study differed on their combined loadings on the seasonality and depression dimension, it was hypothesized that they would vary on the factors that were differentially associated with both dimensions. Hence high seasonality groups (SAD and S-SAD) would be more strongly linked to the factors associated with the seasonality dimension than would the low seasonality groups (depressed and controls), whereas the high depression groups

(SAD and depressed) would have a stronger showing on the factors associated with the depression dimension than would the low depression groups (S-SAD and controls). The interpretation of the results are organized according to the six areas of study and presented in relation to the six hypotheses in the present study. Following that, the results are discussed with the objective of furthering our understanding of the differences and similarities among SAD, S-SAD, and nonseasonal depression, and their implications for the Dual Vulnerability Hypothesis and the cognitive specificity hypothesis. The exploratory findings relating to sex differences are also examined, followed by a discussion of clinical implications, research strengths and limitations, and future research directions.

#### Eating Cognitions and Behaviours

Hypothesis 1 stated that SAD and S-SAD (high seasonality groups) would have greater dysfunctional eating cognitions and behaviours when compared to the nonseasonally depressed and controls (low seasonality groups). Additionally, SAD would report greater dysfunctional eating cognitions and behaviours than the S-SAD. In this study, eating cognitions were assessed using the Mizes Anorectic Cognitions Scale – Revised (MACS-R) and the Eating Attitudes Test – 26 (EAT-26), which will be discussed separately.

Hypothesis 1 was partially supported in that significant group differences were found only on some of the MACS-R subscales, and SAD, as opposed to S-SAD, presented with dysfunctional eating cognitions. Compared to the other three groups, individuals with SAD believed more that restrained eating is a means to feeling a sense of accomplishment and self-worth (Self-Control subscale). Compared to individuals in the

control group, SAD also endorsed to a greater degree cognitions associated with the importance of regulating weight as a means of self-control and being fearful of gaining weight (Rigid Weight Regulation subscale). The pattern of group cell means indicated that individuals with SAD also scored higher than individuals who were depressed and who were S-SAD on this subscale, although these differences were not statistically significant.

There were no significant differences among the four groups in their belief that weight and appearance are the basis for judgment by others (Weight and Approval subscale). However, upon examining the cell means for this subscale across groups, there was a trend for individuals with SAD to have stronger beliefs that others judge them on their weight compared to the other three groups, particularly controls.

This is the first research study to examine dysfunctional eating cognitions in SAD compared to nonseasonal depression, S-SAD, and nonclinical controls. The finding of individuals with SAD being characterized with dysfunctional eating cognitions is related to the well-supported finding in the SAD literature that individuals with SAD tend to have increased vegetative symptoms including increased appetite, weight gain, and carbohydrate cravings compared to nonseasonal depressed and nonseasonal nondepressed groups (Krauchi & Wirz-Justic, 1988; Rosenthal et al., 1984; Tam et al., 1997). For instance, Krauchi and Wirz-Justice (1988) found that compared to controls, individuals with SAD consumed more carbohydrate-rich food during the winter months compared to in the summer months, as well as individuals with SAD eating more meals per day compared to controls.

Comparing these results to the research assessing eating cognitions in the eating disorder literature, Mizes and colleagues (Mizes et al., 2000) have found that the Self-Control and Weight and Approval subscales of the MACS-R vary between different eating disorder diagnostic groups, namely that individuals with bulimia nervosa (BN) scored significantly higher on these subscales compared to individuals with anorexia nervosa (AN). In the present study, similar to Mizes et al. (2000), the Self-Control subscale differentiated SAD from the other groups, whereas the Weight and Approval subscale did not differentiate between groups, although there was a trend for SAD to be higher than the other groups, particularly the control group. These findings indicate similarity between SAD and BN in that both groups believe that self-control is a basis for self-esteem; however they are different in that bulimia nervosa is characterized by believing that approval by others is based on weight and appearance, whereas SAD is not. As far as the author knows, Mizes et al. (2000) is the only study published that compared eating disordered groups on the subscales of the MACS-R. An earlier version of the MACS has differentiated individuals with eating disorders from nonclinical groups on all of its subscales (Mizes, 1988, 1992), as well as discriminating between individuals with BN, restrained eaters, and nonclinical controls (Bonifazi, Crowther, & Mizes, 2000).

In sum, the present research highlights the importance of examining eating attitudes when differentiating SAD from other control groups. Additional information on comparing the four groups in the present study on eating related symptoms can be found by looking at the results involving the EAT-26, a measure of behavioural symptoms associated with eating psychopathology.



In this study, eating behaviours were assessed using the Eating Attitude Test - 26 (EAT-26). Hypothesis 1 was partially supported in that some subscales of the EAT-26 differed significantly across groups. Compared to the S-SAD and control groups, SAD was more preoccupied with being thinner and with avoiding carbohydrate-rich and high-caloric foods (Dieting subscale), and more preoccupied with thoughts about food and engaged in more binge behaviours (Bulimic subscale). Individuals with nonseasonal depression were more likely to attempt to maintain self-control while eating and perceive pressure from others to gain weight (Oral Control subscale) compared to individuals with S-SAD.

Similar to the MACS-R findings, individuals with SAD presented with more dysfunctional eating behaviours (e.g., Dieting and Bulimia subscales) than their sub-syndromal and control group counterparts. Other researchers have found similar results comparing SAD and controls using the EAT-26, although a S-SAD group was not included (Berman et al., 1993). Here, the researchers found that individuals with SAD scored significantly higher on the overall EAT-26 score compared to nonclinical controls. As well, using the Eating Disorders Inventory (Garner & Olmstead, 1984), a measure of core behavioural and psychological constructs of eating disorder psychopathology (e.g., drive for thinness, bulimia, body dissatisfaction) individuals with bulimia nervosa scored higher than the individuals with SAD on all subscales except Body Dissatisfaction, Perfectionism, and Maturity fears. In turn, individuals with SAD scored higher than controls on all subscales except Perfectionism.

No other studies have measured eating cognitions and behaviour in individuals

with SAD. There has been one study that prospectively assessed seasonal variations on the EAT-26 in the winter and summer months in a nonclinical (psychiatric nurses) sample. Although the researchers found no seasonal changes on the EAT-26 overall and subscale scores, they did find seasonal variations on four items (Eagles, McLeod, Mercer, & Watson, 2000). This finding indicates that it may be also worthwhile to assess the seasonal variation of particular items in addition to subscales to find group differences.

Compared to the MACS-R findings presented above on dysfunctional eating cognitions, the present research on eating behaviours paints a slightly different picture, particularly regarding the nonseasonal depression group. In this study, the Depressed group presented with more attempts to maintain self-control when eating compared to S-SAD. This finding is supported in the research literature whereby there is a relationship between depression and disordered eating, as evidenced by a high prevalence comorbidity between individuals with depression and eating disorders (Brewerton et al., 1995; Perez, Joiner, & Lewinsohn, 2004; Zaider, Johnson, & Cockell, 2000). For instance, 63% of individuals with bulimia nervosa are also diagnosed with depression (Brewerton, Lydiard, Herzog, & Brotman, 1995). Thus, these findings suggest that both SAD and nonseasonal depression present with dysfunctional eating cognitions and behaviours, although this is found to a larger degree in SAD.

Overall, the two measures of dysfunctional eating cognitions and behaviours, the MACS-R and EAT-26, provided partial support for the first hypothesis, which is based on the DVH and the cognitive-specificity hypothesis. It was expected that individuals high on the seasonality dimension (SAD, S-SAD) would have greater dysfunctional

eating cognitions than individuals low on this dimension (Depressed, Control). Instead, SAD, not S-SAD, presented with significantly more dysfunctional eating cognitions than individuals in the other three groups on the Self-Control subscale, than individuals in the control group (i.e., on the Rigid Weight Regulation, Dieting, and Bulimia subscales), and than S-SAD (i.e., on the Dieting and Bulimia subscales). On the subscales where there were no significant differences between SAD and the other groups, there was a trend towards SAD being greater than S-SAD and Depressed (where both had similar scores) and the control group (i.e., Rigid Weight Regulation, Weight and Approval subscales). There was also a trend for SAD to be greater than the S-SAD group (e.g., Dieting and Bulimia subscales).

There are some factors that make SAD unique from S-SAD that may explain why SAD, and not S-SAD, experienced more dysfunctional eating cognitions and behaviours compared to the other groups. First, although both SAD and S-SAD are high in seasonality, they differ on the depression dimension where SAD loads high and S-SAD loads low. Perhaps, it is a combination of loading high on the seasonality and depression dimensions, not being high on either the seasonality or depression dimensions, that is associated with dysfunctional eating cognitions. Second, SAD has greater impairment due to seasonal changes (which encompass vegetative symptoms as well) than S-SAD. The seasonal impairment criteria for selection into the SAD group is at least moderate impairment, whereas S-SAD can have GSS scores greater than 11 and mild/no impairment, or GSS scores between 9 and 11 and at least mild impairment. Other researchers have found that impairment (measured as occupational impairment) is an

important variable when differentiating SAD from nonseasonal depression (Michalak, Wilkinson, Hood, & Downrick, 2002). Third, the SAD group presented with the most vegetative symptoms (HDRS-B subscale) compared to the other groups, including S-SAD. Thus, it seems that SAD when categorized with these defining features may be associated with greater dysfunctional eating cognitions, particularly symptoms related to gaining a sense of self-worth when limiting food intake (Self-Control subscale).

This pattern of SAD being characterized by more dysfunctional eating behaviours compared to the other three groups was also found numerically on other eating disorder subscales, although the groups were not statistically significant from one another. The non-significant findings might be related to lower, although acceptable, internal scale consistencies on some of the dysfunctional eating subscales (Cronbach's  $\alpha = .68$  and  $.67$  for EAT-26 Bulimia and Oral Control subscales, respectively). Absence of statistical differences between SAD and other groups on the MACS-R Weight and Approval and Rigid Weight Regulation subscales may be related to relatively low power in the analyses to detect significant differences (power =  $.77$ , power =  $.78$ , respectively) compared to the Self-Control subscales (power =  $.99$ ). Thus, there are some statistical factors that may account for the non-significant group differences on some of the eating attitudes and behaviours subscales.

#### Winter Stress Appraisal

Hypothesis 2 predicted that in comparison to the other three groups, SAD would report greater stressfulness of their vegetative symptoms during winter, and poorer perceived winter stress appraisal such as greater dread of winter, greater impairment in

functioning during winter, negative affect, and poorer perceived ability to cope with winter compared to the other three groups. This hypothesis was supported.

Individuals with SAD reported greater dread of winter, and greater stressfulness and impairment associated with winter vegetative symptoms compared to individuals with depression, S-SAD and nonseasonal nondepressed controls. Individuals with depression experienced more impairment in winter than the control group. Thus, both individuals with SAD and nonseasonal depression found vegetative symptoms impairing, although this impairment was greater in SAD. These findings are similar to those found by Dew and Tan (2003) who used the same measure of winter-stress appraisal and also found that individuals with SAD experienced significantly more winter-stress appraisal compared to nonseasonal, S-SAD, and control groups. These findings in the present study may also have been related to the result that SAD had greater vegetative symptoms than depressed individuals, who in turn were greater than S-SAD and controls.

Individuals with SAD also used more rumination to cope with the vegetative symptoms compared to the other three groups. Individuals categorized as depressed and S-SAD endorsed using a more ruminative coping style than the control group (discussed below). These findings are parallel to those found in this study in the rumination coping style to depressed mood as measured by the RSQ where individuals with SAD and nonseasonal depression have a more ruminative coping style compared to sub-syndromal and control groups. Taken together, rumination as measured by the RSQ and the Perceived Winter Stress Scale emphasize the ruminative response style to depressed mood in both SAD and nonseasonal depression, particularly as it relates to winter stimuli.

Individuals with SAD experienced more negative affect (e.g., feeling nervous, upset, angry) during the fall or winter months compared to individuals with depression, S-SAD, and nonseasonal nondepressed controls. Individuals with depression experienced more negative affect than the control group. Finally, individuals with SAD and depression felt they were less able to cope during the fall or winter compared to the individuals with S-SAD and controls. Taken together, these findings suggest that during the winter, SAD is more affected in their mood and coping ability, whereas individuals with depression are more affected in their coping ability, which may be related to a more general pessimism in their self-evaluation of coping ability.

In the exploratory analyses involving clinical individuals who were diagnosed with a major depressive episode, similar results for winter-stress appraisal were also found. Specifically, individuals who were clinically diagnosed with SAD experienced significantly more dread of winter, more perceived stressfulness of vegetative symptoms, more rumination about vegetative symptoms, and greater impairment in functioning during winter. This indicates that winter-stress appraisal is a robust finding in this study.

Taken together, findings from the overall and clinical sample provide partial support for the DVH in that individuals high on the seasonality and depression dimensions (i.e., SAD) experienced negative winter appraisal, as opposed to individuals high on only the seasonality dimension (S-SAD). Thus, seasonality in itself is not associated with winter-stress appraisal, and instead it is the combination of loading high on both seasonality and depression dimensions that is related to winter-stress appraisal. Other interesting findings were that individuals experiencing nonseasonal depression

were associated with high levels of rumination, impairment due to vegetative symptoms during the winter months, and winter-related stress. These individuals also presented with greater vegetative symptoms than S-SAD and controls (HDRS-B subscale), although it was significantly less than the SAD group.

The findings related to negative winter stress appraisal are also supported by the cognitive content specificity hypothesis. This may mean that individuals with SAD may be predisposed to viewing winter negatively, and as a result experience greater winter stress appraisal compared to the other groups.

#### Physical Health

Hypothesis 3 predicted that physical health would be related to the seasonality dimension in that individuals characterized as SAD and S-SAD would engage in increased levels of physical activity compared to individuals with depression and nonseasonal nondepressed controls. It was also hypothesized that SAD would engage in greater physical activity levels than S-SAD.

Three main physical activity concepts were examined: amount of time spent per occasion in physical activity, how often in the past month he or she has engaged in physical activity, and changes in physical activity levels compared to the past year. Each of these concepts was measured in six types of physical activities: high, medium, and low intensities for both individual and team activities. The hypotheses were based on the eating disorder literature, whereby increased physical activity is associated with eating disorder behaviours, which have also been found to have a seasonal pattern to them (Davis et al., 1997; Mond, Hay, Rodgers, Owen, & Beumont, 2004). Hypothesis 3 was

partially supported. Results indicated that across these three physical activity variables, only one significant group by sex interaction was found, and the other significant results were all sex main effects. These sex differences are discussed in a section below that summarizes the sex differences found throughout the study.

The group by sex interaction indicated that control males engaged more, on average per occasion, in a physical activity than SAD males. This finding might be interpreted as that physical activity serves as a protective factor against SAD, that SAD men exercise less for some reason (possibly because the lethargy and lack of motivation associated with their depressive symptoms might make them less inclined to be active) or both explanations might be tenable. The first postulation has some support in the literature that highlights the psychological benefits of engaging in physical activities. For example, researchers (e.g., Babyak, et al., 2000; Penedo & Dahn, 2005) reviewed studies examining the mental health benefits of exercise, and reported that participating in physical activities results in improvements in mood and reduction in symptoms of depression. Salmon (2001) reviewed the existing physiological and psychological literature on the effects of exercise on anxiety and depression symptoms, and provide convincing evidence for a stress-adaptation model. Specifically, the author proposed that exercise improves an individual's resilience to stressful events. Given that individuals with SAD in this study identify having the highest levels of winter stress appraisal, compared to the other groups, this model would predict that exercise may be a useful strategy to deal with winter stressors. This idea is supported in a study by Leppamaki et al. (2002) who found that bright-light exposure and aerobic exercise decreased vegetative



symptoms in individuals with S-SAD.

Overall, the present research findings indicate that physical activity levels are generally not related to either seasonality or depression dimensions in that there was an absence of group differences in physical activity. This is congruent with previous works such as that by Mond et al. (2004) who found no relationship between eating disordered psychopathology and frequency of engaging in physical activities (i.e., based on number of leisure-time activities, number of weeks of participating in each activity, average number of sessions, and average duration of each session). Perhaps the use of more psychological measurements associated with physical activity might reveal group differences. Mond et al. (2004) found that particular exercise *attitudes* (i.e., exercising to improve appearance, and feelings of guilt following the postponement of exercise) were related to eating disordered psychopathology. Merely engaging in high levels of physical activity may not generally differentiate the groups, whereas other aspects of physical activity, such as attitudes towards it, may differentiate groups. Thus, the research literature suggests that the relationship between physical activity, seasonality, eating attitudes, and depression is complex, and investigating other physical activity variables, such as attitudes towards exercise, may differentiate groups.

Another plausible explanation for the lack of significant group findings in the current study involves the retrospective nature of the questionnaire that required individual to compare current physical activity levels to the previous year, which may be difficult to recall accurately. It may be more useful and valid to have an individual keep a weekly/monthly log of physical activities levels (via behavioural and physiological

measures) in order to assess current physical activity levels (Shelton & Klesges, 1995). Finally, it should be noted that the statistical analyses involved in the testing of physical activity variables had relatively low power to detect significant group differences (e.g., power ranged from .57 to .83). Hence, whatever group differences there might have been would not have been revealed due to the low power in the statistical testing.

#### Interpersonal Context-Specificity

Hypothesis 4 predicted that individuals who score high on the depression dimension such as SAD and Depressed would have greater interpersonal context-specificity (e.g., sociotropic tendencies) when compared to S-SAD and Control groups. This hypothesis was partially supported. It was found that individuals with SAD and nonseasonal depression were more sociotropic than controls. In other words, individuals with SAD and nonseasonal depression were more invested in close relationships and had a stronger need for affiliation and acceptance by others (Clark et al., 1995). An examination of cell means across groups reveals a trend where individuals had increasingly higher sociotropy scores from control, S-SAD, SAD, and nonseasonal depression.

With respect to the personality literature investigating the relationship between sociotropy and depression, theorists have proposed that sociotropic individuals are more vulnerable to developing depression when encountering interpersonal loss, social rejection, or disapproval from significant others (Beck, 1983). For example, in a retrospective study by Abela, McIntyre-Smith, and Dechef (2003) the researchers found that when asked to recall the most stressful event occurring in the last year, sociotropic

individuals were more likely to recall an event with interpersonal meaning compared to an event with achievement meaning (autonomy). Sociotropy has also been found to be related to improvement of depression symptoms in group therapy, and to interact with negative personal events to predict depression (for a review see Clark, Beck, & Alford, 1999).

Although the relationship between the cognitive vulnerability of sociotropy and experiencing problems in interpersonal relationships in nonseasonal depression is well-supported in the literature, the research involving sociotropy in SAD is inconclusive and under-researched. Specifically, this is the first study to examine sociotropy, as measured by the SAS-R, in SAD. Thus, the current research suggests that individuals with high depression symptoms, regardless of seasonality, are more sociotropic and, therefore, may be more vulnerable to experiencing depression when faced with interpersonal challenges. This also provides partial support for the DVH, whereby individuals high on the depression dimension had a trend towards higher levels of sociotropy than individuals low on depression.

#### Response Styles to Depressed Mood

Hypothesis 5 predicted that individuals who score high on the depression dimension (SAD and Depressed) would use more rumination in response to their depressed mood when compared to S-SAD and Control groups. The Response Style Questionnaire (RSQ) measured response styles to depressed mood, including rumination. This hypothesis was partially supported. Participants with SAD engaged in higher levels of rumination compared to nonseasonally depressed, S-SAD, and controls. Individuals

with nonseasonal depression also experienced more ruminative response style to depressed mood compared to controls, although this was not significantly different from that of sub-syndromal depression, as predicted by the hypothesis. However, the trend reflected in the cell means show a decrease in rumination scores when one moves from SAD to nonseasonal depression, sub-syndromal depression, and finally to controls.

Another significant finding was that individuals with SAD engaged in more dangerous coping activities to depressed mood compared to the control group. In the clinical subsample, both SAD and depressed group undertook more dangerous activities than did the control group. These results suggest a link between the depression dimension and behaviours characterized by impulsivity and high risk that may be detrimental to the individual. However, one has to remember that the internal consistency of the dangerous activity scale was low (Cronbach's  $\alpha = .55$ ) and needs to view this finding with some caution.

Thus, these ruminative responses style findings support a trend hypothesized by the DVH in that individuals who loaded high on the depression dimension (SAD and depressed) presented with more ruminative responses to depressed mood than individuals who loaded low on the depression dimension (S-SAD and controls). Similar findings are reported in the depression literature. Many researchers have found that depressed individuals engage in more ruminative behaviours than nondepressed individuals (Nolen-Hoeksema, 2000). As well, researchers have also found a ruminative response style to depressed mood in the fall predicts depressive symptom severity during the winter (Rohan et al., 2003; Young & Azam, 2003). Thus, the current study provides additional

support for the role of ruminative behaviour in SAD and nonseasonal depression.

#### General Negatives Attitudes

Hypothesis 6 predicted that SAD and Depressed would have greater negative attitudes when compared to S-SAD and Control groups. The Dysfunctional Attitude Scale (DAS) measured negative attitudes. This hypothesis was fully supported as individuals with SAD and nonseasonal depression had more general negative attitudes compared to individuals with S-SAD and nonseasonal nondepressed controls.

In terms of the DVH, this research finding, namely the role of negative attitudes related to the depression dimension, is supported in both the SAD and nonseasonal depression literature. In the seasonal depression literature, Michalak, Wilkinson, Dowrick, and Wilkinson (2001) found that in a community sample in North Wales, individuals with nonseasonal depression had significantly higher levels of negative attributional style, as measured by the Automatic Thoughts Questionnaire (ATQ; Hollon & Kendall, 1980), than individuals with seasonal depression. The ATQ is a similar measure to the DAS used in this scale in that it measures the presence of general negative attitudes. The current research is similar to the findings by Hodges and Marks (1998) whereby individuals with seasonal and nonseasonal depression experienced greater dysfunctional attitudes and more negative automatic thoughts compared to controls, although these two groups did not differ from one another. In sum, this research provides additional support for the relation between dysfunctional attitudes and the depression dimension, as outlined by the DVH.

#### Hamilton Depression Rating Scale-28 (HDRS-28)

Analyses were completed on the two subscales of the HDRS-28: vegetative and cognitive/affective symptoms. This was done because although the total HDRS scores were used to categorize the different groups in the study (i.e., SAD, Depressed, S-SAD, Control), research has shown that the two subscales, vegetative (HDRS-B) and cognitive/affective symptoms (HDRS-A), are useful as well in differentiating the groups. In particular, SAD may be characterized by more vegetative symptoms compared to the other groups (Sakamoto, Nakadaira, Kamo, & Kamo, 1995).

Findings from the present study revealed that individuals with high loading on the depression dimension (i.e., SAD and nonseasonal depression) presented with a greater severity of cognitive/affective symptoms compared to individuals who had low loading on the depression dimension (i.e., S-SAD and control groups). Individuals with SAD presented with more vegetative symptoms compared to the other three groups, and individuals with depression presented with greater vegetative symptoms than S-SAD and control groups. Overall, these results provide mixed support for the DVH. The link between the seasonality dimension and vegetative symptoms is unclear. As expected, individuals (SAD group) who had the highest loading on the seasonality dimension as measured by the GSS reported the most severe vegetative symptoms. However, the Depressed group reported more severe vegetative symptoms than did the S-SAD even though the Depressed had a lower seasonality loading. The results thus provide clearer support for the depression dimension in that individuals loading high on the depression dimension (i.e., SAD and depressed groups) experienced more cognitive-affective symptoms compared to individuals scoring low on this dimension (e.g., S-SAD and

control groups).

### Understanding Group Differences

The research findings in this study have been presented above for the six hypotheses. The findings have also been presented for each dependent variable, as well as a discussion of each in relation to the applicable literature, including the DVH and the cognitive specificity hypothesis where applicable. Now, it may be useful to conceptualize the four groups, SAD, S-SAD, nonseasonal depression, and nonseasonal nondepressed controls, on the basis of their similarities and differences compared to the other groups. This would be useful in understanding the unique presenting symptoms of each group.

### *Seasonal Affective Disorder*

In the present study, SAD could be differentiated from the other three groups (S-SAD, depressed, and control) on the basis of its greater experience of vegetative symptoms (e.g., craving carbohydrates and sweets, eating more than usual, gaining weight). Specifically, compared to the three groups, SAD individuals believed that restrained eating behaviours is associated with a means of feeling a sense of accomplishment and self-worth. They also used more rumination in response to a depressed mood, particularly related to winter-stimuli during the fall/winter months. Compared to depressed and control individuals, SAD appraised winter-related stimuli to be more stressful in that they dreaded winter more, found vegetative symptoms to be more stressful and impairing, and experienced more negative affect during the fall and winter months. These findings are in line with the DVH that proposes that individual

with seasonal depression experience greater vegetative-related symptoms than depressed and control groups. A discussion about the reasons why S-SAD was not higher on these vegetative-related symptoms compared to nonseasonal depressed individuals and controls will be presented below.

In addition to the variables related to the vegetative symptoms (i.e., seasonality dimension) mentioned above, SAD experienced other vegetative-related symptoms that were significantly higher than the control group. For example, individuals with SAD engaged in more dysfunctional eating cognitions and behaviours that included believing strict weight regulation to be related to controlled eating and fears of gaining weight, engaging in dieting behaviours that are related to a preoccupation with being thinner and avoidance of high-carbohydrate and high-sugar foods, and being more preoccupied with thoughts about food. With respect to variables associated with the depression dimension, individuals with SAD also engaged in more dangerous activities and rumination as a response style to depressed mood, placed a higher value on personal relationships and the opinions of others, engaged in more general negative attitudes, and had more depressive symptoms compared to controls. Thus, overall, SAD differs from the other groups in this study namely on variables related to the seasonality dimension or vegetative symptoms, and on some variables associated with the depression dimension.

Next, the similarities and differences between S-SAD and the other groups are discussed in somewhat more theoretical detail, as it is this group that is less understood compared to SAD in the literature.

#### *Sub-syndromal Seasonal Depression*



As mentioned earlier, S-SAD can be described in terms of the seasonality continuity hypothesis (Rohan et al., 2004). In other words, SAD and S-SAD are hypothesized to vary in terms of quantity (i.e., frequency) and not quality (i.e., type of symptoms) of different degrees of seasonality.

The present study provides evidence that S-SAD may be differentiated from the other three groups on several variables. For instance, individuals with S-SAD presented with fewer dysfunctional eating attitudes (e.g., dieting behaviours and preoccupations with food thoughts) than the SAD group, although these were not significantly different from the levels experienced by the control groups. In fact, the only variable that differentiated S-SAD from the control group was greater rumination on winter-related variables. In other words, despite the S-SAD group having higher GSS scores, they did not generally vary from individuals with no seasonal change (controls).

When compared to SAD and nonseasonal depression groups, S-SAD had significantly less difficulty in coping during the fall and winter months, had less vegetative and depressive symptoms, and had less general negative attitudes compared to the SAD and nonseasonal depression groups. Furthermore, S-SAD made less attempts than nonseasonal depressed individuals to maintain self-control while eating despite perceiving pressure from others to gain weight. However, this distinction did not exist between S-SAD and SAD. Hence it would seem that the difference between S-SAD and nonseasonal depression lies in self-control while eating.

#### *Nonseasonal Depression*

There were also variables that differentiated nonseasonal depressed individuals

from the other three groups. For instance, depressed individuals engaged in a ruminative response style to depressed mood, and placed investment in personal relationships and in the opinions of others to a greater extent than did the controls. They also experienced a greater impairment in winter-related stimuli, a greater ruminative response style to winter-related stimuli (e.g., wishing could go outside more, wishing they felt similar to how they felt during the summer), and more negative feelings during the fall and winter months. These differences between nonseasonal depression and controls were less pronounced than the differences between individuals with SAD and the other groups.

Some existing research supports the notion of individuals with nonseasonal depression experiencing adverse reactions to winter seasons. For example, in an undergraduate sample, individuals retrospectively identified situations that produced a two-week period of low mood during the previous year (e.g., felt sad, down, or depressed; Keller & Nesse, 2005). Participants were then asked to identify what caused their low mood. Results indicated that approximately 10% of the individuals reported that winter led to a low mood, and these individuals show higher levels of fatigue, pessimism, sleeping, and eating. Sher et al. (2005) compared individuals with major depression in the fall/spring months to individuals with major depression in the winter/summer months on both clinical and biological parameters. The results indicated that higher cortisol levels were found in the spring/fall group compared to the winter/summer group, thus, providing support for the different types of major depression. These two studies provide support that both low mood and major depression are associated with adverse reactions to winter months, as well as seasonal variations in

stress-related hormones. A limitation of these studies was that the participants were not screened to have current or past seasonal or nonseasonal depression. In other words, these samples may have contained individuals with seasonal depression. Finally, individuals with depression possessed greater general negative attitudes than controls, which is a finding supported by the literature.

In addition to discussing similarities and differences between the four groups in this study, it is also interesting to examine the significant sex differences in the study. The following section presents this research.

### Sex Differences

#### *Eating Cognitions and Behaviours*

Regardless of group classification, females believed more than males that restrained eating is related to self-esteem (Self Control subscale). This finding parallels that reported by Osman et al. (2001) who used a brief version of the MACS-R in an undergraduate sample.

#### *Winter Stress Appraisal - Dread of winter*

Females with SAD also experienced more dread of winter compared to females categorized as depressed, sub-syndromal, and controls. Males with SAD had more dread of winter than control males. Finally, males with S-SAD experienced more dread of winter compared to control males. These findings suggest that no clear sex differences exist with respect to winter stress appraisal. However, individuals with high seasonality tend to be more averse to winter than their same-sexed counterparts who have lower degrees of seasonality.

*Stress and Impairment Associated with Winter Vegetative Symptoms*

In the overall sample, females experienced a greater stressfulness associated with their vegetative symptoms than males.

*Physical Health*

Compared to females, males spent more time on high-intensity individual and team activities and on low-intensity team activities. On the average, they also spent more time on physical activities regardless of the type of activity. They were also more likely than females to maintain their activity level in high-intensity exercises. Taken together, these findings suggest that males participated in more physical activities and were more consistent over the past year in their physical activity routines. These findings are supported in the literature, whereby researchers have found that men engage more frequently in physical activities compared to women (Dishman & Jackson, 2000; Thome & Espelage, 2004).

*Hamilton Depression Rating Scale – 28*

In the overall sample females presented with greater vegetative symptoms compared to males. Males with SAD had greater vegetative symptoms than males with depression, S-SAD, and controls. Females with SAD had greater vegetative symptoms than females characterized by S-SAD and controls. Finally, females with SAD had greater vegetative symptoms than females with depression, who in turn had greater vegetative symptoms than S-SAD females and control females.

*Summary*

In summary, the following differences were found between males and females in

the present study irrespective of group classification. Females engaged in more restrictive eating behaviours as a means of maintaining a sense of accomplishment and self-esteem, experienced more distress associated with their vegetative symptoms, and more vegetative symptoms compared to males. However, males spent more time engaging in high-intensity activities on an individual and team basis. They also spent more time undertaking low-intensity team activities and did so more frequently. Regardless of the type of activities, males generally spent more time in physical activity than did females.

### Clinical Implications

There are numerous clinical implications associated with the current study. Clinical implications can be described for both the assessment and treatment of seasonal depression, nonseasonal depression, and sub-syndromal depression. Regarding assessment, the variables included in this study were all able to differentiate the different groups in one way or another. For example, SAD and nonseasonal depressed individuals ruminated more than S-SAD and controls. The presence of dysfunctional eating cognitions and behaviours as well as winter dread appear to be especially linked to individuals with seasonal depression. Consideration of all these variables when interviewing individuals who present with depressed mood and vegetative symptoms might be useful.

Furthermore, this study provided evidence that individuals who present with high seasonality (as measured by the GSS) and depression (as measured by the HDRS-T) scores do exhibit psychological distress even though they might not meet the clinical

criteria for major depression. This distress includes dysfunctional eating cognitions, winter-stress appraisal, ruminative and high risk response styles, general negative attitudes, sociotropic tendencies, and cognitive/affective and vegetative symptoms. As well, depressed individuals (elevated depression scores but without a clinical diagnosis) who had low seasonality scores, also presented with vegetative symptoms, including attempting to maintain self-control when eating, impairment of vegetative symptoms, ruminative coping style in response to winter stimuli, and negative affect during the winter months. Hence it would seem prudent to assess individuals with elevated depression scores for these vegetative-related symptoms, irrespective of clinical diagnoses.

Another implication relates to the S-SAD group. Because these individuals did not present with significant psychological distress, and in most cases do not appear to be different from the control group, a re-conceptualization of this group might be required in order to make their distinction more meaningful. The current literature defines S-SAD solely on the basis of their having GSS scores of 9-11 and at least mild impairment, or having GSS scores greater than 11 and no or mild impairment. What might help to distinguish the S-SAD from the control and the SAD groups would be to add an extra criterion to its definition. This extra criterion might be a range of depression scores that is higher than that for the controls but lower than those applied to the SAD group. Hence, using a combination of GSS scores, seasonal impairment, and severity of depression scores might be more useful in the identification of a sub-clinical SAD group that experiences some psychological distress, instead of relying only on GSS and

seasonal impairment alone as is done in the present literature.

The findings from the present study have implications for the treatment of SAD. Given that SAD has been shown to be associated with unique dysfunctional eating, winter-stress appraisal, and general negative attitudes, it would be worthwhile to investigate treating these beliefs in cognitive behavioural therapy (CBT) either as the sole therapeutic strategy or as a complement to light therapy. Indeed, CBT has been shown to be beneficial for relapse prevention for individuals with depression (Gotlib & Hammen, 2002). As well, preliminary studies have shown that CBT is beneficial for individuals experiencing seasonal depression. For example, in the first randomized trial of CBT for SAD, individuals with SAD were treated with either light therapy ( $n = 8$ ), CBT ( $n = 7$ ), or the combination of CBT and light therapy ( $n = 6$ , Rohan et al., 2004). All three treatments were associated with comparable improvements in depression (as measured by the SIGH-SAD and BDI-II) and the combined treatment group had the highest rate of full remissions at the end of treatment. At one-year follow-up, individuals who had been treated with CBT or with the combined treatment generally had better outcomes than those who had been treated with light therapy alone. Specifically, individuals treated with CBT were less depressed and had a lower rate of relapse than individuals who had been treated with light therapy alone. These findings suggest that CBT alone or in conjunction with light therapy may improve the long-term outcome regarding seasonal depression symptoms.

Another clinically important finding is that individuals with seasonal depression engaged in more dangerous activities as a coping style to depressed mood than controls.

Dew and Tan (2003) reported the same finding. It would appear that this is an issue to be examined in clinical work with SAD individuals to ensure their psychological and physical safety should they tend to impulsive and risky undertakings.

Finally in the present study, the SAD, depressed and S-SAD groups generally engaged in lower levels of physical activities (i.e., average duration of physical activity) compared to the healthy controls. Exercise is an important component of any healthy lifestyle and it is a beneficial treatment for nonseasonal depression (Babyak et al., 2000; Lawlor & Hopker, 2001; Stich, 1999). In the eating disorder literature, and to a lesser extent in the seasonal depression literature, cognitive behavioural treatment programs that incorporate a nutritional and physical activity program have been shown to lead to decreases in negative mood and improvements in eating disorder symptoms (Fossati, Amati, Painot, Reiner, Haenni, & Golay, 2004). As well, 84% (28 out of 33) of international clinicians surveyed by Hechler, Beumont, Marks, and Touyz (2005) agreed that physical activity is important in the pathogenesis and maintenance of eating disorders, and should be incorporated into assessment and treatment programs. Given the symptom overlap between eating disorders and seasonal depression, it may be worthwhile to consider increasing the level of physical activity as part of the treatment plan for seasonal depression. In addition to monitoring levels of physical activity, related psychological variables, such as attitudes towards exercise, might be relevant and need to be considered as well.

#### Strengths and Limitations of the Study

This present study furthers our understanding of the S-SAD group that has been



largely ignored in the seasonal depression literature. It also affords a comparison of the groups with nonseasonal depression that is not often done. An examination of previous works in the literature shows a lack of consideration of the S-SAD group (Martin et al., 2004; Pendse, Engstrom, & Traskman-Bendz, 2004; Thompson, Thompson, & Smith, 2004), or of the nonseasonal depression group (Hankin, Fraley, & Abela, 2005; Lee, Harkness, Sabbagh, & Jacobson, 2005). In order to understand more fully the psychological landscape of SAD and how it is unique from closely related depressive conditions, it is important to compare and contrast it with S-SAD and nonseasonal depression.

The classification criteria adopted in the present study is more complete than those used in previous works. For example, an overwhelming majority of works do not consider the seasonality (GSS) score of their nonseasonal depression groups (e.g., Hankin et al., 2005; Lee et al., 2005) as long as they meet the diagnostic criteria for major depression. Perhaps, the seasonality issue might have been dealt with in diagnostic interviews but interviews alone cannot quantitatively control for seasonality changes to ensure a greater homogeneity within the nonseasonal depression group. In the present study, the same GSS criterion was applied to the nonseasonal depression and control group. This was done to ensure that the nonseasonal depression individuals were “nonseasonal” as per the guideline developed by Rosenthal et al. (1987).

This study also undertook exploratory analyses involving clinical SAD and nonseasonal depression individuals who have clinical depression. Results from these analyses allow one to ascertain the robustness of the findings from the overall main

study. If the findings from the main study hold up as well in the smaller clinical subset sample, then more confidence can be placed in the results.

It is noteworthy that in the exploratory analyses involving the clinical subsamples, the individuals in all four groups (SAD, depressed, S-SAD, and control) were age- and sex- matched. Such matching reduces confounds associated with age and sex, and ensures that any group differences that might be observed are related to the factors under investigation. Confidence in the findings is increased by the fact that the scales used in the study had strong psychometric properties. Most of them had Cronbach's alpha exceeding .80. The majority of the scales were established standardized measures.

Finally, another strength of the project is that the study has a strong theoretical foundation as it bridges two psychological theories, the DVH and the cognitive specificity hypothesis. This broadens the field of research in seasonal depression, particularly related to cognitive variables.

There are several limitations associated with this study. The most obvious drawback is that in the main analyses, the subjects were not assessed for clinical depression. In this sense, it might be misleading to label the groups in the main study as SAD or depressed. Perhaps it would have been more accurate to refer to them as subclinical. However, their depression scores were high. SAD had a mean Hamilton score of 41.80 and nonseasonal depressed had a mean score of 34.04. Given such elevated Hamilton scores, it would have been difficult to view these individuals as merely subclinical. It should also be noted that one-third of the SAD (38%) and of the depressed group (30%) met the clinical criteria for major depression. Additionally, the SAD group

reported at least moderate impairment associated with the seasonal changes, indicating that their functioning had been affected by their depressive episodes. This is in keeping with the diagnostic requirement of functional impairment.

Another obvious limitation is the small number of individuals in the exploratory analyses involving the clinical samples. The greatest hurdle in this part of the project was obtaining nonseasonal depressed individuals who not only had high depression scores but also low GSS scores *plus* no or mild impairment. There were many individuals who had low GSS scores but their impairment was greater than mild, and many individuals whose GSS scores fell in the middle range (9-11) but reported no seasonal impairment at all. There were also a few individuals with very high GSS scores (exceeding 12) who reported no seasonal impairment. Had the criteria for nonseasonal depression been less stringent and more in line with previous works, these individuals would have been included and the sample size for the exploratory analyses would have been increased considerably. However, to maintain methodological rigor, these subjects were excluded, resulting in low sample size. Low sample size would therefore limit the power of the analyses to detect real group differences.

A third limitation relates to the overlap between the main study and the clinical subsample in their subject composition. The main study encompasses both clinical and the “subclinical” subjects. One might argue that it would have been better to separate the clinical subjects from the subclinical subjects and run the statistical analyses on both of them separately, or to compare the clinical with the subclinical subjects. While this would be reasonable argument, the fact remains that the objective of the present study

was not to compare clinical versus subclinical subjects. Rather its goal was to compare the four groups on psychological factors. The exploratory analyses were carried out post-hoc after it was ascertained that the sample composition permitted an investigation into the clinical subsamples and speak to the robustness of the findings in the main study.

There were participants in the study who presented with dysfunctional eating cognitions and behaviours. Some of them might have met the criteria for an eating disorder. However, this was not assessed. A good measure to detect the presence of individuals who meet Eating Disorder criteria would be the Eating Disorder Diagnostic Scale (Stice, Fisher, & Martinez, 2004). Examination of such individuals would have been helpful to further one's understanding of the link between the variables measured in the study and eating disorder. It would also be useful to expand the use of measures to include observational and ones completed by others, since the measures used in this study were self-report.

Finally, the four groups in the overall sample had unequal sample sizes and this may increase Type I error (Tabachnick & Fidell, 2001, p. 46). However, efforts were made to compensate for unequal group sizes by using Pillai's trace in MANOVA analyses, and confirming MANOVA results with Discriminant Function Analyses.

### Conclusion

In summary, the present study compared seasonal affective disorder (SAD), nonseasonal depression (Depressed), sub-syndromal SAD (S-SAD), and control groups on six main areas of emotional and behavioural functioning: dysfunctional eating cognitions and behaviours, cognitive content specificity to winter stimuli, physical

activity levels, interpersonal context-specificity, response styles to depressed mood, and general negative attitudes. These six areas translated into six main hypotheses as predicted by the DVH and cognitive-specificity hypothesis.

Hypotheses 1 to 3 were related to the seasonality dimension as conceptualized by the DVH (Lam et al., 2001; Young et al., 1991). First, hypothesis one was related to dysfunctional eating cognitions and behaviours. It was found individuals (SAD) who were high on the seasonality and depression dimensions, had at least moderate impairment related to vegetative symptoms, and experienced greater vegetative symptoms than the other three groups, could be distinguished by their higher belief that controlled eating was related to a sense of accomplishment and self-worth (Self-Control subscale of the MACS-R). Other eating-related subscales provided findings that had similar trends in this direction (e.g., Weight and Approval, Rigid Weight Regulation subscales), although these relationships were nonsignificant. Individuals with SAD were also more preoccupied with thoughts about food, about being thinner, avoiding carbohydrate-rich and high-caloric foods, and engaged in binge behaviours when compared to the S-SAD and control groups. Finally, individuals with SAD presented with more rigid weight regulation compared to controls. These findings highlight the important role that eating attributes can contribute to group discrimination.

Second, related to hypothesis 2, winter-stress appraisal was noted to be a significant characteristic of seasonal depression. For example, SAD experienced a greater reaction to winter stimuli as evidenced in its greater dread of winter, more stress associated with the atypical depressive symptoms, more impairment during the winter,

and greater negative affect during the winter months. This suggested that individuals with SAD experience cognitive-content that is related to winter-stimuli.

Third, with respect to hypothesis 3, physical activity levels varied more among sex groups than groups defined by seasonality and depression dimensions. Generally, males participated in more physical activity levels than females. One significant group by sex finding was that control males engaged in more physical activities than SAD males. This finding suggests the protective factor of physical activities with seasonal depression, although the finding needs to be replicated. Thus, hypotheses 1 and 2 provide support of the role of eating attitudes and behaviours, and winter-stress appraisal to be important in differentiating SAD, S-SAD, depression, and control groups. Hypothesis three indicated that physical activity levels were more relevant to sex differences.

Hypotheses 4 to 6 were related to variables hypothesized to vary on the depression dimension, namely interpersonal context-specificity, responses styles to depressed mood, and general negative attitudes. Hypothesis 4, related to interpersonal context-specificity, found that individuals with SAD and depressed engaged in more sociotropic tendencies than the control group, thus highlighting the importance of this cognitive vulnerability variable. Hypothesis 5 was related to response styles used in reaction to a depressed mood. It was found that SAD engaged in more ruminative response style to depressed mood compared to all three groups, and in more high risk behaviours in response to depressed mood than controls. These findings highlight the importance of addressing coping styles to their depressed moods in individuals with

SAD. Finally, hypothesis 6 was related to general negative attitudes, and found that individuals with SAD and depression had more general negative attitudes compared to S-SAD and controls. Overall, hypothesis 4 to 6 provide support for the importance of examining these depression-related variables in SAD, particularly interpersonal-context specificity, ruminative and dangerous response styles to depressed mood, and general negative attitudes, for both SAD and depression groups. Thus, these are the main findings in the research project in relation to the variables expected to vary with the seasonality and depression dimensions.

#### Directions for Future Research

Based on this research study, the following suggestions for future research are presented. First, it would be useful to replicate the present study after taking into account its aforementioned limitations. This would help to establish the validity and reliability of its findings. Seasonal changes in psychological variables could be tracked by using a longitudinal design where subjects are assessed during the winter and summer months. This would shed light on the clinical course of seasonal depression, particularly related to its yearly onset and remission cycle. This could also provide information on the yearly pattern of symptoms in nonseasonal and S-SAD, thus providing information on the similarities and differences between these groups. Further investigations in eating disorders and seasonality could be carried out given the association between SAD and eating cognitions/behaviours in the present study.

Other future research implications from this study include developing an intervention program based on cognitive behavioural therapy to identify, assess and

modify dysfunctional eating cognitions/behaviours and general negative attitudes in individuals with SAD. Eventually, a randomized control trial comparing the efficacy of using this modified CBT with seasonal depression could be completed. Also, this study used self-report measures of the dependent variables. It would be useful to include other measures of these variables including ratings of these variables by others (i.e., spouses, parents, close friends). This would increase the validity of these findings, particularly if support for these variables is found from many sources. In addition, sex differences should be studied further, as there were interesting differences between males and females in this study, most evident in levels of physical activity. Related to this, a measure of attitudes towards physical activity may be helpful to incorporate as this may better differentiate the groups on physical activity related variables.

In conclusion, this paper examined the bridge between the DVH and the cognitive-specificity hypothesis by including comprehensive measures of psychological variables related to seasonality and depression dimensions that were used to categorize four groups: SAD, nonseasonal depression, S-SAD, and controls. Given that seasonal depression affects about 1-3% of Canadians (Lam & Levitt, 1999) and is characterized by many distressing symptoms, the importance of assessing the similarities and differences between SAD and other groups can help understand its unique symptom presentation. It is hoped that by undertaking research that can inform strategies to manage seasonal depression, particularly related to its cognitive and vegetative symptom presentation, then the people experiencing SAD can be positively impacted.



## REFERENCES

- Abela, J. R. Z., McIntyre-Smith, A., & Dechef, M. L. E. (2003). Personality predispositions to depression: a test of the specific vulnerability and symptom specificity hypotheses. *Journal of Social and Clinical Psychology, 22*, 493-514.
- Agumadu, C. O., Yousufi, S. M., Malik, I. S., Nguyen, M. T., Jackson, M. A., Soleymani, K., et al. (2004). Seasonal variation in mood in African American college students in the Washington, D.C. metropolitan area. *American Journal of Psychiatry, 161*, 1084-1089.
- Allen, N. B., de L. Horne, D. J., & Trinder, J. (1996). Sociotropy, autonomy, and dysphoric emotional responses to specific classes of stress: a psychophysiological evaluation. *Journal of Abnormal Psychology, 105*, 25-33.
- American Psychiatric Association (2000). *Diagnostic and Statistical Manual, 4<sup>th</sup> Edition Text Revision*. Washington, D.C.: Author.
- Babiyak, M., Blumenthal, J. A., Herman, S., Khatri, P., Doraiswamy, M., Moore, K., et al. (2000). Exercise treatment for major depression: maintenance of therapeutic benefit at 10 months. *Psychosomatic Medicine, 62*, 633-638.
- Bagby, R. M., Ryder, A. G., Schuller, D. R., & Marshall, M. B. (2004). The Hamilton Depression Rating Scale: has the gold standard become a lead weight? *American Journal of Psychiatry, 161*, 2163-2177.
- Bauer, M., & Dunner, D. (1993). Validity of the seasonal pattern as a modifier for mood disorders for DSM-IV. *Comprehensive Psychiatry, 34*, 159-170.
- Beck, A. T. (1983). Cognitive therapy of depression: new perspectives. In P. J. Clayton &

- J. E. Barrett (Eds.), *Treatment of depression: old controversies and new approaches*. New York: Raven Press.
- Beck, A. T. (1987). Cognitive model of depression. *Journal of Cognitive Psychotherapy*, *1*, 2-27.
- Beck, A. T. (1991). Cognitive therapy: a 30-year retrospective. *American Psychologist*, *46*, 368-375.
- Beck, R., & Perkins, T. S. (2001). Cognitive content-specificity for anxiety and depression: a meta-analysis. *Cognitive Therapy and Research*, *25*, 651-663.
- Beck, A. T., Ward, C. H., Mendelson, M., Mock, J., & Erbaugh, J. (1961). An inventory for measuring depression. *Archives of General Psychiatry*, *4*, 561-571.
- Berman, K., Lam, R. W., & Goldner, E. M. (1993). Eating attitudes in seasonal affective disorder and bulimia nervosa. *Journal of Affective Disorders*, *29*, 219-225.
- Bonifazi, D. Z., Crowther, J. H., & Mizes, J. S. (2000). Validity of questionnaires for assessing dysfunctional cognitions in bulimia nervosa. *International Journal of Eating Disorders*, *27*, 464-470.
- Bonifazi, D. Z., Baker, L., Crowther, J. H., & Mizes, J. S. (1992, November). *Do questionnaires adequately assess cognitions in bulimia nervosa?* Paper presented at the 26<sup>th</sup> annual meeting of the Association of the Advancement of Behavior Therapy, Boston, MA.
- Brewerton, T. D., Lydiard, R. B., Herzog, D. B., & Brotman, A. W. (1995). Comorbidity of Axis I psychiatric disorders in bulimia nervosa. *Journal of Clinical Psychiatry*, *56*, 77-80.

- Butler, L. D., & Nolen-Hoeksema, S. (1994). Gender differences in response to depressed mood in a college sample. *Sex Roles, 30*, 331-346.
- Chotai, J., Smedh, K., Nilsson, L., & Adolfsson, R. (2004). A dual vulnerability hypothesis for seasonal depression is supported by the seasonal pattern assessment questionnaire in relation to the temperament and character inventory of personality in a general population. *Journal of Affective Disorders, 82*, 61-70.
- Clark, D. A., & Beck, A. T. (1989). Cognitive theory and therapy of anxiety and depression. In P. C. Kendall, & D. Watson (Eds.), *Anxiety and depression: Distinctive and overlapping features of personality, psychopathology, and psychotherapy* (pp. 379-411). San Diego, CA: Academic Press, Inc.
- Clark, D. A., Beck, A. T., & Alford, B. A. (1999). *Scientific foundations of cognitive theory and therapy of depression*. New York: John Wiley & Sons, Inc.
- Clark, D. A., Beck, A. T., & Brown, G. K. (1992). Sociotropy, autonomy, and life event perceptions in dysphoric and nondysphoric individuals. *Cognitive Therapy and Research, 16*, 635-652.
- Clark, D. A., Steer, R. A., Beck, A. T., & Ross, L. (1995). Psychometric properties of revised sociotropy and autonomy scales in college students. *Behavioral Research and Therapy, 33*, 325-334.
- Cohen, S. (1986). Contrasting the hassle scale and the perceived stress scale: who's really measuring perceived stress? *American Psychologist, 41*, 716-719 (comment).
- Cohen, S., Kamarck, T., & Mermelstein, R. (1983). A global measure of perceived stress. *Journal of Health and Social Behavior, 24*, 385-396.

- Davis, C., Katzman, D. K., Kaptein, S., Kirsh, C., Brewer, H., & Kalmbach, K. et al. (1997). The prevalence of high-level exercise in the eating disorders: etiological implications. *Comprehensive Psychiatry*, 38, 321-326.
- Davis, C., Kennedy, S. H., Ravelski, E., & Dionne, M. (1994). The role of physical activity in the development and maintenance of eating disorders. *Psychological Medicine*, 24, 957-967.
- Davis, C., Woodside, D. B., Olmstead, M. P., & Kaptein, S. (1999). Psychopathology of the eating disorders: the influence of physical activity. *Journal of Applied Behavioral Research*, 4, 139-156.
- Desan, P. H., & Oren, D. A. (2001). Is seasonal affective disorder a disorder of circadian rhythms? *CNS Spectrums*, 6, 487-501.
- Dew, R. & Tan, J. (2003). Explanatory style, coping and winter stress in SAD, SSAD, and depression. *Chronobiology International*, 20(6), 1152-1153.
- Dishman, R. K., & Jackson, E. M. (2000). Exercise, fitness, and stress. *International Journal of Sport Psychology: Special Exercise psychology*, 31, 175-203.
- Dobson, K. S., & Breiter, H. J. (1983). Cognitive assessment with major depressive disorders. *Cognitive Therapy and Research*, 10, 13-29.
- Dykman, B. M. & Joh II, M. (1998). Dysfunctional attitudes and vulnerability to depressive symptoms: a 14-week longitudinal study. *Cognitive Therapy and Research*, 22, 337-352.
- Eagles, J. M., McLeod, I. H., Mercer, G., & Watson, F. (2000). Seasonality of eating pathology on the eating attitudes test in a nonclinical population. *International*

*Journal of Eating Disorders*, 27, 335-340.

Eaves, G., & Rush, A. J. (1984). Cognitive patterns in symptomatic and remitted unipolar major depression. *Journal of Abnormal Psychology*, 93, 31-40.

Elbi, H., Noyan, A., Korukoglu, S., Ünal, S., Bekaroglu, M., & Oguzhanoglu, N. et al. (2002). Seasonal affective disorder in eight groups in Turkey: a cross-national perspective. *Journal of affective disorders*, 70, 77-84.

First, M. B., Spitzer, R. L., Gibbon, M., & Williams, J. B. W. (1995). The structured clinical interview for DSM-III-R personality disorders (SCID-II): I. description. *Journal of Personality Disorders*, 9, 83-91.

Fossati, M., Amati, F., Painot, D., Reiner, M., Haenni, C., & Golay, A. (2004). Cognitive-behavioral therapy with simultaneous nutritional and physical activity education in obese patients with binge eating disorder. *Eating and Weight Disorders*, 9, 134-138.

Garfinkel, P. E., & Newman, A. (2001). The eating attitudes test: twenty-five years later. *Eating and Weight Disorders*, 6, 1-24.

Garner, D. M. (1991). *Eating Disorders Inventory-2: professional manual*. Los Angeles, CA: Western Psychological Services.

Garner, D. M., & Garfinkel, P. E. (1979). The Eating Attitudes Test: an index of the symptoms of anorexia nervosa. *Psychological Medicine*, 9, 273-279.

Garner, D. M., & Olmsted, M.P. (1984). *Eating Disorder Inventory*. Odessa, FL: Psychological Assessment Resources.

Garner, D. M., Olmsted, M. P., Bohr, Y., & Garfinkel, P. E. (1982). The Eating Attitudes

- Test: psychometric features and clinical correlates. *Psychological Medicine*, 9, 272-279.
- Ghadirian, A. M., Marini, N., Jabalpurwala, S., & Steiger, H. (1999). Seasonal mood patterns in eating disorders. *General Hospital Psychiatry*, 21, 354-359.
- Golden, R. N., Gaynes, B. N., Ekstrom, R. D., Hamer, R. M., Jacobsen, F. M., & Suppes, T. et al. (2005). The efficacy of light therapy in the treatment of mood disorders: a review and meta-analysis of the evidence. *American Journal of Psychiatry*, 162, 656-662.
- Gotlib, I. E. & Hammen, G. L. (Eds.). (2002). *Handbook of depression*. New York: Guilford Press.
- Gruber, N. P., & Dilsaver, S. C. (1996). Bulimia and anorexia nervosa in winter depression: lifetime rates in a clinical sample. *Journal of Psychiatry and Neuroscience*, 21, 9-12.
- Hamilton, M. (1960). A rating scale for depression. *Journal of Neurology, Neurosurgery, and Psychiatry*, 23, 56-62.
- Hamilton, H. (1967). Development of a rating scale for primary depressive illness. *British Journal of Social and Clinical Psychology*, 6, 278-296.
- Hammen, C., Ellicott, A., Gitlin, M., & Jamison, K. R. (1989). Sociotropy/autonomy: a longitudinal study of their relationship to the course of bipolar disorder. *Cognitive Therapy and Research*, 16, 409-418.
- Hankin, B. L., Fraley, R. C., & Abela, J. R. Z. (2005). Daily depression and cognitions about stress: Evidence for a traitlike depressogenic cognitive style and the prediction

of depressive symptoms in a prospective daily diary study. *Journal of Personality and Social Psychology*, 88, 673-685.

Hébert, M., Beattie, C. W., Tam, E. M., Yatham, L. N., & Lam, R. W. (2004).

Electroretinography in patients with winter seasonal affective disorder. *Psychiatry Research*, 127, 27-34.

Hébert, M., Dumont, M., & Lachapelle, P. (2002). Electrophysiological evidence suggesting a seasonal modulation of retinal sensitivity in subsyndromal winter depression. *Journal of Affective Disorders*, 68, 191-202.

Hechler, T., Beumont, P., Marks, P., & Touyz, S. (2005). How do clinical specialists understand the role of physical activity in eating disorders? *European Eating Disorders Review*, 13, 125-132.

Hewitt, P. L., Flett, G. L., & Mosher, S. W. (1992). The Perceived Stress Scale: factor structure and relation to depression symptoms in a psychiatric sample. *Journal of Psychopathology and Behavioral Assessment*, 14, 247-257.

Hodges, S., & Marks, M. (1998). Cognitive characteristics of seasonal affective disorder: a preliminary investigation. *Journal of Affective Disorders*, 50, 59-64.

Imai, M., Kayukawa, Y., Ohta, T., Li, L., & Nakagawa, T. (2003). Cross-regional survey of seasonal affective disorders in adults and high-school students in Japan. *Journal of Affective Disorders*, 77, 127-133.

Johnson, C. S., & Bedford, J. (2004). Eating attitudes across age and gender groups: A Canadian study. *Eating and Weight Disorders*, 9, 16-23.

- Just, N., Abramson, L. Y., & Alloy, L. B. (2001). Remitted depression studies as tests of the cognitive vulnerability hypotheses of depression onset: A critique and conceptual analysis. *Clinical Psychology Review, 21*, 63-83.
- Kasper, S., Rogers, S. L., Yancey, A. L., Schultz, P. M., Skwerer, R. G., Rosenthal, N. E. (1988). Phototherapy in subsyndromal seasonal affective disorder (S-SAD) and “diagnosed” controls. *Pharmacopsychiatry, 21*, 428-429.
- Kasper, S., Rogers, S., Yancey, A., Schultz, P., Skwerer, R., & Rosenthal, N. (1989). Phototherapy in individuals with and without subsyndromal seasonal affective disorder. *Archives of General Psychiatry, 46*, 837-844.
- Kasper, S., Wehr, T., Bartko, J., Gaist, P., & Rosenthal, N. (1989). Epidemiological findings of seasonal changes in mood and behaviour. *Archives of General Psychiatry, 46*, 823-833.
- Keller, M. C., & Nesse, R. M. (2005). Is low mood an adaptation? Evidence for subtypes with symptoms that match precipitants. *Journal of Affective Disorders, 86*, 27-35.
- Kendall, P. C., & Ingram, R. E. (1989). Cognitive-behavioral perspectives: theory and research on depression and anxiety. In P. C. Kendall, & D. Watson (Eds.), *Anxiety and depression: distinctive and overlapping features of personality, psychopathology, and psychotherapy* (pp. 27-53). San Diego, CA: Academic Press, Inc.
- Koenig, L. J., & Wasserman, E. L. (1995). Body image and dieting failure in college men and women: examining links between depression and eating problems. *Sex Roles, 32*, 225-249.



- Kräuchi, K., & Wirz-Justice, A. (1988). The four seasons: food intake frequency in seasonal affective disorder in the course of a year. *Psychiatry Research, 25*, 323-328.
- Lam, R. W., Goldner, E. M., & Grewal, A. (1996). Seasonality of symptoms in anorexia and bulimia nervosa. *International Journal of Eating Disorders, 19*, 35-44.
- Lam, R. W., & Levitan, R. D. (2000). Pathophysiology of seasonal affective disorder: a review. *Journal of Psychiatry and Neuroscience, 25*, 469-480.
- Lam, R. W., & Levitt, A. J. (1999). *Canadian consensus guidelines for the treatment of seasonal affective disorder*. Canada: Clinical & Academic Publishing.
- Lam, R. W., Solyom, L., & Tompkins, A. (1991). Seasonal mood symptoms in bulimia nervosa and seasonal affective disorder. *Comprehensive Psychiatry, 32*, 552-558.
- Lam, R. W., Tam, E. M., Yatham, L. N., Shiah, I., & Zis, A. P. (2001). Seasonal depression: the dual vulnerability hypothesis revisited. *Journal of Affective Disorders, 63*, 123-132.
- Lawlor, D. A., & Hopker, S. W. (2001). The effectiveness of exercise as an intervention in the management of depression: systematic review and meta-regression analysis of randomised controlled trials. *British Medical Journal, 322*, 763-766.
- Leary, M. R. (Ed.) (2001). *Interpersonal rejection*. New York: Oxford University Press.
- Leary, M. R., Koch, E. J., & Hechenbleikner, N. R. (2001). Emotional responses to interpersonal rejection. In M. R. Leary (Ed.), *Interpersonal rejection* (pp. 145-166). London: Oxford University Press.
- Lee, T. M. C., Chen, E. Y. H., Chan, C. C. H., Paterson, J. G., Janzen, H. L., & Blashko,

- C. A. (1998). Seasonal affective disorder. *Clinical Psychology: Science and Practice*, 5, 275-290.
- Lee, L., Harkness, K. L., Sabbagh, M. A., & Jacobson, J. A. (2005). Mental state decoding abilities in clinical depression. *Journal of Affective Disorders*, 86, 247-258.
- Leppämäki, S. J., Partonen, T. T., Hurme, J., Haukka, J. K., & Lönnqvist, J. K. (2002). Randomized trial of the efficacy of bright-light exposure and aerobic exercise on depressive symptoms and serum lipids. *Journal of Clinical Psychiatry*, 63, 316-321.
- Levitan, R. D., Kaplan, A. S., & Rockert, W. (1996). Characteristics of the “seasonal” bulimic patient. *International Journal of Eating Disorders*, 19, 187-192.
- Levitan, R. D., Masellis, M., Basile, V. S., Lam, R. W., Kaplan, A. S., Davis, C., et al. (2004). The dopamine-4 receptor gene associated with binge eating and weight gain in women with seasonal affective disorder: an evolutionary perspective. *Biological Psychiatry*, 56, 665-669.
- Levitan, R. D., Rector, N. A., & Bagby, R. M. (1998). Negative attributional style in seasonal and nonseasonal depression. *American Journal of Psychiatry*, 155, 428-430.
- Lewy, A. J., Sack, R.L., Miller, L. S., Hoban, T. M., Singer, C. M., Samples, J. R., et al. (1986). The use of plasma melatonin levels and light in the assessment and treatment of chronobiologic sleep and mood disorders. *Journal of Neural Transmission*, 21(Suppl.), 311-322.

- Lucht, M. J., & Kasper, S. (1999). Gender differences in seasonal affective disorder (SAD). *Archives of Women's Mental Health, 2*, 83-89.
- Magnusson, A. (1996). Validation of the seasonal pattern assessment questionnaire (SPAQ). *Journal of Affective Disorders, 40*, 121-129.
- Magnusson, A. (2000). An overview of epidemiological studies on seasonal affective disorder. *Acta Psychiatrica Scandinavica, 101*, 176-184.
- Magnusson, A., Friis, S., & Opjordsmoen, S. (1997). Internal consistency of the Seasonal Pattern Assessment Questionnaire (SPAQ). *Journal of Affective Disorders, 42*, 113-116.
- Magnusson, A., & Stefansson, J. G. (1993). Prevalence of seasonal affective disorder in Iceland. *Archives of General Psychiatry, 50*, 941-946.
- Marcus, D. K., & Nardone, M. E. (1992). Depression and interpersonal rejection. *Clinical Psychology Review, 12*, 433-449.
- Martiny, K., Lunde, M., Simonsen, C., Clemmensen, L., Poulsen, D. L., & Solstad, K. et al. (2004). Relapse prevention by citalopram in SAD patients responding to 1 week of light therapy. A placebo-controlled study. *Acta Psychiatrica Scandinavica, 109*, 230-234.
- Matsushita, S., Nakamura, T., Nishiguchi, N., & Higuchi, S. (2002). Association of serotonin transporter regulatory region polymorphism and abnormal eating behaviors. *Molecular Psychiatry, 7*, 538-540.

- McBride, C., Bacchiochi, J. R., & Bagby, R. M. (2005). Gender differences in the manifestation of sociotropy and autonomy personality traits. *Personality & Individual Differences, 38*, 129-136.
- McCarthy, E., TARRIER, N., & Gregg, L. (2002). The nature and timing of seasonal affective symptoms and the influence of self-esteem and social support: a longitudinal prospective study. *Psychological Medicine, 32*, 1425-1434.
- McConville, C., McQuaid, M., McCartney, A., & Gilmore, W. (2002). Mood and behaviour problems associated with seasonal changes in Britain and Ireland. *International Journal of Social Psychiatry, 48*, 103-114.
- Mersch, P. P. A., Vastenburger, N. C., Meesters, Y., Bouhuys, A. L., Beersma, D. G. M., & van den Hoofdakker, R. H. et al. (2004). The reliability and validity of the seasonal pattern assessment questionnaire: a comparison between patient groups. *Journal of Affective Disorders, 80*, 209-219.
- Michalak, E. E., Wilkinson, C., Dowrick, C., & Wilkinson, G. (2001). Seasonal affective disorder: prevalence, detection, and current treatment in North Wales. *British Journal of Psychiatry, 179*, 31-34.
- Michalak, E. E., Wilkinson, C., Hood, K., & Dowrick, C. (2002). Seasonal and nonseasonal depression: How do they differ? Symptom profile, clinical, and family history in a general population sample. *Journal of Affective Disorders, 69*, 185-192.
- Mizes, J. S. (1988). Personality characteristics of bulimic and non-eating disordered female controls: a cognitive behavioural perspective. *International Journal of*

*Eating Disorders*, 7, 541-550.

Mizes, J. S. (1991). Construct validity and factor stability of the Anorectic Cognitions Questionnaire. *Addictive Behaviors*, 16, 89-93.

Mizes, J. S. (1992). Validity of the Mizes Anorectic Cognitions Scale: a comparison between anorectics, bulimics, and psychiatric controls. *Addictive Behaviors*, 17, 283-289.

Mizes, J. S., Christiano, B., Madison, J., Post, G., Seime, R., & Varnado, P. (2000). Development of the Mizes Anorectic Cognitions Questionnaire Revised: psychometric properties and factor structure in a large sample of eating disorder patients. *International Journal of Eating Disorders*, 28, 415-421.

Mizes, J. S., & Klesges, R. C. (1989). Validity, reliability, and factor structure of the Anorectic Cognitions Questionnaire. *Addictive Behaviors*, 14, 589-594.

Mond, J. M., Hay, P. J., Rodgers, B., Owen, C., & Beumont, P. J. V. (2004). Relationships between exercise behaviour, eating-disordered behaviour and quality of life in a community sample of women: When is exercise 'excessive'? *European Eating Disorders Review*, 12, 265-272.

Moscovitch, A., Blashko, C. A., Eagles, J. M., Darcourt, G., Thompson, C., & Kasper, S. et al. (2004). A placebo-controlled study of sertraline in the treatment of outpatients with seasonal affective disorder. *Psychopharmacology*, 171, 390-397.

Osman, A., Chiros, C. E., Gutierrez, P. M., Kopper, B. A., & Barrios, F. X. (2001). Factor structure and psychometric properties of the Brief Mizes Anorectic Cognitions questionnaire. *Journal of Clinical Psychology*, 57, 785-799.

- Neumeister, A. (2004). Neurotransmitter depletion and seasonal affective disorder: Relevance for the biologic effects of light therapy. *Primary Psychiatry Special - Neurotransmitter Depletion, 11*, 44-48.
- Neto, J., & Araújo, L. M. (2004). Melatonin and psychiatric disorders. *Jornal Brasileiro de Psiquiatria, 53*, 38-46.
- Nolen-Hoeksema, S. (1987). Sex differences in unipolar depression: evidence and theory. *Psychological Bulletin, 101*, 259-282.
- Nolen-Hoeksema, S. (1990). *Sex differences in depression*. Stanford University Press.
- Nolen-Hoeksema, S. (1991). Responses to depression and their effects on the duration of depressive episodes. *Journal of Abnormal Psychology, 100*, 569-582.
- Nolen-Hoeksema, S., & Morrow, J. (1991). A prospective study of depression and posttraumatic stress symptoms after a natural disaster: the 1989 Loma Prieta earthquake. *Journal of Personality and Social Psychology, 61*, 115-121.
- Nolen-Hoeksema, S., & Morrow, J. (1993). Effects of rumination and distraction on naturally occurring depressed mood. *Cognition and Emotion, 7*, 561-570.
- Nolen-Hoeksema, S., Parker, L. E., & Larson, J. (1994). Ruminative coping with depressed mood following loss. *Journal of Personality and Social Psychology, 67*, 92-104.
- Nunnally, J. C. (1978). *Psychometric theory*. New York: McGraw-Hill.

- Pbert, L., Doerfler, L. A., & DeCosimo, D. (1992). An evaluation of the Perceived Stress Scale in two clinical populations. *Journal of Psychopathology & Behavioral Assessment, 14*, 363-375.
- Peñas-Lliedó, E., Vaz Leal, F. J., & Waller, G. (2002). Excessive exercise in anorexia nervosa and bulimia nervosa: relation to eating characteristics and general psychopathology. *International Journal of Eating Disorders, 31*, 370-375.
- Pendse, B. P. G., Engström, G., & Träskman-Bendz, L. (2004). Psychopathology of seasonal affective disorder patients in comparison with major depression patients who have attempted suicide. *Journal of Clinical Psychiatry, 65*, 322-327.
- Penedo, F. J., & Dahn, J. R. (2005). Exercise and well-being: a review of mental and physical health benefits associated with physical activity. *Current Opinion in Psychiatry, 18*, 189-193.
- Perez, M., Joiner, T. E. J., & Lewinsohn, P. M. (2004). Is major depressive disorder or dysthymia more strongly associated with bulimia nervosa? *International Journal of Eating Disorders, 36*, 55-61.
- Perry, J. A., Silvera, D. H., Rosenvinge, J. H., Neilands, T., & Holte, A. (2001). Seasonal eating patterns in Norway: a non-clinical population study. *Scandinavian Journal of Psychology, 42*, 3-7-312.
- Pinel, J. P. J. (2003). *Biopsychology (5<sup>th</sup> ed.)*. Boston, MA: Allyn & Bacon, Inc.
- Raheja, S.K., King, E.A., & Thompson, C. (1996). The seasonal pattern assessment questionnaire for identifying seasonal affective disorders. *Journal of Affective Disorders, 41*, 193-199.

- Rohan, K.J., Lindsey, K.T., Roecklein, K.A., & Lacy, T.J. (2004). Cognitive-behavioral therapy, light therapy, and their combination in treating seasonal affective disorder. *Journal of Affective Disorders, 80*, 272-283.
- Rohan, K. J., Sigmon, S. T., & Dorhofer, D. M. (2003). Cognitive-behavioral factors in seasonal affective disorder. *Journal of Consulting and Clinical Psychology, 71*, 22-30.
- Rohan, K. J., Sigmon, S. T., Dorhofer, D. M., & Boulard, N. E. (2004). Cognitive and psychophysiological correlates of subsyndromal seasonal affective disorder. *Cognitive Therapy and Research, 28*, 39-56.
- Rosen, L. N., Targum, S. D., Terman, M., Bryant, M. J., Hoffman, H., Kasper, S. F. et al. (1990). Prevalence of seasonal affective disorder at four latitudes. *Psychiatry Research, 31*, 131-144.
- Rosenthal, N. (1993). *Winter blues*. New York: The Guilford Press.
- Rosenthal, N., Bradt, G. H., & Wehr, T. A. (1987). Seasonal Pattern Assessment Questionnaire. Bethesda, MD: National Institute of Mental Health.
- Rosenthal, N. E., Genhart, M. J., Jacobsen, F. M., Skwerer, R. G., & Wehr, T. A. (1987). Disturbances of appetite and weight regulation in seasonal affective disorder. *Annals of New York Academy of Science, 499*, 216-230.
- Rosenthal N.E., Genhart M.J., Sack D.A., Skwerer R.G., Wehr T.A. (1987). Seasonal affective disorder and its relevance for the understanding and treatment of bulimia. In J.I. Hudson & H.G. Pope Jr. (Eds.), *The Psychobiology of Bulimia* (pp. 205-228). Washington, DC: American Psychiatric Press.



- Rosenthal, N., Sack, D., Gillin, C., Lewy, A., Goodwin, A., Davenport, Y., Mueller, P., Newsome, D., & Wehr, T. (1984). Seasonal affective disorder: a description of the syndrome and preliminary findings with light therapy. *Archives of General Psychiatry, 41*, 72-80.
- Rosenvinge, J. H., Perry, J. A., Bjorgum, L., Bergersen, T.D., Silvera, D. H., & Holte, A. (2001). A new instrument measuring disturbed eating patterns: development and validation of a 5-item scale (EDS-5). *European Eating Disorders Review, 9*, 123-132.
- Sakamoto, K., Nakadaira, S., Kamo, K., & Kamo, T. (1995). A longitudinal follow-up study of seasonal affective disorder. *American Journal of Psychiatry, 152*, 862-868.
- Salmon, P. (2001). Effects of physical exercise on anxiety, depression, and sensitivity to stress: a unifying theory. *Clinical Psychology Review, 21*, 33-61.
- Schlager, D., Froom, J., & Jaffe, A. (1995). Winter depression and functional impairment among ambulatory primary care patients. *Comprehensive Psychiatry, 36*, 18-24.
- Schwartz, J. A. J., & Koenig, L. J. (1996). Response styles & negative affect among adolescents. *Cognitive Therapy and Research, 20*, 13-36.
- Shelton, M. L., & Klesges, R. C. (1995). Measures of physical activity and exercise. In D. B. Allison (Ed.), *Handbook of assessment methods for eating behaviors and weight-related problems. Measures, theory, and research* (pp. 185-214). Thousand Oaks, CA: Sage Publications, Inc.

- Shen, J., Kennedy, S. H., Levitan, R. D., Kayumov, L., & Shapiro, C. M. (2005). The effects of Nefazodone on women with seasonal affective disorder: clinical and polysomnographic analyses. *Journal of Psychiatry and Neuroscience, 30*, 11-16.
- Sher, L., Oquendo, M. A., Galfalvy, H. C., Zalsman, G., Cooper, T. B., & Mann, J. J. (2005). Higher cortisol levels in spring and fall in patients with major depression. *Progress in Neuro-Psychopharmacology and Biological Psychiatry, 29*, 529-534.
- Spoont, M.R., Depue, R.A., & Krauss, S.S. (1991). Dimensional measurement of seasonal variation in mood and behavior. *Psychiatry Research, 39*, 269-284.
- Stevens, J. (1986). *Applied multivariate statistics for the social sciences*. Mahwah, NJ: Lawrence Erlbaum Associates.
- Stevens, J. P. (2001). *Applied multivariate statistics for the social sciences* (4<sup>th</sup> ed.). St. Paul, MN: Assessment Systems Corporation.
- Stice, E., Fisher, M., & Martinez, E. (2004). Eating disorder diagnostic scale: Additional evidence of reliability and validity. *Psychological assessment, 16*, 60-71.
- Stich, F. A. (1999). *A meta-analysis of physical exercise as a treatment for symptoms of anxiety and depression*. (Doctoral dissertation, University of Wisconsin – Madison). *Dissertation Abstracts International: Section B: The Sciences & Engineering, 59*, 4487.
- Solenberger, S. E. (2001). Exercise and eating disorders: a 3-year inpatient hospital record analysis. *Eating Behaviors, 2*, 151-168.
- Tabachnick, B. G., & Fidell, L. S. (2001). *Using multivariate statistics* (4<sup>th</sup> ed.). New York: Harper Collins.

- Tam, E. M., Lam, R. W., Robertson, H. A., Stewart, J. N., Yatham, L. N. & Zis, A. P. (1997). Atypical depressive symptoms in seasonal and non-seasonal mood disorders. *Journal of Affective Disorders, 44*, 39-44.
- Terman, M., Amira, L., Terman, J. S., & Ross, D. C. (1996). Predictors of response and nonresponse to light treatment for winter depression. *American Journal of Psychiatry, 153*, 1423-1429.
- Thome, J., & Espelage, D. L. (2004). Relations among exercise, coping, disordered eating, and psychological health among college students. *Eating Behaviors, 5*, 337-351.
- Thompson, C., Thompson, S., & Smith, R. (2004). Prevalence of seasonal affective disorder in primary care: A comparison of the seasonal health questionnaire and the seasonal pattern assessment questionnaire. *Journal of Affective Disorders, 78*, 219-226.
- Yardley, J. K., Zarebski, J., & Goodstadt, M. (1996). *Youth leisure and substance use: a multivariate study. A research grant proposal submitted to Ontario Ministry of Culture, Tourism, and Recreation, Recreation Policy Branch and Ontario Ministry of Health, Health Promotions Branch.* Unpublished manuscript. Brock University, Ontario.
- Yamatsuji, M., Yamashita, T., Arii, I., Taga, C., Tatara, N., & Fukui, K. (2003). Seasonal variations in eating disorder subtypes in Japan. *International Journal of Eating Disorders, 33*, 71-77.

- Young, M. A., & Azam, O. A. (2003). Ruminative response style and the severity of seasonal affective disorder. *Cognitive Therapy and Research, 27*(2), 223-232.
- Young, M.A., Blodgett, C., & Reardon, A. (2003). Measuring seasonality: psychometric properties of the Seasonal Pattern Assessment Questionnaire and the Inventory for Seasonal Variation. *Psychiatry Research, 117*, 75-83.
- Young, M. A., Watel, L. G., Lahmeyer, H. W., & Eastman, C. I. (1991). The temporal onset of individual symptoms in winter depression differentiating underlying mechanisms. *Journal of Affective Disorders, 22*, 191-197.
- Weissman, A. N. (1979). *The Dysfunctional Attitude Scale: a validation study*. Unpublished doctoral dissertation. University of Pennsylvania.
- Weissman, A. N., & Beck, A. T. (1978). *Development and validation of the Dysfunctional Attitude Scale: a preliminary investigation*. Paper presented at the annual meeting of the American Educational Research Association, Toronto.
- Wesner, M., & Tan, J. (1999). *Visual functioning in depression*. Presented at the annual convention of the American Psychological Society, Denver, Colorado.
- William, J. B. W., Link, M. J., Rosenthal, N. E. & Terman, M. (1988). *Structured Interview Guide for the Hamilton Depression Rating Scale, Seasonal Affective Disorders Version (SIGH-SAD)*. New York: New York State Psychiatric Institute.
- Wirz-Justice, A., & Anderson, J. (1990). Morning light exposure for the treatment of winter depression: the one true light therapy? *Psychopharmacology Bulletin, 26*, 511-519.
- Zaider, T. I., Johnson, J. G., & Cockell, S. J. (2000). Psychiatric comorbidity associated

with eating disorder symptomatology among adolescents in the community.

*International Journal of Eating Disorders*, 28, 58-67.

Appendix A

Demographic and General Information

## RESEARCH QUESTIONNAIRE

**Section A:** *This section asks for your demographic information. This is for statistical purposes so that we may know the composition of the people in the project.*

Age: \_\_\_\_\_ Sex: Male / Female Program Year: \_\_\_\_\_

Marital Status: Single / Common-law / Married / Divorced / Separated / Widowed

Ethnicity, check one:

- \_\_\_ Aboriginal
- \_\_\_ White, not of Hispanic origin (origins in Europe, North Africa, Middle East)
- \_\_\_ Black, not of Hispanic origin (origins in Africa)
- \_\_\_ Asian/Pacific Islander (origins in Far East, Southeast Asia, India Subcontinent, Pacific Islands)
- \_\_\_ Latino or Hispanic (Mexican, Puerto Rican, Cuban, Central or South America, or other Spanish culture or origin)
- \_\_\_ Other, please specify \_\_\_\_\_

Place of birth (city, country): \_\_\_\_\_

Place of permanent residence: \_\_\_\_\_

How long have you lived at your permanent address: \_\_\_ years and \_\_\_ months

Where do you spend your summer? \_\_\_\_\_

Are you currently on psychiatric medication? Yes / No  
- if yes, for what disorder? \_\_\_\_\_

Do you use alcohol on a regular basis? Yes / No  
- if yes, how often do you use alcohol? \_\_\_\_\_

Do you use mood-altering drugs on a regular basis? Yes / No  
- if yes, *what drug* and *how often*? \_\_\_\_\_

Please list all medications that you have had in the last 8 weeks:

If you are taking antidepressant medication, we are interested in knowing whether or not you experience any changes in your vision after you started taking your medication. Please circle the number on the rating scales below that best describes your visual experience:

Colour appearance

1	2	3	4	5
Faded colour		No change		Deeper colour
Washed out, Dim				Brighter, Richer

Light/dark contrast

1	2	3	4	5
Low contrast,		No change		High contrast
Low acuity, Less detail, Hazy				High acuity, greater detail, Sharp

Do you have any eye diseases such as optic neuritis, retinitis pigmentosa, macular degeneration, glaucoma, detached retina, amblyopia (lazy eye), tunnel vision, cataracts, keratitis, uveitis (eye inflammation)? Yes / No

Do you need corrective visual aids? Yes / No

When was the last time you had an eye examination?

How much do you weigh? If uncertain, give your best estimate: \_\_\_\_\_ lb

How tall are you? \_\_\_\_\_ ft \_\_\_\_\_ in

Over the past 3 months, how many menstrual periods have you missed?

Not applicable-----0-----1-----2-----3-----4-----more than 4

Have you been taking birth control pills during the past 3 months?

Not applicable Yes No



Appendix B

Seasonal Pattern Assessment Questionnaire (SPAQ)

**Section B: The purpose of this form is to find out if and how your mood and behaviour change over time. Please fill in all the relevant circles. Note: We are interested in your experience, not others you may have observed.**

1. In the following questions, fill in circles for all applicable months. This may be a single month 0, a cluster of months, e.g., 0 0 0, or any other grouping. At what time of the year do you...

	J	F	M	A	M	JN	JL	A	S	O	N	D	No particular month stands out as extreme
A. Feel best	0	0	0	0	0	0	0	0	0	0	0	0	0
B. Tend to gain most weight	0	0	0	0	0	0	0	0	0	0	0	0	0
C. Eat most	0	0	0	0	0	0	0	0	0	0	0	0	0
D. Sleep least	0	0	0	0	0	0	0	0	0	0	0	0	0
E. Feel most energetic	0	0	0	0	0	0	0	0	0	0	0	0	0
F. Socialize least	0	0	0	0	0	0	0	0	0	0	0	0	0
G. Crave carbohydrates most	0	0	0	0	0	0	0	0	0	0	0	0	0
H. Feel worst	0	0	0	0	0	0	0	0	0	0	0	0	0
I. Eat least	0	0	0	0	0	0	0	0	0	0	0	0	0
J. Sleep most	0	0	0	0	0	0	0	0	0	0	0	0	0
K. Lose most weight	0	0	0	0	0	0	0	0	0	0	0	0	0
L. Crave carbohydrates least	0	0	0	0	0	0	0	0	0	0	0	0	0
M. Feel least energetic	0	0	0	0	0	0	0	0	0	0	0	0	0
N. Socialize the most	0	0	0	0	0	0	0	0	0	0	0	0	0

2. Please check the year(s) in the past 6 years which had the same pattern as above:

Sept.00/Aug.01     Sept.99/Aug.00     Sept.98/Aug.99  
 Sept.97/Aug.98     Sept.96/Aug.97     Sept.95/Aug.96

3. (a) Please check the year(s) in the past 6 years which DID NOT have the same pattern as above:

Sept.00/Aug.01     Sept.99/Aug.98     Sept.98/Aug.99  
 Sept.97/Aug.98     Sept.96/Aug.97     Sept.95/Aug.96

(b) Please specify how these years marked in 3(a) above differed:

4. To what degree do you change with the seasons on the following? (Circle only one answer per item)

	No Change	Slight Change	Moderate Change	Marked Change	Extremely Marked Change
A. Sleep length	0	1	2	3	4
B. Social activity	0	1	2	3	4
C. Mood (overall feeling of well being)	0	1	2	3	4
D. Weight	0	1	2	3	4
E. Appetite	0	1	2	3	4
F. Energy level	0	1	2	3	4

5. If your experiences in question 4 changes with the seasons, do you feel that they are a problem for you? Yes / No

- If yes, is this problem:

mild     moderate     marked     severe     disabling

6. Do you experience any regular occurring, seasonally linked stressors in your life, for example, seasonal unemployment, anniversary of the death of a loved one, etc.? Yes / No

If yes, please specify what the stressor is and the months you experience it:

---



---

7. Is starting school a seasonal stressor for you? Yes / No

If yes, when does it become a stressor for you? (specify the months):

---

8. By how much does your weight fluctuate during the course of the year?

—	0-3 lbs	—	4-7 lbs
—	8-11 lbs	—	12-15 lbs
—	16-20 lbs	—	over 20 lbs

9. Approximately how many hours of each 24-hour day do you sleep during each season, including naps? (Circle only one answer per question)

WINTER (Dec 21-Mar 20)

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 18+

SPRING (Mar 21-June 20)

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 18+

SUMMER (June 21-Sept 20)

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 18+

FALL (Sept 21-Dec 20)

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 18+

10. Using the scale below, indicate how the following weather changes make you feel (fill in only one circle per question):

-3 = in very low spirits or markedly slowed down

-2 = moderately low/slowed down

-1 = mildly/slowed down

0 = no effect

+1 = slightly improves your mood or energy level

+2 = moderately improves your mood or energy level

+3 = markedly improves your mood or energy level

	-3	-2	-1	0	+1	+2	+3	Don't know
A. Cold weather	0	0	0	0	0	0	0	0
B. Hot weather	0	0	0	0	0	0	0	0
C. Humid weather	0	0	0	0	0	0	0	0
D. Sunny weather	0	0	0	0	0	0	0	0
E. Dry weather	0	0	0	0	0	0	0	0
F. Grey and cloudy	0	0	0	0	0	0	0	0
G. Long days	0	0	0	0	0	0	0	0
H. High pollen	0	0	0	0	0	0	0	0
I. Foggy and smoggy	0	0	0	0	0	0	0	0
J. Short days	0	0	0	0	0	0	0	0

11. Do you notice a change in food preference during the different seasons, for example a preference for salts, sweets, fats, or carbohydrates? Yes / No

- If yes, please specify the type of craving and the months they typically occur in:

---



---

12. Do you believe you have the seasonal blues (ie. periods of feeling down, or blue, that are linked to specific seasons)? Yes / No

13. If you answered "yes" to question 12, please continue with the items below:

- Please specify the months you are typically blue in: \_\_\_\_\_
- How old were you when you started having the seasonal blues?  
\_\_\_\_\_
- Counting only the years from when you started having the seasonal blues until now, what proportion of the years would you say you have the seasonal blues?  
\_\_\_\_\_
- How do you know that you have the seasonal blues? What changes, if any, do you notice occurring in yourself, emotionally, psychologically, mentally, and physically?

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

- Do you think you are having the seasonal blues NOW? Yes / No

If you are not having the seasonal blues now, when do you think it will start this year? \_\_\_\_\_

Appendix C

Hamilton Depression Rating Scale-28 Items (HDRS-28)

**Section C: Compared to how you feel when you are in an even or normal mood state, how would you rate yourself on the following items during the past 2 weeks?**

I have been feeling	Not at all 0	Just a little 1	More than just a little 2	Quite a bit, moderately 3	Marked or severely 4
1. down and depressed	0	1	2	3	4
2. less interested in doing things	0	1	2	3	4
3. less interested in sex	0	1	2	3	4
4. less interested in eating	0	1	2	3	4
5. that I've lost some weight	0	1	2	3	4
6. that I can't fall asleep at night	0	1	2	3	4
7. that my sleep is restless	0	1	2	3	4
8. that I wake up too early	0	1	2	3	4
9. heavy in my limbs or aches in back, muscles, or head, more tired than usual	0	1	2	3	4
10. guilty or like a failure	0	1	2	3	4
11. wishing for death or suicidal	0	1	2	3	4
12. tense, irritable, or worried	0	1	2	3	4
13. sure I'm ill or have a disease	0	1	2	3	4
14. that my speech and thought are slow	0	1	2	3	4
15. fidgety, restless, or antsy	0	1	2	3	4
16. that morning is worse than evening	0	1	2	3	4
17. that evening is worse than morning	0	1	2	3	4
18. unreal or in a dream state	0	1	2	3	4
19. suspicious of people/paranoid	0	1	2	3	4
20. preoccupied/obsessed that I must check things a lot	0	1	2	3	4
21. physical symptoms when worried	0	1	2	3	4
22. like socializing less	0	1	2	3	4
23. that I have gained weight	0	1	2	3	4
24. that I WANT to eat more than usual	0	1	2	3	4
25. that I HAVE eaten more than usual	0	1	2	3	4
26. that I crave sweets and starches	0	1	2	3	4
27. that I sleep more than usual	0	1	2	3	4
28. that my mood slumps in the afternoons or evenings	0	1	2	3	4

*Please do not write below this line*

*Score (1-21)  
Supplemental Score (22-28)*

Appendix D

Dysfunctional Attitudes Scale - Form A (DAS)

**Section D.** This inventory lists different attitudes or beliefs that people sometimes hold. Read *each* statement carefully and decide how much you agree or disagree with the statement. For each of the attitudes, show your answer by circling the number under the column that *best describes how you think*. Be sure to choose only one answer for each attitude. Because people are different, there are no right or wrong answers to these statements. To decide whether a given attitude is typical of your way of looking at things, simply keep in mind what you are like *most of the time*.

	<i>Attitudes</i>	<i>Totally agree</i>	<i>Agree very much</i>	<i>Agree Slightly</i>	<i>Neutral</i>	<i>Disagree slightly</i>	<i>Disagree very much</i>	<i>Totally Disagree</i>
1.	It is difficult to be happy unless one is good looking, intelligent, rich, and creative.	7	6	5	4	3	2	1
2.	Happiness is more a matter of my attitude toward myself than the way other people feel about me.	7	6	5	4	3	2	1
3.	People will probably think less of me if I make a mistake.	7	6	5	4	3	2	1
4.	If I do not do well all the time, people will not respect me.	7	6	5	4	3	2	1
5.	Taking even a small risk is foolish because the loss is likely to be a disaster.	7	6	5	4	3	2	1
6.	It is possible to gain another person's respect without being especially talented at anything.	7	6	5	4	3	2	1
7.	I cannot be happy unless most people I now admire me.	7	6	5	4	3	2	1
8.	If a person asks for help, it is a sign of weakness.	7	6	5	4	3	2	1
9.	If I do not do as well as other people, it means I am an inferior human being.	7	6	5	4	3	2	1
10.	If I fail at my work, then I am a failure as a person.	7	6	5	4	3	2	1
11.	If you cannot do something well, there is little point in doing it at all.	7	6	5	4	3	2	1
12.	Making mistakes is fine because I can learn from them.	7	6	5	4	3	2	1
13.	If someone disagrees with me, it probably indicates he does not like me.	7	6	5	4	3	2	1
14.	If I fail partly, it is as bad as being a complete failure.	7	6	5	4	3	2	1
15.	If other people know what you are really like, they will think less of you.	7	6	5	4	3	2	1
16.	I am nothing if a person I love doesn't love me.	7	6	5	4	3	2	1
17.	One can get pleasure from an activity regardless of the end result.	7	6	5	4	3	2	1
18.	People should have a reasonable likelihood of success before undertaking anything.	7	6	5	4	3	2	1



19.	My value as a person depends greatly on what others think of me.	7	6	5	4	3	2	1
20.	If I don't set the highest standard for myself, I am likely to end up a second-rate person.	7	6	5	4	3	2	1
21.	If I am to be a worthwhile person, I must be truly outstanding in at least one major respect.	7	6	5	4	3	2	1
22.	People who have good ideas are more worthy than those who do not.	7	6	5	4	3	2	1
23.	I should be upset if I make a mistake.	7	6	5	4	3	2	1
24.	My own opinions of myself are more important than other's opinions of me.	7	6	5	4	3	2	1
25.	To be a good, moral, worthwhile person, I must help everyone who needs it.	7	6	5	4	3	2	1
26.	If I ask a question, it makes me look inferior.	7	6	5	4	3	2	1
27.	It is awful to be disapproved of by people important to you.	7	6	5	4	3	2	1
28.	If you don't have other people to lean on, you are bound to be sad.	7	6	5	4	3	2	1
29.	I can reach important goals without slave driving myself.	7	6	5	4	3	2	1
30.	It is possible for a person to be scolded and not get upset.	7	6	5	4	3	2	1
31.	I cannot trust other people because they might be cruel to me.	7	6	5	4	3	2	1
32.	If others dislike you, you cannot be happy.	7	6	5	4	3	2	1
33.	It is best to give up your own interests in order to please other people.	7	6	5	4	3	2	1
34.	My happiness depends more on other people than it does on me.	7	6	5	4	3	2	1
35.	I do not need the approval of other people in order to be happy.	7	6	5	4	3	2	1
36.	If a person avoids problems, the problems tend to go away.	7	6	5	4	3	2	1
37.	I can be happy even if I miss out on many of the good things on life.	7	6	5	4	3	2	1
38.	What other people think about me is very important.	7	6	5	4	3	2	1
39.	Being isolated from others is bound to lead to unhappiness.	7	6	5	4	3	2	1
40.	I can find happiness without being loved by another person.	7	6	5	4	3	2	1

Note. Items 2, 6, 12, 17, 24, 29, 30, 35, 37, and 40 are reversed scored.

Appendix E

Mizes Anorectic Cognitions Scale - Revised (MACS-R)

**Section E.** This is an inventory of beliefs and attitudes about eating and weight. There are a number of statements with which you may tend to agree or disagree. On your answer sheet there is one of five possible answers for each item. For each statement, you should circle one of the numbers, according to your own reaction to the item:

Circle over #1 if you **STRONGLY DISAGREE** (for example 1 2 3 4 5)

Circle over #2 if you **MODERATELY DISAGREE**

Circle over #3 if you **NEITHER AGREE NOR DISAGREE**

Circle over #4 if you **MODERATELY AGREE**

Circle over #5 if you **STRONGLY AGREE**

It is not necessary to think over any item very long. Mark your answer quickly and go on to the next statement. Be sure to mark how you actually feel about the statement, not how you think you should feel. Try to avoid the neutral or "3" response as much as possible. Select this answer only if you really cannot decide whether you tend to agree or disagree with a statement.

		SD	MD	N	MA	SA
1.	I feel victorious over my hunger when I am able to refuse sweets	1	2	3	4	5
2.	No matter how much I weigh, fats, sweets, breads, and cereals are bad food because they always turn into fat	1	2	3	4	5
3.	No one likes fat people; therefore, I must remain thin to be liked by others	1	2	3	4	5
4.	I am proud of myself when I control my urge to eat	1	2	3	4	5
5.	When I eat desserts, I get fat. Therefore, I must never eat desserts so I won't be fat	1	2	3	4	5
6.	How much I weigh has little to do with how popular I am	1	2	3	4	5
7.	If I don't establish a daily routine, everything will be chaotic and I won't accomplish anything	1	2	3	4	5
8.	My friends will like me regardless of how much I weigh	1	2	3	4	5
9.	When I am overweight, I am not happy with my appearance. Gaining weight will take away the happiness I have with myself	1	2	3	4	5
10.	People like you because of your personality, not whether you are overweight or not	1	2	3	4	5
11.	When I eat something fattening, it doesn't bother me that I have temporarily let myself eat something I'm not supposed to	1	2	3	4	5
12.	If I eat a sweet, it will be converted instantly into stomach fat	1	2	3	4	5
13.	If my weight goes up, my self-esteem goes down	1	2	3	4	5
14.	I can't enjoy anything because it will be taken away	1	2	3	4	5
15.	It is more important to be a good person than it is to be thin	1	2	3	4	5
16.	When I see someone who is overweight, I worry that I will be like him/her	1	2	3	4	5
17.	All members of the opposite sex want a mate who has a perfect, thin body	1	2	3	4	5
18.	Having a second serving of a high calorie food I really like doesn't make me feel guilty	1	2	3	4	5
19.	If I can cut out all carbohydrates, I will never be fat	1	2	3	4	5
20.	When I overeat, it has no effect on whether or not I feel like a strong person	1	2	3	4	5
21.	Members of the opposite sex are more interested in "who" you are rather than whether or not you are thin	1	2	3	4	5
22.	If I gain one pound, I'll go on and gain a hundred pounds, so I must keep precise control of my weight, food, and exercise	1	2	3	4	5
23.	I rarely criticize myself if I have let my weight go up a few pounds	1	2	3	4	5
24.	I try to attract members of the opposite sex through my personality rather than by being thin	1	2	3	4	5

Appendix F  
Physical Health Scale

**SECTION K:** Indicate how many times in the LAST MONTH, you participated in physical activity individually and with club teams (Column A). Indicate on average, how many hours (or part hours) you spent per occasion (Column B). Also, tell us whether your involvement in these activities has increased, decreased, or stayed the same, in the last year (Column C).

For Column A, use the following terms to determine the intensity of the activities:

High-intensity means heavy perspiration, heavy breathing, and few rests.

Medium-intensity means some perspiration, faster than normal breathing, and some rests.

Low-intensity means a little perspiration, normal breathing, and plenty of rests.

For Column B, use the following numbers to indicate how many times in the last month:

- |                           |                       |
|---------------------------|-----------------------|
| 0. Not at all             | 4. 2 - 3 times a week |
| 1. Less than once a month | 5. 4 - 6 times a week |
| 2. 1 - 3 times a month    | 6. Every day          |
| 3. Once a week            |                       |

	A How often in the last month?	B Average number of hours (or part hours) per occasion	C Compared to last year, your involvement in this type of physical activity has ... (circle one response)
<b>1. High-intensity individual physical activity</b> Hard levels of running, swimming, cycling, speed walking, etc.	0 1 2 3 4 5 6	_____	Increased Decreased Stayed the same
<b>2. Medium-intensity individual physical activity</b> Moderate levels of jogging, aerobics, in-line skating, etc.	0 1 2 3 4 5 6	_____	Increased Decreased Stayed the same
<b>3. Low-intensity individual physical activity</b> Easy levels of walking, biking, etc.	0 1 2 3 4 5 6	_____	Increased Decreased Stayed the same
<b>4. High-intensity team physical activity</b> Hard levels of soccer, hockey, basketball, etc.	0 1 2 3 4 5 6	_____	Increased Decreased Stayed the same
<b>5. Medium-intensity team physical activity</b> Moderate levels of baseball, volleyball, football, etc.	0 1 2 3 4 5 6	_____	Increased Decreased Stayed the same
<b>6. Low-intensity team physical activity</b> Easy levels of bowling, curling, billiards, darts, etc.	0 1 2 3 4 5 6	_____	Increased Decreased Stayed the same

Appendix G

Sociotropy-Autonomy Scale - Revised (SAS-R)

**Section G.**

**Please indicate what percentage of the time each of the statements below applies to you by using the scale to the right of the items. Choose the percentage that comes closest to how often the item describes you.**

	<i>PERCENTAGE DESCRIBES YOU</i>				
	0%	25%	50%	75%	100%
1. I would be uncomfortable dining out in a restaurant by myself.	0	25	50	75	100
2. I get uncomfortable when I am not sure how I am expected to behave in the presence of others	0	25	50	75	100
3. I focus almost exclusively on the positive outcomes of my decisions.	0	25	50	75	100
4. It is important to be liked and approved of by others.	0	25	50	75	100
5. I feel more comfortable helping others than receiving help.	0	25	50	75	100
6. I am very uncomfortable when a close friend or family member decides to “pour their heart out” to me.	0	25	50	75	100
7. I am reluctant to ask for help when working on a difficult and puzzling task.	0	25	50	75	100
8. When I am with other people, I look for signs of whether or not they like being with me.	0	25	50	75	100
9. When visiting with people, I get fidgety when sitting around and talking and would rather get up and do something	0	25	50	75	100
10. I am more concerned that people like me than I am about making important achievements.	0	25	50	75	100
11. I am afraid of hurting other people’s feeling.	0	25	50	75	100
12. People rarely come to me with their personal problems.	0	25	50	75	100
13. I sometimes unintentionally hurt the people I love the most by what I say.	0	25	50	75	100
14. I feel bad if I do not have some social plans for the weekend.	0	25	50	75	100
15. I tend to be direct with people and say what I think.	0	25	50	75	100
16. People tend to dwell too much on their personal problems.	0	25	50	75	100
17. Once I’ve arrived at a decision, I rarely change my mind.	0	25	50	75	100
18. Being able to share experiences with other people makes them much more enjoyable for me.	0	25	50	75	100
19. I do things that are not in my best interest in order to please others.	0	25	50	75	100
20. I prefer to “work out” my personal problems by myself.	0	25	50	75	100
21. When I have a problem, I like to go off on my own and think it through rather than being influenced by others.	0	25	50	75	100
22. I find it hard to pay attention to long conversations, even with friends.	0	25	50	75	100
23. I get lonely when I am home by myself at night.	0	25	50	75	100
24. The worst part about growing old is being left alone.	0	25	50	75	100
25. Having close bonds with other people makes me feel secure.	0	25	50	75	100
26. My close friends and family are too sensitive to what others say.	0	25	50	75	100
27. I am concerned that if people knew my faults or weaknesses, they would not like me.	0	25	50	75	100
28. I set my own standards and goals for myself rather than accepting those of other people.	0	25	50	75	100
29. I worry that somebody I love will die.	0	25	50	75	100
30. If a goal is important to me, I will pursue it even if it may make other people uncomfortable.	0	25	50	75	100
31. I find it difficult to say “no” to people.	0	25	50	75	100



32. I censor what I say because I am concerned that other people may disapprove or disagree	0%	25%	50%	75%	100%
33. I am usually the last person to hear that I've hurt someone by my actions.	0	25	50	75	100
34. I often find myself thinking about friends or family.	0	25	50	75	100
35. I would rather take personal responsibility for getting the job done than depend on someone else.	0	25	50	75	100
36. If a friend has not called for a while I get worried that s/he has forgotten me.	0	25	50	75	100
37. I spend a lot of time thinking over my decisions.	0	25	50	75	100
38. It is important to me to be free and independent.	0	25	50	75	100
39. People I work with often spend too much time weighing out the "pros" and "cons" before taking action.	0	25	50	75	100
40. When I am having difficulty solving a problem, I would rather work it out for myself than have someone show me the solution.	0	25	50	75	100
41. Often I fail to consider the possible negative consequences of my actions.	0	25	50	75	100
42. When I achieve a goal I get more satisfaction from reaching the goal than from any praise I might get.	0	25	50	75	100
43. If I think I am right about something, I feel comfortable expressing myself even if others don't like it.	0	25	50	75	100
44. I am uneasy when I cannot tell whether or not someone I've met likes me.	0	25	50	75	100
45. If somebody criticizes my appearance, I feel I am not attractive to other people.	0	25	50	75	100
46. I get uncomfortable around a person who does not clearly like me.	0	25	50	75	100
47. It is more important to be active and doing things than having close relations with other people.	0	25	50	75	100
48. Sometimes I hurt family and close friends without knowing that I've done anything wrong.	0	25	50	75	100
49. I tend to fret and worry over my personal problems.	0	25	50	75	100
50. The possibility of being rejected by others for standing up for my rights would not stop me.	0	25	50	75	100
51. I need to be engaged in a challenging task in order to feel satisfied with my life.	0	25	50	75	100
52. I don't enjoy what I am doing when I don't feel that someone in my life really cares about me.	0	25	50	75	100
53. I like to be certain that there is somebody close I can contact in case something unpleasant happens to me.	0	25	50	75	100
54. It would not be much fun for me to travel to a new place all alone.	0	25	50	75	100
55. I am more apologetic to others than I need to be.	0	25	50	75	100
56. I prize being an unique individual more than being a member of a group.	0	25	50	75	100
57. If I think somebody may be upset at me, I want to apologize.	0	25	50	75	100
58. I become particularly annoyed when a task is not completed.	0	25	50	75	100
59. I find it difficult to be separated from people I love.	0	25	50	75	100



Appendix H

Response Style Questionnaire (RSQ)

**Section H:** People think and do many different things when they feel sad, blue, or depressed. Please read each of the items below and indicate whether you never, sometimes, often, or always think or do each one when you feel sad, down, or depressed. Please indicate what you generally do, not what you think you should do.

Items	Rating Scale			
	Never	Sometimes	Often	Always
1. Ask someone to help you overcome a problem.	1	2	3	4
2. Think about how alone you feel.	1	2	3	4
3. Think "I won't be able to do my job/work because I feel so badly."	1	2	3	4
4. Think about your feelings of fatigue and achiness.	1	2	3	4
5. Think about how hard it is to concentrate.	1	2	3	4
6. Try to find something positive in the situation or something you learned.	1	2	3	4
7. Take recreational drugs or drink alcohol.	1	2	3	4
8. Think "I'm going to do something to make myself feel better".	1	2	3	4
9. Help someone else with something in order to distract yourself.	1	2	3	4
10. Think about how passive and unmotivated you feel.	1	2	3	4
11. Remind yourself that these feelings won't last.	1	2	3	4
12. Analyze recent events to try to understand why you are depressed.	1	2	3	4
13. Think about how you don't seem to feel anything any more.	1	2	3	4
14. Think "Why can't I get going?"	1	2	3	4
15. Think "Why do I always react this way?"	1	2	3	4
16. Go to a favourite place to get your mind off your feelings.	1	2	3	4
17. Go away by yourself and think about why you feel this way.	1	2	3	4
18. Talk it out with someone whose opinions you respect (friend/family/ clergy).	1	2	3	4
19. Think "I'll concentrate on something other than how I feel."	1	2	3	4
20. Write down what you are thinking about and analyze it.	1	2	3	4
21. Do something that has made you feel better in the past.	1	2	3	4
22. Think about a recent situation, wishing it had gone better.	1	2	3	4
23. Think "I'm going to go out and have some fun."	1	2	3	4
24. Make a plan to overcome a problem.	1	2	3	4
25. Stay around people.	1	2	3	4
26. Concentrate on your work.	1	2	3	4
27. Think "Why do I have problems other people don't have?"	1	2	3	4
28. Do something reckless or dangerous.	1	2	3	4

Items	Rating Scale			
	Never	Sometimes	Often	Always
29. Think about how sad you feel.	1	2	3	4
30. Think about all your shortcomings, failings, faults, mistakes.	1	2	3	4
31. Do something you enjoy.	1	2	3	4
32. Think about how you don't feel up to doing anything.	1	2	3	4
33. Do something fun with a friend.	1	2	3	4
34. Analyze your personality to try to understand why you are depressed.	1	2	3	4
35. Take your feelings out on someone else.	1	2	3	4
36. Go someplace alone to think about your feelings.	1	2	3	4
37. Deliberately do something to make yourself feel worse.	1	2	3	4
38. Think about how angry you are with yourself.	1	2	3	4
39. Listen to sad music.	1	2	3	4
40. Isolate yourself and think about the reasons why you feel sad.	1	2	3	4
41. Try to understand yourself by focusing on your depressed feelings.	1	2	3	4

Appendix I

Winter Stress Scale (WSS)

**Section I: Please respond to the questions below and write clearly.**

---

1. How much do you dread the winter?

1                      2                      3                      4                      5  
 not at all          a little              moderately          very                  extremely

- Please explain your answer:

---

2. Some people experience certain changes in themselves during the winter. If you experience these changes as well, please rate how stressful they are for you.

CHANGES                      0              1              2              3              4              5  
    does not    not stressful    quite    moderately    very    extremely  
    apply        at all        stressful    stressful    stressful    stressful

CHANGES	0	1	2	3	4	5
Carbohydrate craving	0	1	2	3	4	5
Weight gain	0	1	2	3	4	5
Energy loss	0	1	2	3	4	5
Increased sleep	0	1	2	3	4	5
Other (please specify below):	0	1	2	3	4	5

Please provide additional information below to help us understand better your experience with the changes (where applicable):

3. *To what degree do the winter changes (the ones that you endorsed in question 2) interfere with your ability to cope with daily life difficulties in your life (i.e., work, academic, social, family, and personal)?*

1	2	3	4	5
not at all	a little	moderately	very	extremely

*Please explain your answer:*

- 
4. *How often do you engage in the following behaviour? Please use the rating scale below to answer the questions.*

1	2	3	4	5
never	rarely	sometimes	often	always

- (a) During the winter I find myself thinking about how any changes in mood and behaviour that I experience may (or actually do) affect my life.
- (b) During the winter/fall I find myself wishing that I could go outside more.
- (c) During the winter/fall I think about how I never seem to have enough energy to do what I can during the summer.
- (d) During the winter/fall I think things like, "I won't be able to do job/work because I feel so bad".
- (e) During the winter/fall I find myself thinking about how any changes in

mood in behaviour that I am experiencing affect my life.

(f) During the winter/fall I wish that I felt more like I do during the summer.

---

5. Do you experience any negative mood or behavioural changes (e.g., feelings, sleep, appetite, social interactions, weight, etc.) from summer to fall/winter? .....Yes / No  
If yes, please answer the questions below:

(I) Please list the reason(s) why you think you experience the negative mood or behavioural changes.

(S1) Do you think that the changes you experience during the fall/winter will disappear when the weather gets better?.....Yes / No

Please explain why:

(S2) Do you think that you will continue to experience these changes year after year? Yes/No

Please explain why:

(G) Do these changes affect you in your:

- Personal life.....Yes / No
  - Family life.....Yes / No
  - Social life.....Yes / No
  - Academic life (if applicable).....Yes / No
  - Career life (if applicable).....Yes / No
- 

6. Please answer the questions using the rating scale given below:

1	2	3	4	5
disagree strongly	disagree	neutral	agree	agree strongly

**During the fall and/or winter:**

- (a) I get more upset than usual because of something that happened unexpectedly \_\_\_\_\_
- (b) I am less able to control the important things in my life \_\_\_\_\_
- (c) I feel more nervous and “stressed” than usual \_\_\_\_\_
- (d) I am more successful than usual at dealing with irritating life hassles \_\_\_\_\_
- (e) I cope more effectively than usual with important changes that are  
occurring in my life \_\_\_\_\_
- (f) I am more confident than usual about my ability to handle my  
personal problems \_\_\_\_\_
- (g) I feel more than usual that things go my way \_\_\_\_\_
- (h) I am less able to cope than usual with things that I have to do \_\_\_\_\_
- (i) I am less able than usual to control irritations in my life \_\_\_\_\_
- (j) I feel more on top of things than usual \_\_\_\_\_
- (k) I get more angry than usual because of things that happen that  
are outside of my control \_\_\_\_\_
- (l) I think more than usual of things that I have to accomplish \_\_\_\_\_
- (m) I am more able to control the way I spend my time \_\_\_\_\_
- (n) I feel more so than usual that difficulties are piling up so high that I cannot overcome  
them \_\_\_\_\_



Appendix J

Eating Attitudes Test -26 (EAT-26)

## SECTION J.

Please check one response for each of the following statements.		Always	Usually	Often	Sometimes	Rarely	Never
1	I am terrified about being overweight.	3	2	1	0	0	0
2	Avoid eating when I am hungry.	3	2	1	0	0	0
3	Find myself preoccupied with food.	3	2	1	0	0	0
4	Have gone on eating binges where I feel I may not be able to stop.	3	2	1	0	0	0
5	Cut my food into small pieces.	3	2	1	0	0	0
6	Aware of the caloric content of foods I eat.	3	2	1	0	0	0
7	Particularly avoid food with a high carbohydrate content (bread, rice, potatoes).	3	2	1	0	0	0
8	Feel that others would prefer if I ate more.	3	2	1	0	0	0
9	Vomit after I have eaten.	3	2	1	0	0	0
10	Feel extremely guilty after eating.	3	2	1	0	0	0
11	Am preoccupied with a desire to be thinner.	3	2	1	0	0	0
12	Think about burning up calories when I exercise.	3	2	1	0	0	0
13	Other people think I'm too thin.	3	2	1	0	0	0
14	Am preoccupied with the thought of having fat on my body.	3	2	1	0	0	0
15	Take longer than others to eat my meals.	3	2	1	0	0	0
16	Avoid foods with sugar in them.	3	2	1	0	0	0
17	Eat diet foods	3	2	1	0	0	0
18	Feel that food controls my life.	3	2	1	0	0	0
19	Display self-control around food.	3	2	1	0	0	0
20	Feel that others pressure me to eat.	3	2	1	0	0	0
21	Give too much time and thought to food.	3	2	1	0	0	0
22	Feel uncomfortable after eating sweets.	3	2	1	0	0	0
23	Engage in dieting behaviour.	3	2	1	0	0	0
24	Like my stomach to be empty.	3	2	1	0	0	0
25	Have the impulse to vomit after meals.	3	2	1	0	0	0
26	Enjoy trying new rich foods.	0	0	0	1	2	3

Appendix K

Self-report measure of DSM-IV-TR Major Depressive Episode, Current

**Section L:** *The questions below ask about your thoughts, feelings, and behaviours. Please answer them by circling either “YES” or “NO”, or writing in your response.*

1. In the last 2 weeks nearly every day, I have felt sad, blue, or depressed	YES	NO
2. In the last 2 weeks, I have lost all interest in things like work or hobbies or things I usually like to do for fun	YES	NO
3a. In the last 2 weeks, I have experienced loss of appetite	YES	NO
b. In the last 2 weeks, I have lost weight <u>without</u> trying to – as much as 2 pounds a week or as much as 10 pounds altogether	YES	NO
c. In the last 2 weeks, I have experienced an increase in appetite	YES	NO
d. In the last 2 weeks, my eating increased so much that I gained as much as 2 pounds a week for weeks or 10 pounds altogether	YES	NO
4a. In the last 2 weeks nearly every night, I have been having trouble falling asleep, staying asleep, or waking up too early	YES	NO
b. In the last 2 weeks nearly every day, I have been sleeping too much	YES	NO
5a. In the last 2 weeks nearly every day, I have been talking or moving more slowly than is normal for me	YES	NO
b. In the last 2 weeks, I have to moving all the time -- that is, I couldn't sit still and paced up and down	YES	NO
6. In the last 2 weeks, I have lacked energy or felt tired out all the time even when I have not been working very hard	YES	NO
7. In the 2 weeks nearly every day, I have been feeling worthless, sinful, or guilty	YES	NO
8a. In the last 2 weeks nearly every day, I have been having a lot more trouble concentrating than is normal for me	YES	NO
b. In the last 2 weeks nearly every day, my thoughts have come much slower than usual or seemed mixed up	YES	NO
c. In the past 2 weeks nearly every day, I have been unable to make up my mind about things I ordinarily have no trouble deciding about	YES	NO
9a. In the past 2 weeks, I have thought a lot about death – my own, someone else's, or death in general	YES	NO
b. In the past 2 weeks, I have felt like I wanted to die	YES	NO
c. In the past 2 weeks, I have felt so low I thought about committing suicide	YES	NO
d. I have attempted suicide in the past	YES	NO

**If you answered “yes” to any of the items 1-9, complete the rest of the questionnaire:**

10. How have the symptoms above affected your life (work, social, personal, family), if any?

11. Are the symptoms above due to:
- |  |          |
|--|----------|
| (a) the death of someone or something close to you | YES / NO |
| (b) a medical condition                            | YES / NO |
| (c) use of medication, drugs or alcohol            | YES / NO |

Appendix L  
Consent Form

## **INFORMED CONSENT FORM**

*(To protect your anonymity, this form will be detached from your research questionnaire before any of your responses are examined).*

1. Title of research: *Winter Study*.
2. This study investigates the emotional, cognitive, and behavioural experiences of people during the winter. As a research participant, you will be asked to complete a questionnaire that asks questions about what you think and feel, and how you behave. Some of the questions will be general, some are more specific and related to the winter. Completion of the questionnaire typically takes about 1 hour.
3. Your participation is strictly voluntary. You are free to withdraw from the study at any time without explanation or penalty. You are free to refrain from answering any questions that you do not wish to answer; however, we do encourage you to answer all questions as your responses would more make sense if all questions are answered. All your responses are strictly confidential and anonymous. There are no risks or benefit to you for participating in this study.
4. If you are an Introductory Psychology student, you will receive one bonus point towards your course marks for your participation. If you are not an Introductory Psychology student, you will be entered into three \$100 random prize draws. If you are an Introductory Psychology student who has already maximized the number of bonus points you can get, you will be entered into the three \$100 random prize draws.
5. All data will remain in secure and confidential storage with Dr. Josephine Tan (the project supervisor) at Lakehead University for seven years. After that, the questionnaires will be destroyed.

*If you have read the above, understand it, and wish to participate in this study, please sign below to indicate your informed consent for participation.*

\_\_\_\_\_

Print your name here

\_\_\_\_\_

Sign here

\_\_\_\_\_

Print today's date here

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*If you wish to receive a copy of the results, please write below your NAME and permanent POSTAL ADDRESS:*

Appendix M

Poster/Notice Regarding the Study

### **Looking for Research Participants!**

**The Department of Psychology, Lakehead University, is looking for individuals to participate in a research project that examines people's emotions, thoughts, and behaviour during the winter. The study requires participants to complete a research questionnaire that will take approximately one hour. The questionnaire can be done at home and mailed back to us. All responses are kept confidential and anonymous. All participants will be entered into three \$100 random prize draws.**

For more information, please call Jennine at (807) 939-1806 or email [winterstudy@hotmail.com](mailto:winterstudy@hotmail.com).



Appendix N

Cover Letter to Nonstudent Participants

Date

Dear Research Participant,

Thank you for your interest in participating in this study entitled “Winter Experiences”. It is being carried out by Jennine Rawana, who is a Psychology Doctoral student, under the supervision of a Psychology faculty, Dr. Josephine Tan (346-7751). This study looks at the emotions, thoughts, and behaviours of people during the winter time.

Participation of this study is entirely voluntary and your responses will be kept confidential. As a small token of our appreciation for your help, your name will be entered into three \$100 random prize draws.

Taking part in this study is very simple. It consists of your completing the enclosed Research Questionnaire and then returning it to us when done. However, we do ask that you please read the Consent Form first (attached to the Research Questionnaire) before you do anything as it explains to you the study in detail and your rights in this project. If you choose to participate after reading the Consent Form, then please sign it and then proceed with the rest of the questionnaire.

To return the questionnaire, you can mail it back or drop it off in the collection box marked “Winter Experiences” in the Psychology Main Office SN 1042. For participants from the community, a postage-paid return envelope is included for your use. For participants from Lakehead University, you can drop your questionnaire into the inter-office mail and address it to “Jennine Rawana, Psychology”.

Once again, thank you very much for your interest in this study. If you have any questions, please do not hesitate to contact me.

Jennine Rawana, M.A., HBSc.  
Doctoral Psychology Student  
Department of Psychology  
Lakehead University  
955 Oliver Road  
Thunder Bay, ON P7B 5E1  
Telephone: 807-939-1806  
E-Mail: winterstudy@hotmail.com

Appendix O

Cover Letter to Physicians

Date of letter  
Name of Health Service Provider  
Address

Dear Dr. X

The Psychology Department of Lakehead University is conducting research on depression and seasonal affective disorder (winter blues). Our project investigates the psychological characteristics, coping strategies, and winter stress experiences of individuals with different levels of seasonality and depression dimensions.

As part of our recruitment efforts, we would like to contact individuals who have these symptoms and present information on our studies to them. Given that you have extensive contact with patients, we would be grateful if you will consider assisting us in our efforts to reach the appropriate patients so that they will know of our study. This can be done by posting our enclosed recruitment poster in your waiting area or leaving some posters for pick up simply in your reception area.

If you prefer, another more direct way would be to inform the appropriate patients of our recruitment efforts and give them a copy of our recruitment poster. Any patient who is interested in more information can call Ms. Jennine Rawana at 939-1806. The name and telephone number are listed on the poster.

We hope that you will assist us in reaching out to your patients. If you have any questions or concerns, please do not hesitate to contact us below. Thank you very much for any help you can render us.

Sincerely,

---

Ms. J. Rawana  
Jennine Rawana, M.A., Ph.D. Student  
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## Appendix P

### Debriefing and Counselling/Therapy Resources

## ***SECTION N: PLEASE TEAR OFF THIS PAGE FOR YOUR OWN INFORMATION***

*Please read this page only **AFTER** you are done with the Research Questionnaire to protect the integrity of your responses!*

### **Debriefing**

Thank you for helping out in this study. At this point, I'd like to give you some more information on this study. The reason we are conducting this study is to investigate the relationship among seasonality and depression dimensions to context-specific (i.e., winter or relationship) cognitions and response styles to depressed moods. Seasonality refers to the degree to which someone experiences variations in eating patterns and sleeping patterns as a result of changes in the seasons. The depression dimension refers to the degree of sadness an individual feels. This research will determine how individuals with varying degrees of seasonality and depression perceive the stressfulness of their seasonal symptoms, what their eating cognitions (e.g., concerns about weight) are, and the degree of their physical activity levels. Also, this project will investigate how they respond to their depressed moods.

The reason for conducting this study is to find out whether there are emotional, cognitive, and behavioural differences among people who have seasonal depression (high seasonality - high depression), nonseasonal depression (low seasonality - high depression), sub-syndromal level of seasonal depression (high seasonality - low depression), and no depression (low seasonality - low depression). The results have implications on helping us to understand better the appropriate strategies for distinguishing these groups for treatment purposes, and to understand the type and degree of similarities they have with each other.

If you or anyone you know are feeling depressed or psychologically distressed, there is help available. At the bottom of this page is a listing of resources that people can access, and we do encourage individuals to seek psychological assistance if they feel they need it to help them get over their distress. If you have any questions, Jennine will be very pleased to help you. Please contact her at 343-8978 or email her at [winterstudy@hotmail.com](mailto:winterstudy@hotmail.com).

Before we end this study, we would like you to please not talk about this study with anyone. There are many other people who have not participated in this study yet. If they hear from you or through the grapevine what this study is all about, it may influence their responses. Our results will not be accurate and the study will be ruined. We hope that you will cooperate with us in this regard. Thank you.

### **Resources for Counselling/Therapy**

- Lakehead University Health and Counselling Services (available free to LU students): 343-8361
- Lakehead University Native Student Support Services: 343-8085
- Family Services Thunder Bay: 626-1880
- Catholic Family Development Centre: 354-7323
- Emergency services are available at the Thunder Bay Regional Hospital McKellar site
- Walk-in services are available at the Urgent Care Unit, Lakehead Psychiatric Hospital from 8:30 am to 4:30 pm
- Self-referrals can be made to the Community Mental Health Program @ Thunder Bay Regional Hospital McKellar (343-7199) or to any mental health professional in private practice (look up the Yellow Pages under Psychologists and Psychological Associates; Psychotherapy; or Marriage, Family & Individual Counsellors).

Table 1

*Classification Criteria for Four Groups*

Criteria	High seasonality, High depression (SAD)	High seasonality, low depression (S-SAD)	High depression, low seasonality (Depressed)	Low depression, low seasonality (Control)
<b>Seasonality<sup>a</sup></b>				
Seasonal Pattern <sup>b</sup>	Yes	Yes	No	No
Seasonal pattern last 2 years	Yes	Yes	Irrelevant	Irrelevant
GSS <sup>c</sup> + Impairment <sup>d</sup>	>11 + at least moderate impairment	9-11 + at least mild impairment <i>or</i> >11 + no or mild impairment	< 9 + no or mild impairment	< 9 + no or mild impairment
Seasonal stressor	No	No	Irrelevant	Irrelevant
<b>Depression</b>				
HDRS-T <sup>e</sup>	≥ 23	<14	≥ 23	<14

<sup>a</sup>Seasonality criteria were assessed with the Seasonal Pattern Assessment Questionnaire (Rosenthal et al., 1987).

<sup>b</sup>Seasonal pattern refers to the presence of symptoms during the fall and winter months (September to April) and the absence of symptoms during the spring and summer months.

<sup>c</sup>GSS = Global Seasonality Score. The GSS score for the S-SAD is based on the criteria in Kasper, Wehr, Bartko, Gaist, and Rosenthal (1989), whereas that for SAD is from Rosenthal and colleagues (1987). For Depressed and Nondepressed, GSS did not matter if there was a seasonal pattern to their symptoms.

<sup>d</sup>Impairment - degree of impairment associated with seasonal changes. The impairment guideline for S-SAD is based on that proposed by Kasper, Wehr, et al. (1989), whereas that for SAD is proposed by Rosenthal and colleagues (1987).

<sup>e</sup>HDRS-T = total scores on the HDRS-28.

Table 2

*Physical Health Scale Variables and Description*

Dependent Variable	Description
Frequency of physical activity	
Frequency of High-Intensity Individual	How often in the last month participate in high-intensity individual physical activities?
Frequency of Medium-Intensity Individual	How often in the last month participate in medium-intensity individual physical activities?
Frequency of Low-Intensity Individual	How often in the last month participate in low-intensity individual physical activities?
Frequency of High-Intensity Team	How often in the last month participate in high-intensity team physical activities?
Frequency of Medium-Intensity Team	How often in the last month participate in medium-intensity team physical activities?
Frequency of Low-Intensity Team	How often in the last month participate in low-intensity team physical activities?
Duration of physical activity	Response provided in hours and converted to minutes for analyses
Duration of High-Intensity Individual	Average per occasion of time a respondent participated in high-intensity individual physical activities
Duration of Medium-Intensity Individual	Average per occasion of time a respondent participated in medium-intensity individual physical activities
Duration of Low-Intensity Individual	Average per occasion of time a respondent participated in low-intensity individual physical activities
Duration of High-Intensity Team	Average per occasion of time a respondent participated in high-intensity team physical activities
Duration of Medium-Intensity Team	Average per occasion of time a respondent participated in medium-intensity team physical activities
Duration of Low-Intensity Team	Average per occasion of time a respondent participated in low-intensity team physical activities
Average Duration of Physical Activity	Average amount of time per occasion of all the types of physical activities - sum of all six physical activity time variables (listed above) divided by 6



Table 2 (continued)

Dependent Variable	Description
Change in physical activity	Response options were increased, decreased, or stayed the same.
Change in High-Intensity Individual	Change in involvement in high-intensity individual physical activities over the past year
Change in Medium-Intensity Individual	Change in involvement in medium-intensity individual physical activities over the past year
Change in Low-Intensity Individual	Change in involvement in low-intensity individual physical activities over the past year
Change in High-Intensity Team	Change in involvement in high-intensity team physical activities over the past year
Change in Medium-Intensity Team	Change in involvement in medium-intensity team physical activities over the past year
Change in Low-Intensity Team	Change in involvement in low-intensity team physical activities over the past year

*Note.* Frequency of physical activity response options were 0 = not at all, 1 = less than once a month, 2 = 1-3 times a month, 3 = once a week, 4 = 2-3 times a week, 5 = 4-6 times a week, and 6 = every day.

Change in physical activity response options were increased, decreased, or stayed the same.

Table 3

*Means (and Standard Deviations) for the HDRS and GSS by Group, Sex, and the Total Sample*

Measure	Group				Total Sample
	SAD	Depressed	S-SAD	Control	
Male					
HDRS-T <sup>a</sup>	45.92 (18.13)	36.00 (12.10)	10.00 (2.65)	6.17 (3.34)	22.05 (20.78)
HDRS-A <sup>b</sup>	33.38 (16.43)	31.25 (9.65)	7.00 (3.27)	4.89 (3.08)	17.85 (16.69)
HDRS-B <sup>c</sup>	11.15 (4.10)	4.75 (4.80)	3.00 (1.83)	1.28 (1.07)	4.93 (5.12)
GSS <sup>d</sup>	15.31 (3.40)	7.25 (2.60)	13.86 (1.77)	5.28 (2.59)	9.76 (5.27)
Female					
HDRS-T <sup>a</sup>	40.74 (12.39)	33.42 (13.76)	8.94 (2.58)	8.40 (3.76)	24.70 (18.00)
HDRS-A <sup>b</sup>	27.17 (8.54)	24.05 (10.96)	6.18 (2.56)	6.43 (3.18)	17.73 (12.29)
HDRS-B <sup>c</sup>	13.80 (6.27)	9.09 (4.78)	2.76 (1.79)	1.98 (1.80)	8.05 (7.02)
GSS <sup>d</sup>	17.28 (2.78)	7.18 (2.44)	13.13 (2.13)	5.35 (2.41)	11.47 (5.94)
Both sexes combined					
HDRS-T <sup>a</sup>	39.51 (13.31)	32.14 (12.75)	9.25 (2.59)	7.71 (3.76)	23.91 (18.04)
HDRS-A <sup>b</sup>	28.37 (10.67)	25.97 (10.95)	6.42 (2.73)	5.95 (5.00)	17.76 (13.51)
HDRS-B <sup>c</sup>	13.28 (5.97)	7.93 (5.09)	2.83 (1.76)	1.76 (1.64)	7.25 (6.70)
GSS <sup>d</sup>	16.90 (3.00)	7.20 (2.44)	13.19 (2.01)	5.33 (2.45)	11.03 (5.78)

<sup>a</sup>HDRS-T = total score on the Hamilton Depression Rating Scale (HDRS-28)<sup>b</sup>HDRS-A = typical score on the HDRS-28<sup>c</sup>HDRS-B = atypical score on the HDRS-28<sup>d</sup>GSS = Global Seasonality Score on the Seasonal Pattern Assessment Questionnaire

Table 4

*Cell Size (Age Mean, Age Standard Deviation) of Student and Non-student Participants*

Type of Participant	Group				Total Sample (N = 179)
	SAD (n = 67)	Depressed (n = 30)	S-SAD (n = 24)	Control (n = 58)	
Male					
Students	7.00 (28.29, 13.31)	6.00 (21.33, 2.73)	6.00 (26.00, 8.85)	16.00 (20.25, 1.65)	35.00 (23.03, 7.52)
Non-students	6.00 (36.83, 10.09)	2.00 (43.55, 6.36)	1.00 (42.00, 0.00)	2.00 (35.00, 15.56)	11.00 (38.18, 9.45)
Total	13.00 (32.23, 12.28)	8.00 (26.88, 10.79)	7.00 (28.29, 10.09)	18.00 (21.89, 6.27)	46.00 (26.65, 10.26)
Female					
Students	36.00 (22.83, 6.92)	19.00 (19.84, 1.30)	15.00 (23.20, 7.78)	36.00 (20.86, 5.03)	106.00 (21.67, 5.86)
Non-students	18.00 (45.44, 12.09)	3.00 (39.33, 9.61)	2.00 (42.00, 4.24)	4.00 (40.75, 12.74)	27.00 (43.81, 11.31)
Total	54.00 (30.37, 13.93)	22.00 (22.50, 7.56)	17.00 (5.41, 9.65)	40.00 (22.85, 8.47)	131.00 (26.17, 11.51)
Both sexes combined					
Students	43.00 (23.72, 8.33)	25.00 (20.20, 1.80)	21.00 (24.00, 7.98)	52.00 (20.67, 4.27)	141.00 (22.01, 6.31)
Non-students	24.00 (43.29, 12.03)	5.00 (41.00, 7.84)	3.00 (42.00, 3.00)	6.00 (38.83, 12.43)	38.00 (42.18, 10.99)
Total	67 (30.73, 13.56)	30 (23.67, 8.56)	24 (26.25, 9.65)	58 (22.55, 7.81)	179 (26.30, 11.17)

Table 5  
*Reliabilities for Dependent Variables*

Dependent Variable	Cronbach's Alpha
Hamilton Depression Rating Scale (HDRS)	
HDRS-T <sup>a</sup>	0.94
HDRS-A <sup>b</sup>	0.92
HDRS-B <sup>c</sup>	0.88
GSS <sup>d</sup>	0.88
Response Style Questionnaire (RSQ) Total	0.87
Rumination	0.92
Dangerous Activities	0.55
Problem-Solving	0.48
Distraction	0.79
Winter Stress Scale (WSS) Total	0.94
W-Dread*	
W-Impair*	
W-Atypical	0.83
W-Ruminate	0.88
Negative Affect (Factor 1)	0.92
Perceived Ability to Cope (Factor 2)	0.85
Winter Perceived Stress Scale (WPSS)	0.88
Eating Cognitions (MACS-R) Total	0.90
Self-Control	0.84
Weight and Approval	0.79

Table 5 (continued)

Dependent Variable	Cronbach's Alpha
Rigid Weight Regulation	0.79
Sociotropy-Autonomy Scale (SAS-R) Total	0.87
Sociotropy	0.89
Solitude	0.77
Independence	0.79
Autonomy	0.81
Dysfunctional Attitudes Scale (DAS) Total	0.95
Eating Attitudes Test - 26 (EAT-26) Total	0.88
Dieting	0.88
Bulimia	0.68
Oral control	0.67
Physical Health Scale (PHS)	0.67
Frequency of physical activity	0.73
Duration in physical activity	0.75
Change in physical activity	0.84

*Note.* Factor 1 and Factor 2, respectively, are the Negative Affect and Perceived Ability to Cope factors.

<sup>a</sup>HDRS-T = total score on the HDRS-28

<sup>b</sup>HDRS-A = typical score on the HDRS-28

<sup>c</sup>HDRS-B = atypical score on the HDRS-28

<sup>d</sup>GSS = Global Seasonality Score on the Seasonal Pattern Assessment Questionnaire

\* Cronbach's Alpha not reported because scale only has one item.

Table 6

*Item Factor Loadings of the Winter Perceived Stress Scale (WPSS) with Varimax Rotation*

WPSS Item Number	Factor One	Factor Two
1	0.75	
2	0.85	
3	0.79	
8	0.81	
9	0.85	
11	0.76	
12	0.48	
14	0.81	
4		0.66
5		0.69
6		0.66
7		0.65
10		0.72
13		0.55

*Note.* Factor 1 and Factor 2, respectively, are the Negative Affect and Perceived Ability to Cope factors.

Table 7

*Pooled Sample Pearson Correlations*

Scale	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1. Rumination		-.13	.45**	.01	.50**	.62**	.43**	.50**	.59**	.53**	.23**	.35**	.26**	.33**
2. Distraction			-.07	.49**	.05	-.07	-.12	-.21	-.20*	-.11	-.27**	-.18	-.21*	-.12
3. Dangerous Act				.00	.26**	.34**	.23*	.32**	.33**	.32**	.10	.26*	.38**	.32**
4. Problem-Solv					.02**	-.06	-.08	-.13	-.16	-.08	-.25*	-.19	-.12	-.10
5. W-Atypical						.72**	.55**	.75**	.61**	.56**	.20*	.42**	.16	.24*
6. W-Ruminate							.61**	.77**	.74**	.65**	.33**	.42**	.25*	.32**
7. W-Dread								.59**	.55**	.53**	.18	.33**	.29**	.24*
8. W-Impair									.66**	.60**	.31**	.36**	.19	.28**
9. WPSS										.91**	.39**	.31**	.30**	.26**
10. Neg Affect											.00	.27**	.30**	.27**
11. Perceive Cop												.17	.05	.03
12. Self-Control													.50**	.62**
13. Wt Approval														.65**
14. Rigid Wt														
15. Sociotropy														
16. Solitude														
17. Independence														
18. Autonomy														
19. DAS total														
20. Dieting														
21. Bulimia														
22. Oral Control														
23. Dur PA														

*Note.* Abbreviations for variable names are as follows. Dangerous Act = Dangerous Activities, Problem Solv = Problem Solving, Neg Affect = Negative Affect, Perceive Cop = Perceived Ability to Cope, Wt Approval = Weight and Approval, Rigid Wt = Rigid Weight Regulation, Dur PA = Average Duration in Physical Activity.

\* $p < .01$ , \*\* $p < .001$ .

Table 7 (continued)

	15	16	17	18	19	20	21	22	23
1. Rumination	.50**	.21**	.02	.12	.39**	.38**	.31**	.12	-.10
2. Distraction	-.10	-.03	.28**	.15	-.19	-.02	-.06	-.07	.02
3. Dangerous Act	.27**	.30**	-.05	.14	.31**	.23*	.18	.07	.07
4. Problem-Solv	.05	-.06	.01	-.03	-.10	-.03	-.12	-.04	.06
5. W-Atypical	.25*	.15	.11	.15	.17	.40**	.45**	.07	-.13
6. W-Ruminate	.29**	.12	.06	.12	.28**	.35**	.39**	.13	-.12
7. W-Dread	.20*	.12	.05	.08	.20*	.32**	.33**	.08	-.14
8. W-Impair	.25*	.14	-.01	.10	.20*	.29**	.41**	.19	-.15
9. WPSS	.30**	.16	.05	.13	.36**	.30**	.35**	.16	-.13
10. Neg Affect	.28**	.18	.07	.16	.34**	.29**	.30**	.16	-.12
11. Perceive Cop	.09	-.01	-.05	-.02	.07	.09	.17	.05	-.15
12. Self-Control	.38**	.27**	-.09	.10	.31**	.63	.53**	.03	-.18
13. Wt Approval	.42**	.32**	-.23*	.03	.62**	.46**	.37**	.09	.04
14. Rigid Wt	.43**	.37**	-.12	.14	.50**	.55**	.43**	.13	.02
15. Sociotropy		.32**	-.10	.12	.54**	.41**	.32**	.22*	-.02
16. Solitude			.24*	.75**	.37**	.20**	.12	.07	.08
17. Independence				.79**	-.18	.05**	-.01	.08	.01
18. Autonomy					.09	.14	.07	.11	.07
19. DAS total						.28**	.24*	.15	.06
20. Dieting							.64**	.25*	-.09
21. Bulimia								.12	-.14
22. Oral Control									-.06
23. Dur PA									

*Note.* Abbreviations for variable names are as follows. Dangerous Act = Dangerous Activities, Problem Solv = Problem Solving, Neg Affect = Negative Affect, Perceive Cop = Perceived Ability to Cope, Wt Approval = Weight and Approval, Rigid Wt = Rigid Weight Regulation, Dur PA = Average Duration in Physical Activity.

\* $p < .01$ , \*\* $p < .001$ .



Table 8

*Overall Spearman Correlations for Frequency of Physical Activity and Change in Physical Activity Variables (Physical Health Scale)*

	1	2	3	4	5	6	7	8	9	10	11	12
1. Frequency HI		.54**	.17*	.31**	.32**	.35**	-.12	-.01	-.05	-.09	-.12	.08
2. Frequency MI			.27**	.24**	.29**	.27**	-.10	-.10	.02	.01	-.02	.14
3. Frequency LI				.17*	.23**	.26**	-.05	.07	.01	.06	.03	.09
4. Frequency HT					.67**	.43**	.05	.04	.02	-.05	-.05	.05
5. Frequency MT						.49**	-.04	.05	.01	-.01	.00	-.01
6. Frequency LT							.13	.06	.06	.04	.03	.03
7. Change HI								.50**	.23**	.48**	.47**	.38**
8. Change MI									.30**	.39**	.37**	.40**
9. Change LI										.34**	.32**	.38**
10. Change HT											.81**	.71**
11. Change MT												.66**
12. Change LT												

*Note.* Abbreviations for variable names are as follows. Frequency refers to frequency of physical activity. Change refers to change in physical activity. HI = High-Intensity Individual physical activities, MI = Medium-Intensity Individual, LI = Low-Intensity Individual, HT = High-Intensity Team, MT = Medium-Intensity Team, LT = Low-Intensity Team.

\* $p < .01$ , \*\* $p < .001$ .

Table 9

*Means (and Standard Deviations) for the Mizes Anorectic Cognitions Scale – Revised (MACS-R)  
Subscales by Group, Sex, and the Total Sample*

MACS-R subscale	Group				Total Sample
	SAD	Depressed	S-SAD	Control	
	Male				
Self-Control	28.08 (5.81)	18.00 (7.91)	22.00 (4.51)	23.50 (4.09)	23.61 (6.29)
Weight and Approval	20.31 (5.69)	14.00 (5.71)	20.86 (3.76)	17.44 (6.03)	18.17 (5.92)
Rigid Weight Regulation	20.61 (5.69)	15.25 (4.23)	19.29 (4.79)	18.28 (6.16)	18.57 (5.67)
	Female				
Self-Control	29.57 (6.49)	26.45 (7.24)	25.35 (6.96)	22.00 (6.85)	26.24 (7.42)
Weight and Approval	20.04 (6.35)	19.82 (5.73)	17.00 (4.64)	15.60 (5.71)	18.28 (6.14)
Rigid Weight Regulation	20.28 (6.02)	18.73 (6.35)	16.94 (5.01)	15.00 (6.11)	18.01 (6.33)
	Both sexes				
Self-Control	29.28 (6.35)	24.20 (8.21)	24.38 (6.44)	22.47 (6.13)	25.56 (7.22)
Weight and Approval	20.09 (6.19)	18.27 (6.20)	18.12 (4.67)	16.17 (5.82)	18.25 (6.07)
Rigid Weight Regulation	20.34 (5.92)	17.80 (6.00)	17.63 (4.96)	16.02 (6.26)	18.15 (6.16)

Table 10

*Means (and Standard Deviations) of the Eating Attitude Test – 26 (EAT-26) by Group, Sex, and the Total Sample*

EAT-26 subscale	Group				Total Sample
	SAD	Depressed	S-SAD	Control	
Male					
Dieting	8.00 (7.71)	1.50 (1.69)	2.29 (3.30)	2.33 (4.21)	3.78 (5.63)
Bulimia	3.00 (2.48)	1.50 (1.20)	0.43 (0.53)	0.72 (0.96)	1.46 (1.82)
Oral Control	3.08 (4.61)	3.63 (3.02)	0.29 (0.49)	1.39 (1.29)	2.09 (3.02)
Female					
Dieting	8.76 (8.40)	6.95 (6.64)	3.53 (4.29)	2.60 (5.16)	5.94 (7.28)
Bulimia	3.37 (3.18)	2.50 (2.72)	0.94 (1.89)	1.08 (1.97)	2.23 (2.82)
Oral Control	1.56 (2.65)	1.91 (2.49)	0.76 (0.90)	1.08 (1.53)	1.37 (2.17)
Both sexes combined					
Dieting	8.61 (8.22)	5.50 (6.21)	3.17 (4.00)	2.52 (4.85)	5.39 (6.94)
Bulimia	3.30 (3.04)	2.23 (2.43)	0.79 (1.61)	0.97 (1.72)	2.03 (2.62)
Oral control	1.85 (3.14)	2.37 (2.70)	0.62 (0.82)	1.17 (1.45)	1.55 (2.43)

Table 11

*Means (and Standard Deviations) of the Response Style Questionnaire (RSQ) subscales by Group, Sex, and the Total Sample*

RSQ subscale	Group				Total Sample
	SAD	Depressed	S-SAD	Control	
	Male				
Rumination	51.15 (10.82)	46.88 (11.34)	42.86 (4.67)	36.78 (9.18)	43.52 (11.09)
Dangerous Activities	7.77 (2.71)	6.00 (1.07)	6.71 (1.11)	6.22 (2.10)	6.70 (2.12)
Problem-Solving	9.38 (1.71)	8.00 (2.73)	8.28 (2.13)	9.06 (1.66)	8.85 (1.97)
Distraction	28.92 (5.07)	28.88 (3.80)	26.00 (4.80)	25.83 (4.05)	26.57 (4.55)
	Female				
Rumination	52.74 (9.47)	46.73 (8.67)	39.71 (7.82)	37.88 (8.70)	45.61 (11.02)
Dangerous activities	7.04 (1.96)	6.45 (1.47)	5.94 (1.14)	5.38 (1.25)	6.30 (1.74)
Problem-solving	9.15 (1.63)	9.23 (1.90)	8.65 (2.03)	9.60 (2.10)	9.23 (1.88)
Distraction	25.55 (4.36)	26.68 (4.02)	27.65 (6.48)	5.38 (1.25)	26.52 (4.98)
	Both sexes combined				
Rumination	52.43 (9.68)	46.77 (9.25)	40.62 (7.10)	37.53 (8.78)	45.07 (11.04)
Dangerous Activities	7.18 (2.12)	7.18 (2.12)	6.17 (1.17)	5.64 (1.60)	6.40 (1.84)
Problem-Solving	9.19 (1.64)	9.19 (1.64)	8.54 (2.02)	9.43 (1.97)	9.13 (1.90)
Distraction	26.21 (4.66)	26.20 (3.98)	27.17 (5.98)	26.81 (5.08)	26.53 (4.86)

Table 12

*Means (and Standard Deviations) of the Sociotropy Autonomy Scale – Revised (SAS-R) Subscales by Group, Sex, and Total Sample*

SAS-R subscales	Group				Total Sample
	SAD	Depressed	S-SAD	Control	
Male					
Sociotropy	57.38 (16.62)	61.63 (16.16)	42.14 (10.23)	51.50 (11.70)	53.50 (14.76)
Solitude	21.15 (8.06)	13.50 (4.78)	19.29 (4.82)	20.67 (8.53)	19.35 (7.69)
Independence	43.77 (8.16)	44.88 (8.25)	40.14 (9.63)	44.17 (7.04)	43.57 (7.86)
Autonomy	64.92 (11.62)	58.25 (11.04)	59.43 (13.48)	64.83 (12.77)	62.89 (12.21)
Female					
Sociotropy	62.02 (15.30)	63.91 (16.04)	58.24 (12.94)	50.38 (16.13)	58.35 (16.18)
Solitude	17.48 (5.63)	18.31 (6.81)	15.24 (7.63)	14.45 (7.00)	16.42 (6.64)
Independence	41.24 (7.07)	35.45 (8.26)	44.12 (7.61)	40.73 (8.81)	40.50 (8.19)
Autonomy	58.65 (8.83)	53.68 (13.56)	58.65 (11.96)	55.00 (12.56)	56.73 (11.35)
Both sexes combined					
Sociotropy	61.12 (15.54)	63.30 (15.82)	53.54 (14.12)	50.72 (14.80)	57.10 (15.93)
Solitude	18.19 (6.28)	17.03 (6.62)	16.42 (7.08)	16.37 (7.98)	17.17 (7.02)
Independence	41.73 (7.30)	37.97 (9.15)	42.96 (8.24)	41.79 (8.40)	41.28 (8.19)
Autonomy	59.87 (9.66)	54.90 (12.92)	58.88 (12.13)	58.05 (13.33)	58.31 (11.86)

Table 13

*Means (and Standard Deviations) of the Winter Stress Scale (WSS) by Group, Sex, and the Total Sample*

WSS	Group				Total Sample
	SAD	Depressed	S-SAD	Control	
	Male				
W-Dread	3.23 (0.83)	2.38 (1.41)	3.00 (0.82)	1.56 (0.70)	2.39 (1.14)
W-Atypical	11.15 (5.80)	3.63 (2.72)	5.00 (2.71)	2.00 (2.35)	5.33 (5.29)
W-Impair	3.25 (0.87)	2.25 (1.58)	1.71 (0.76)	1.24 (0.56)	2.05 (1.22)
W-Ruminate	20.08 (3.97)	15.13 (5.03)	13.00 (3.74)	10.67 (3.12)	14.46 (5.38)
WPSS Factor 1 (Negative Affect)	23.37 (9.16)	23.37 (9.16)	23.14 (4.26)	18.61 (6.12)	22.86 (7.38)
WPSS Factor 2 (Perceived Ability to Cope)	23.00 (3.70)	24.00 (4.47)	20.29 (3.55)	19.22 (3.70)	21.28 (4.20)
WPSS total	51.82 (9.14)	47.38 (8.93)	43.43 (5.38)	37.83 (6.84)	43.95 (9.42)
	Female				
W-Dread	3.26 (1.20)	1.81 (0.85)	1.94 (1.03)	1.98 (1.03)	2.46 (1.25)
W-Atypical	12.70 (4.54)	6.14 (3.50)	5.41 (3.04)	4.00 (3.52)	8.07 (5.51)
W-Impair	3.39 (0.99)	1.91 (0.97)	1.94 (0.90)	1.39 (0.84)	2.37 (1.27)
W-Ruminate	21.31 (4.55)	13.32 (4.62)	14.29 (4.28)	11.38 (3.69)	16.11 (6.13)
WPSS Factor 1 (Negative Affect)	29.94 (3.33)	22.09 (8.38)	19.98 (6.28)	18.46 (6.14)	23.91 (7.81)

Table 13 (continued)

WSS	Group				Total Sample
	SAD	Depressed	S-SAD	Control	
Female continued					
WPSS Factor 2 (Perceived Ability to Cope)	23.02 (2.94)	22.50 (4.13)	20.00 (5.47)	20.48 (3.84)	21.78 (3.97)
WPSS total	52.96 (6.62)	44.59 (9.11)	39.88 (8.87)	39.26 (5.33)	44.72 (9.35)
Both sexes combined					
W-Dread	3.26 (1.13)	1.97 (1.03)	2.25 (1.07)	1.84 (0.95)	2.44 (1.22)
W-Atypical	12.40 (4.80)	5.47 (3.45)	5.29 (2.90)	3.38 (3.32)	7.36 (5.57)
W-Impair	3.36 (0.97)	2.00 (1.14)	1.88 (0.85)	1.34 (0.76)	2.29 (1.26)
W-Ruminate	21.07 (4.44)	13.80 (4.72)	13.92 (4.10)	11.15 (3.51)	15.68 (5.98)
WPSS Factor 1 (Negative Affect)	29.62 (4.65)	22.43 (8.42)	20.83 (5.87)	18.51 (6.08)	23.67 (7.70)
WPSS Factor 2 (Perceived Ability to Cope)	23.02 (3.07)	22.90 (4.20)	20.08 (4.91)	20.09 (3.81)	21.65 (4.03)
WPSS total	52.76 (7.06)	45.33 (9.00)	40.92 (8.06)	38.80 (5.83)	45.27 (9.37)

Table 14

*Means (and Standard Deviations) of the Dysfunctional Attitude Scale (DAS) by Group, Sex, and the Total Sample*

DAS	Group				Total Sample
	SAD	Depressed	S-SAD	Control	
Male	127.00 (34.33)	117.13 (35.39)	109.29 (23.36)	116.61 (28.71)	118.52 (30.48)
Female	133.33 (41.30)	135.04 (38.60)	103.35 (25.03)	105.89 (29.81)	121.53 (38.27)
Both sexes combined	132.10 (39.88)	130.27 (38.03)	105.08 (24.20)	109.21 (29.65)	120.75 (36.37)



Table 15

*Means (and Standard Deviations) of the Duration in Physical Activity variable by Group, Sex, and the Total Sample*

Duration in Physical Activity	Group				Total Sample
	SAD	Depressed	S-SAD	Control	
	Male				
High-Intensity Individual	46.31 (41.56)	67.50 (50.07)	90.00 (67.08)	111.67 (101.76)	82.22 (78.30)
Medium-Intensity Individual	50.76 (46.45)	31.25 (42.57)	68.57 (64.14)	108.33 (102.97)	72.61 (79.80)
Low-Intensity Individual	70.85 (61.20)	75.00 (87.83)	120.00 (134.16)	130.00 (127.77)	101.58 (106.83)
High-Intensity Team	30.92 (51.94)	37.50 (71.26)	54.43 (72.90)	59.44 (66.99)	46.35 (63.79)
Medium-Intensity Team	13.85 (35.95)	30.00 (55.55)	42.86 (57.07)	78.33 (77.78)	46.30 (65.64)
Low-Intensity Team	42.50 (51.90)	45.00 (69.90)	42.86 (45.36)	93.33 (76.93)	63.33 (68.06)
Average	45.77 (31.60)	47.71 (48.79)	69.29 (49.03)	94.95 (49.22)	68.92 (48.76)
	Female				
High-Intensity Individual	56.02 (68.07)	37.05 (52.16)	71.18 (89.87)	43.29 (55.05)	51.11 (65.57)
Medium-Intensity Individual	74.26 (86.80)	60.22 (56.83)	80.00 (101.43)	52.24 (49.90)	66.26 (75.39)
Low-Intensity Individual	86.00 (88.30)	71.14 (73.58)	82.94 (92.80)	69.91 (77.71)	78.34 (83.04)
High-Intensity Team	13.89 (35.31)	18.41 (34.62)	21.17 (59.78)	22.50 (38.88)	18.16 (39.82)
Medium-Intensity Team	28.89 (72.08)	23.18 (53.93)	7.06 (19.93)	26.28 (45.59)	24.36 (57.17)

Table 15 (continued)

Duration in Physical Activity	Group				Total Sample
	SAD	Depressed	S-SAD	Control	
Female continued					
Low-Intensity Team	44.76 (74.98)	29.55 (38.97)	21.18 (36.38)	47.08 (50.37)	39.92 (59.14)
Average	51.02 (48.63)	39.92 (40.57)	47.25 (44.70)	47.71 (35.58)	47.71 (42.92)
Both sexes combined					
High-Intensity Individual	54.13 (63.64)	45.17 (52.56)	76.67 (82.87)	65.27 (79.23)	59.19 (70.21)
Medium-Intensity Individual	69.70 (80.91)	52.50 (54.28)	76.67 (90.87)	70.27 (75.18)	67.91 (76.38)
Low-Intensity Individual	83.02 (83.46)	72.17 (76.06)	93.75 (104.80)	88.77 (99.53)	84.39 (90.10)
High-Intensity Team	17.19 (39.22)	23.50 (46.56)	30.00 (63.79)	33.97 (51.67)	25.40 (48.55)
Medium-Intensity Team	25.97 (66.65)	25.00 (53.48)	17.50 (37.45)	42.72 (61.99)	30.03 (60.06)
Low-Intensity Team	44.35 (71.00)	33.67 (48.24)	27.50 (39.48)	61.43 (62.99)	45.82 (62.16)
Average	50.00 (45.66)	42.00 (42.17)	53.68 (46.06)	62.37 (45.55)	53.16 (45.32)

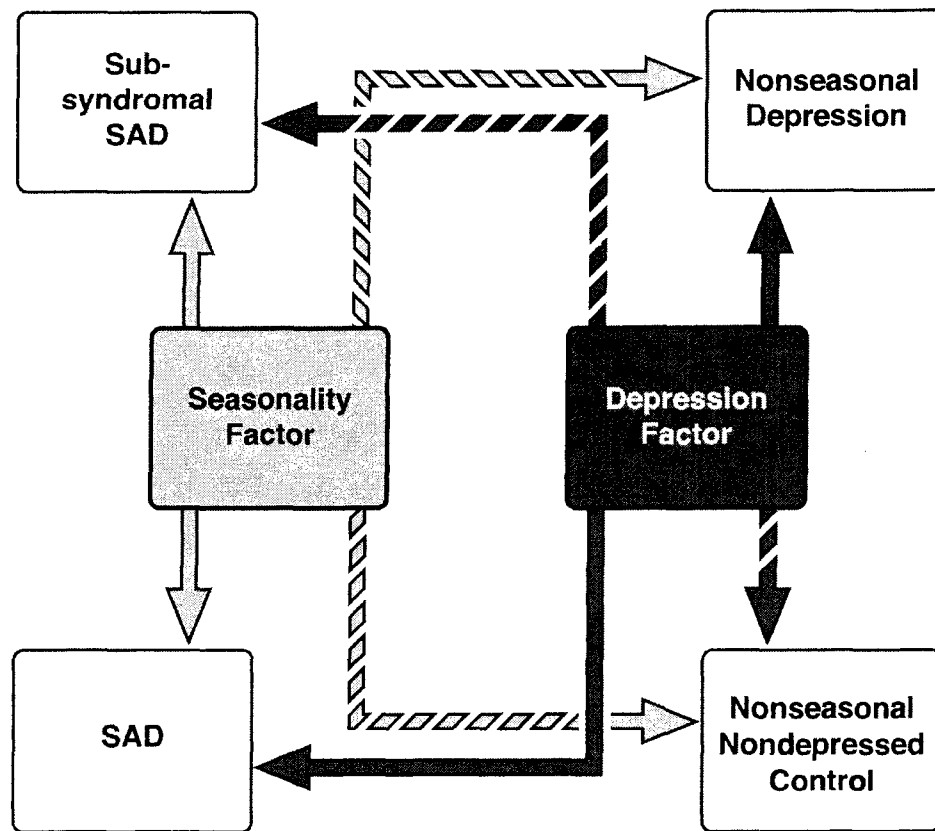


Figure 1. Diagram showing the Dual Vulnerability Hypothesis (Lam et al., 2001; Young et al., 1991). Seasonal affective disorder (SAD), nonseasonal depression, sub-syndromal SAD, and nonseasonal nondepressed controls are defined by different loadings on the seasonality and depression dimensions. Dark lines represent high loadings; dotted lines represent low loadings.

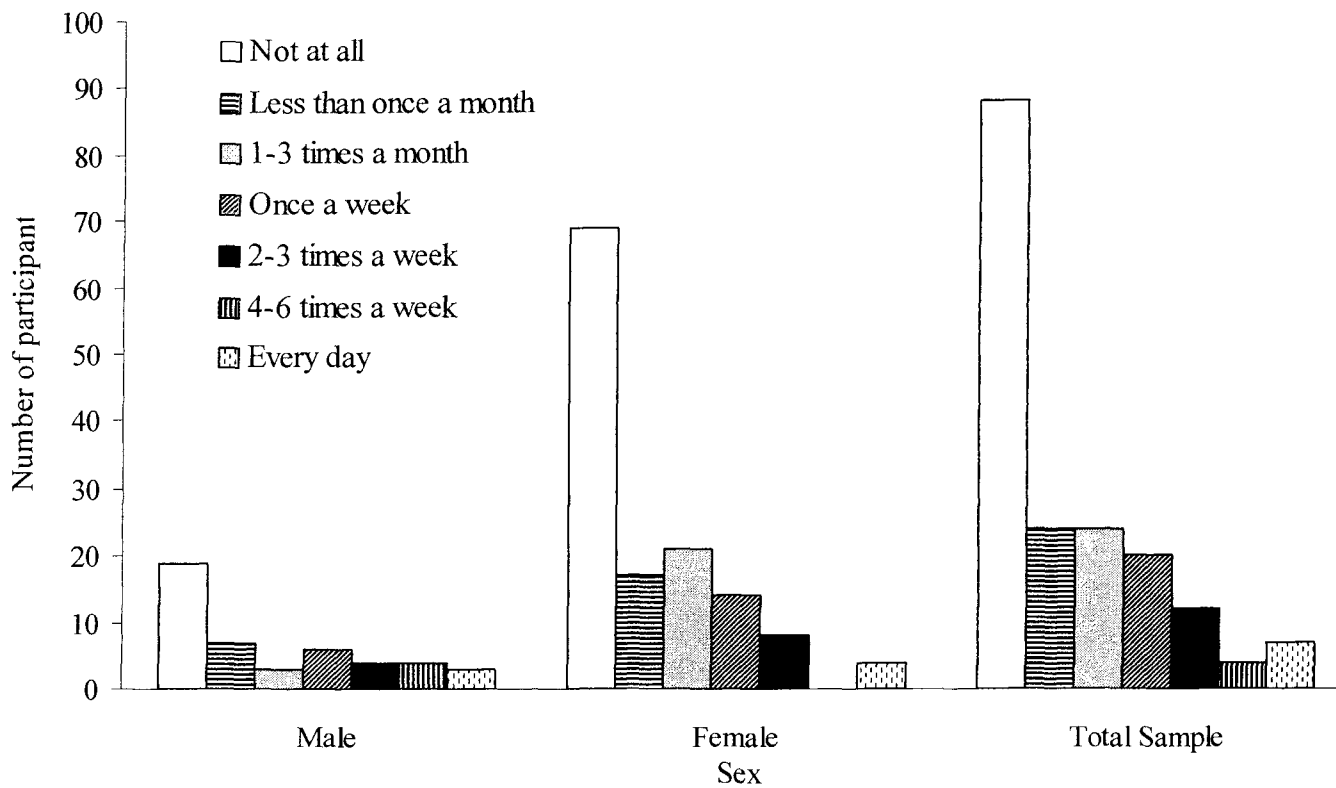


Figure 2. Number of participants who engaged in different frequency levels of low-intensity team activities by Sex and in the total sample.

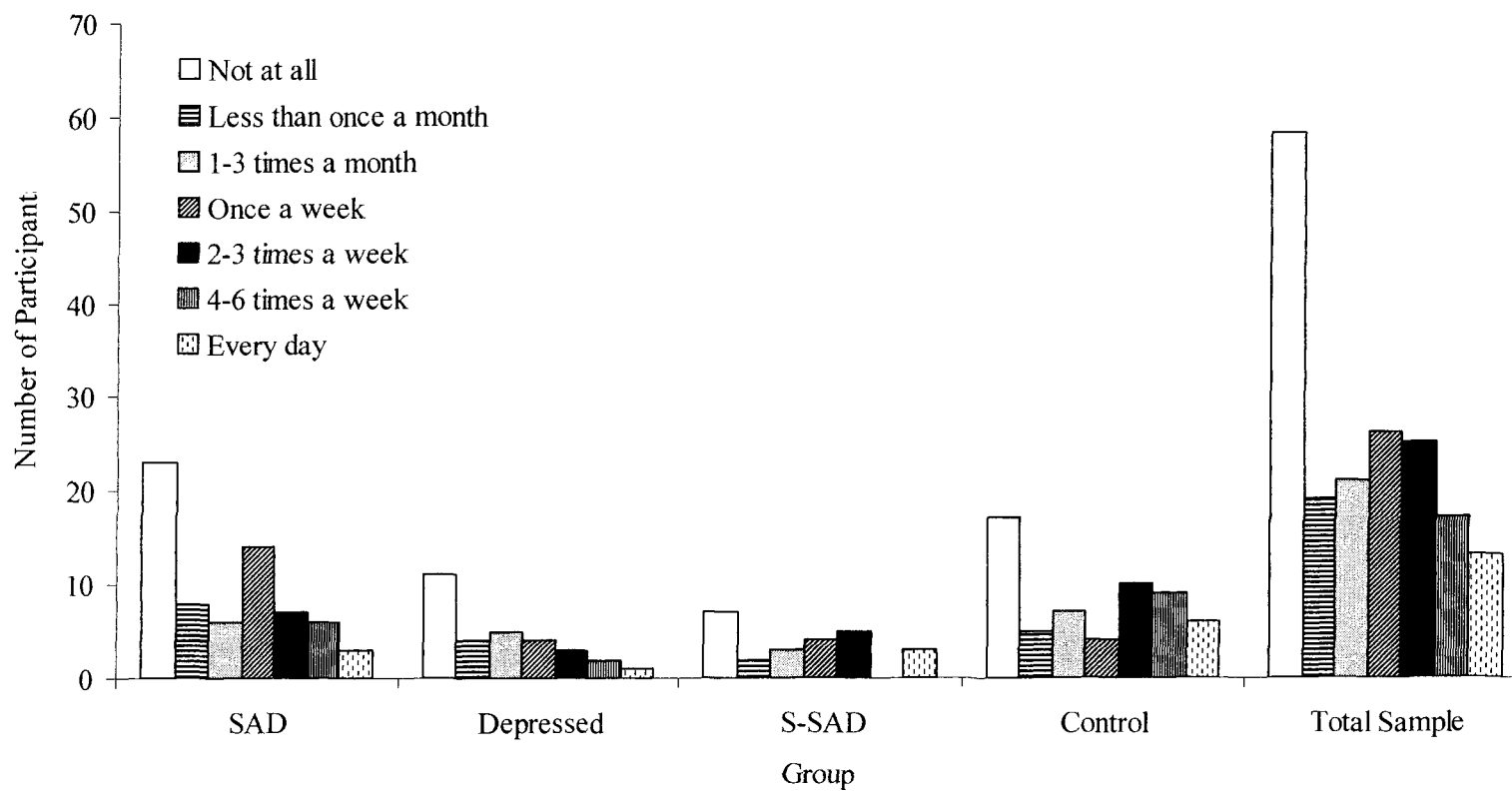


Figure 3. Number of participants who engaged in different frequency levels of high-intensity individual activities by Group and in the total sample.

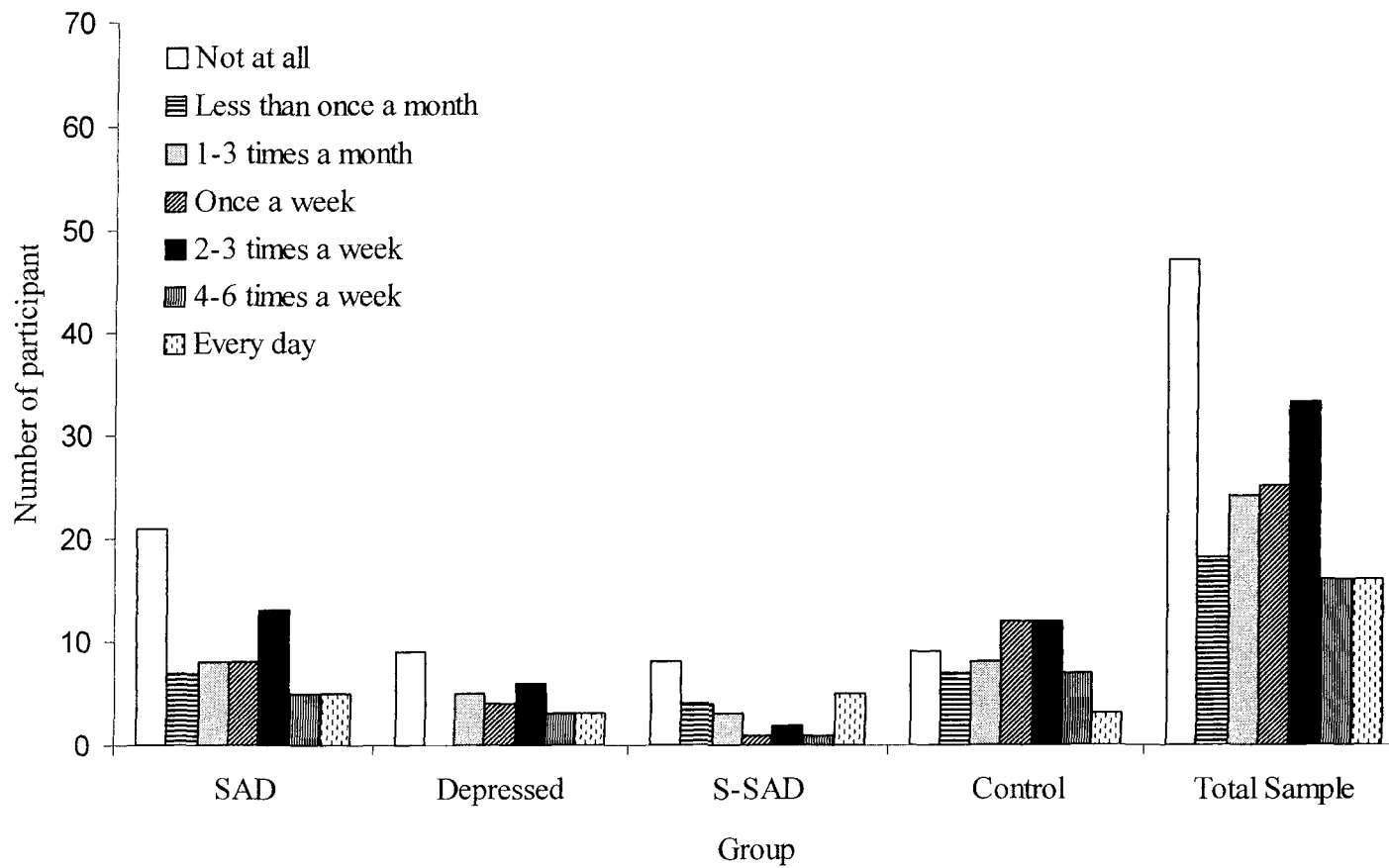


Figure 4. Number of participants who engaged in different frequency levels of medium-intensity individual activities by Group and in the total sample.

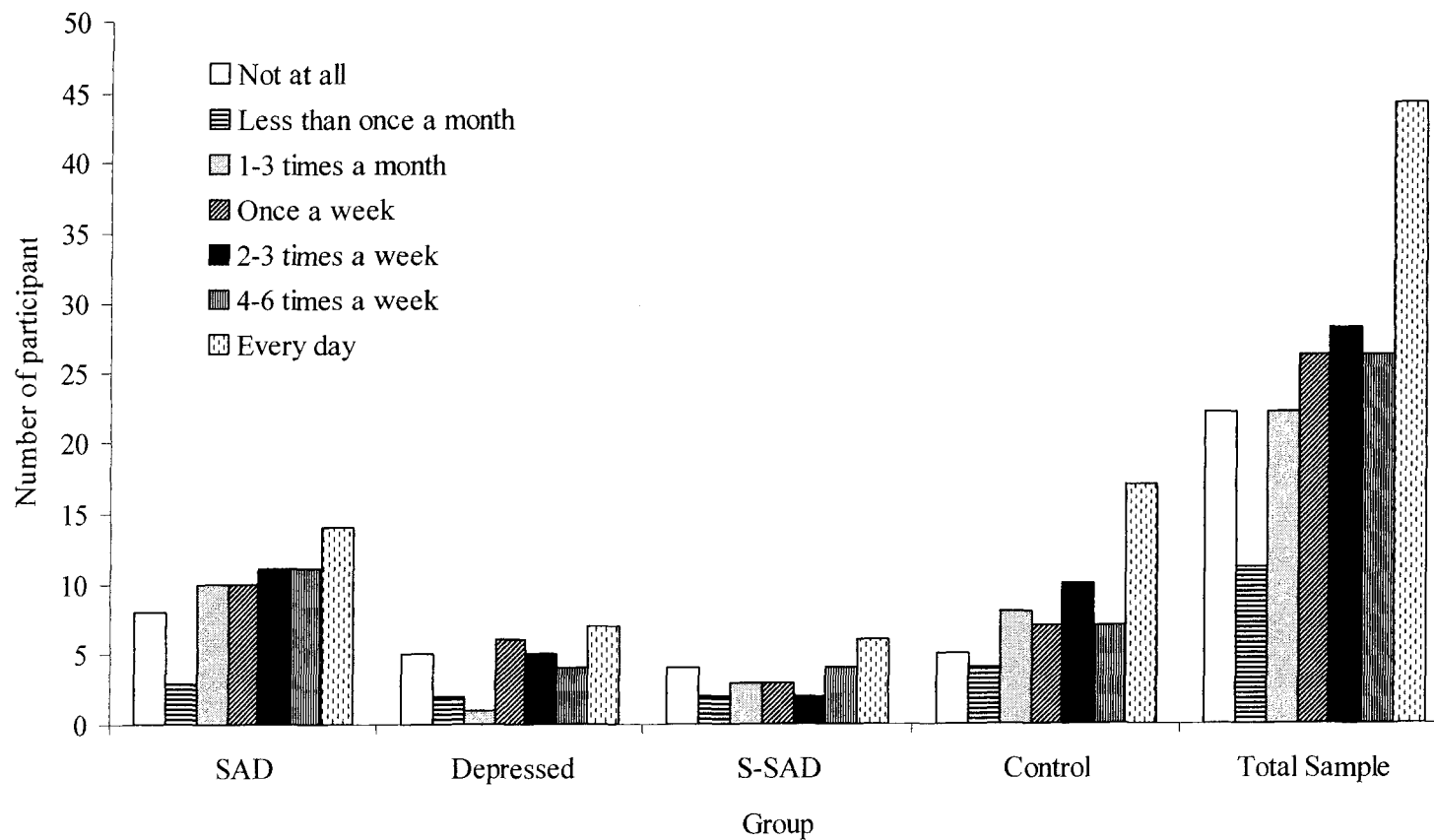


Figure 5. Number of participants who engaged in different frequency levels of low-intensity individual activities by Group and in the total sample.

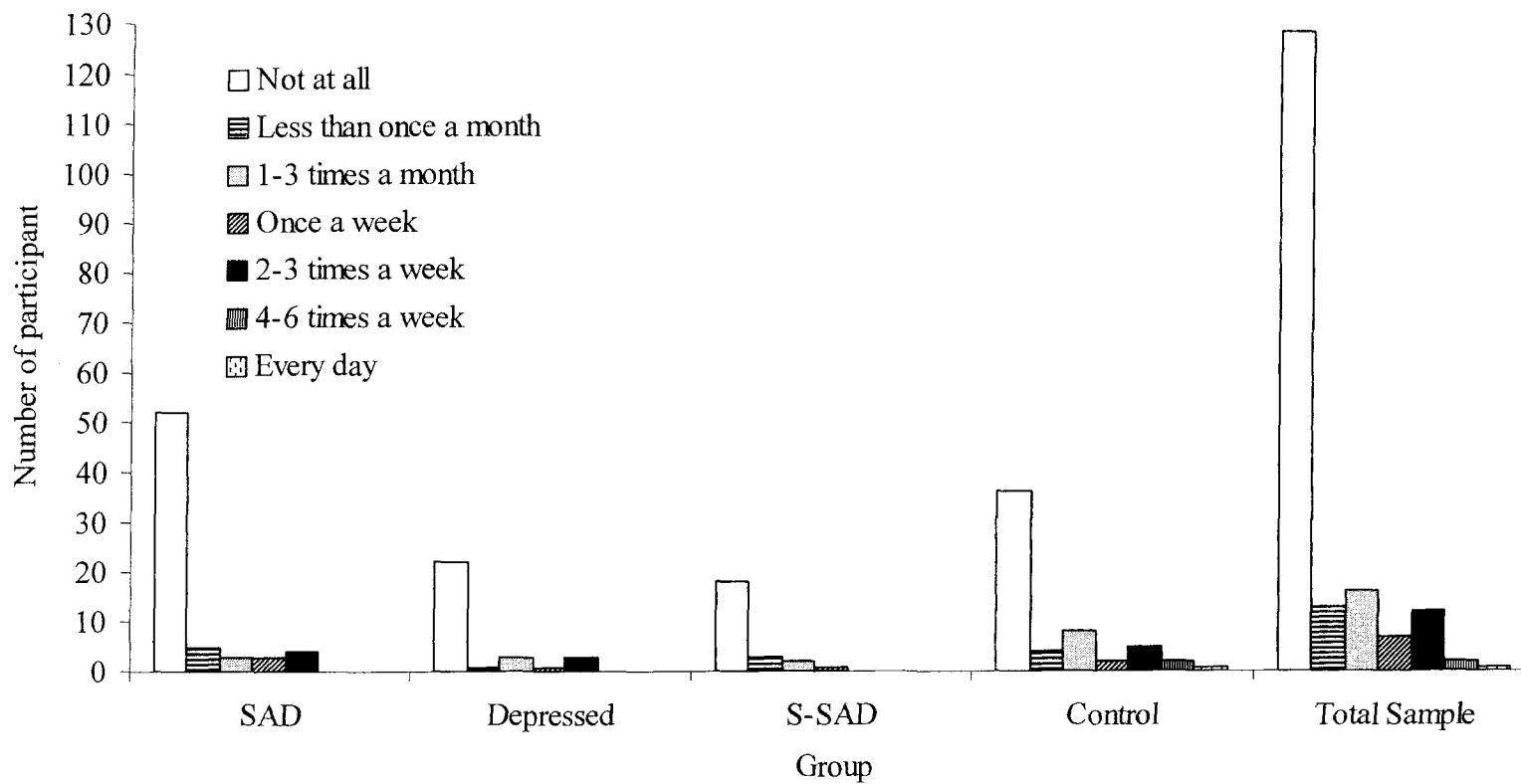


Figure 6. Number of participants who engaged in different frequency levels of high-intensity team activities by Group and in the total sample.



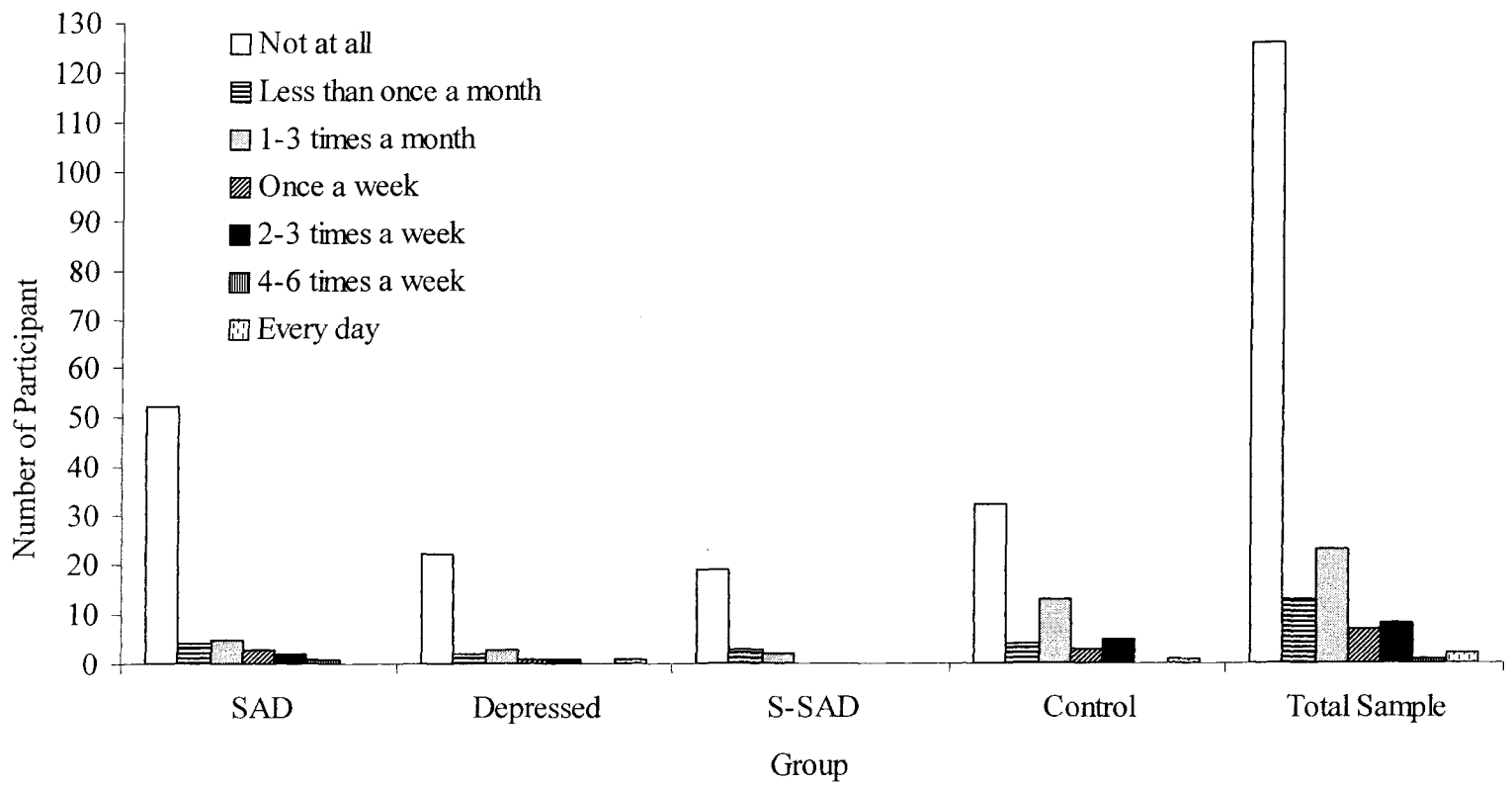


Figure 7. Number of participants who engaged in different frequency levels of medium-intensity team activities by Group and in the total sample.

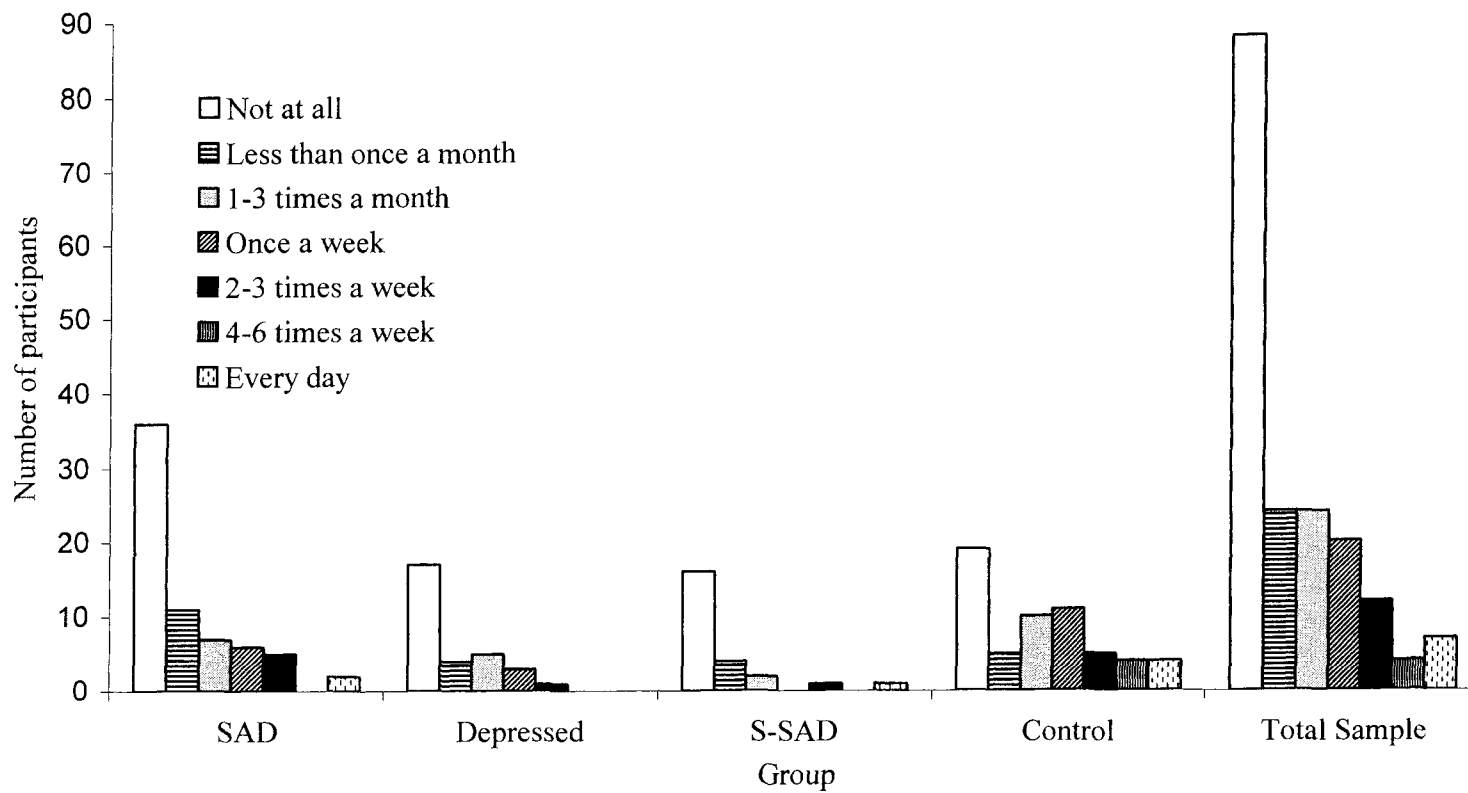


Figure 8. Number of participants who engaged in different frequency levels of low-intensity team activities by Group and in the total sample.

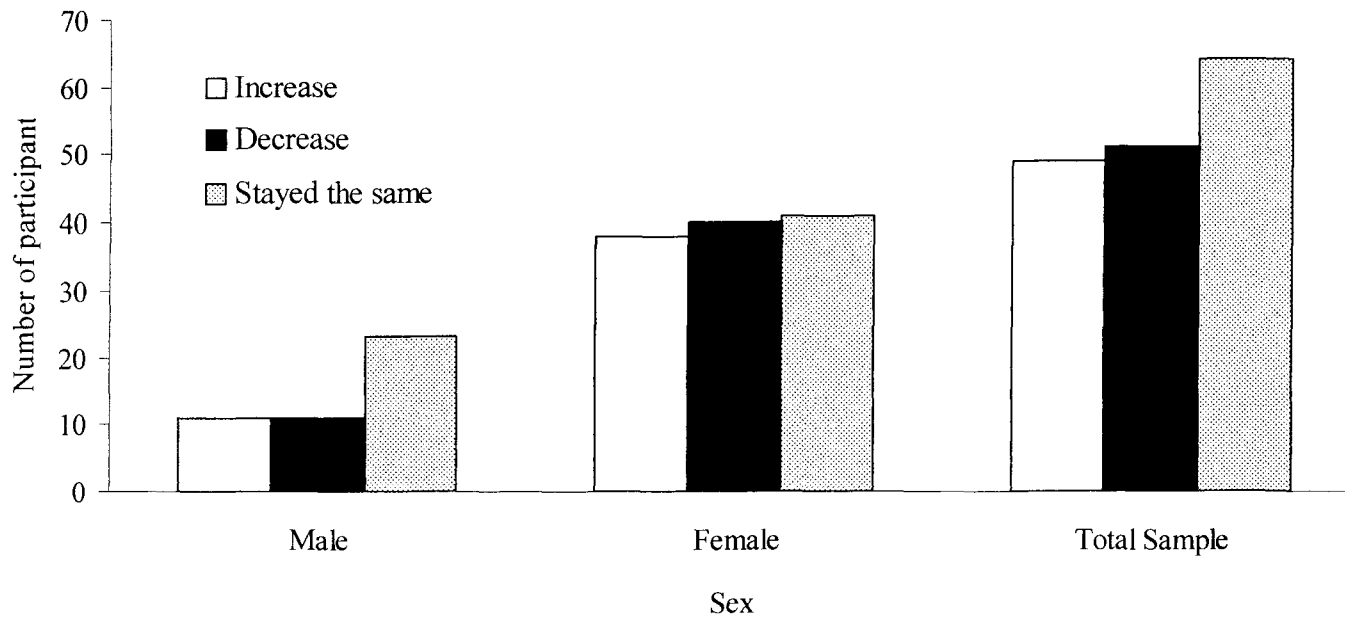


Figure 9. Number of participants who had a change in high-intensity physical activity levels over the past year by Sex and total sample.

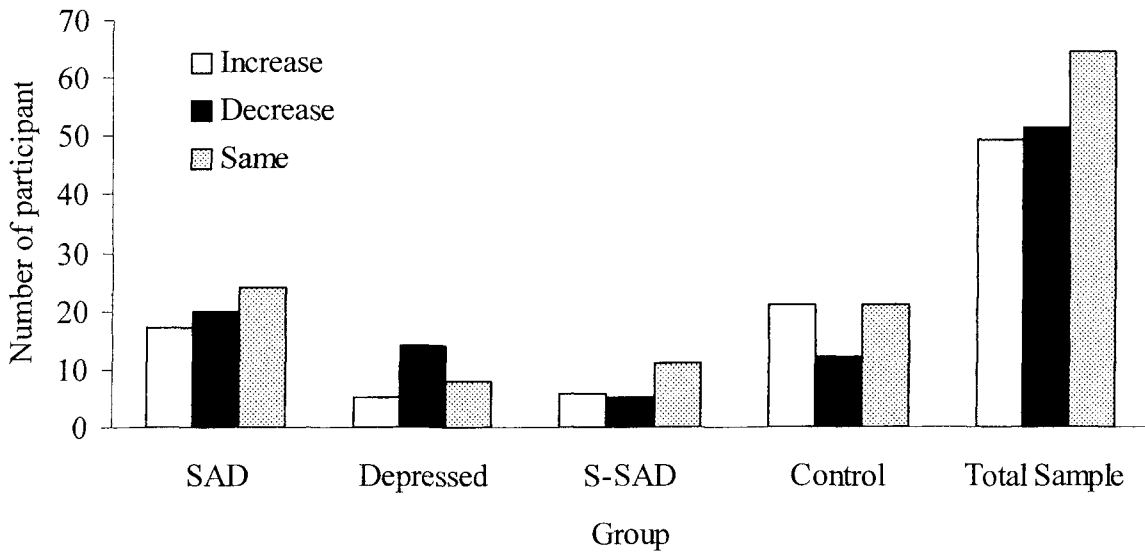


Figure 10. Number of participants who had a change in high-intensity individual physical activity levels over the past year by Group and total sample.

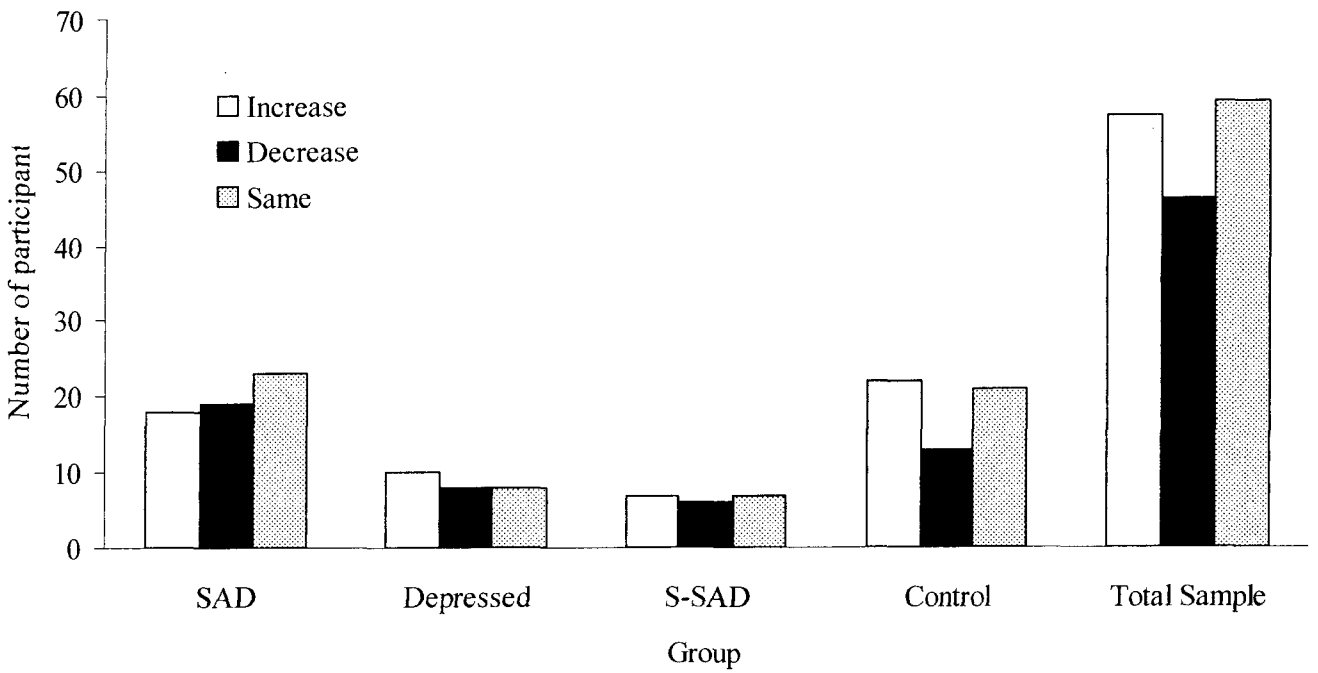


Figure 11. Number of participants who had a change in medium-intensity individual physical activity levels over the past year by Group and total sample

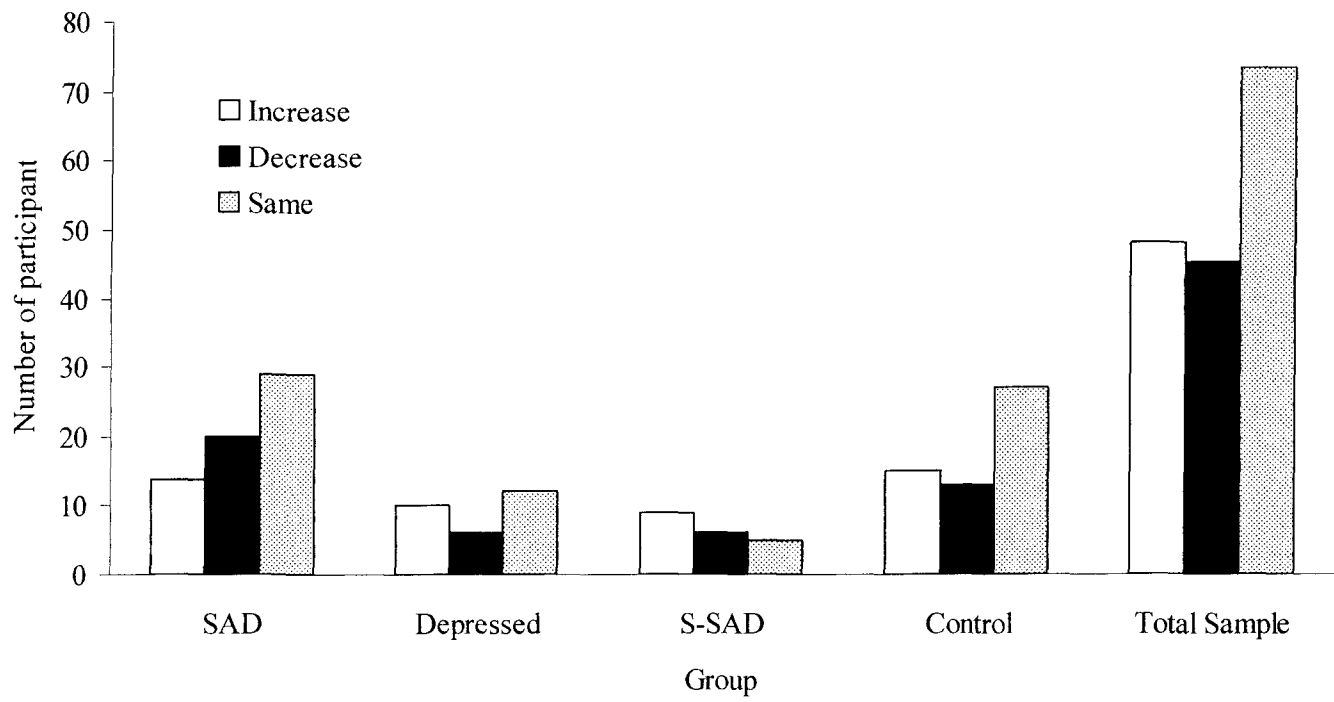


Figure 12. Number of participants who had a change in low-intensity individual physical activity levels over the past year by Group and total sample

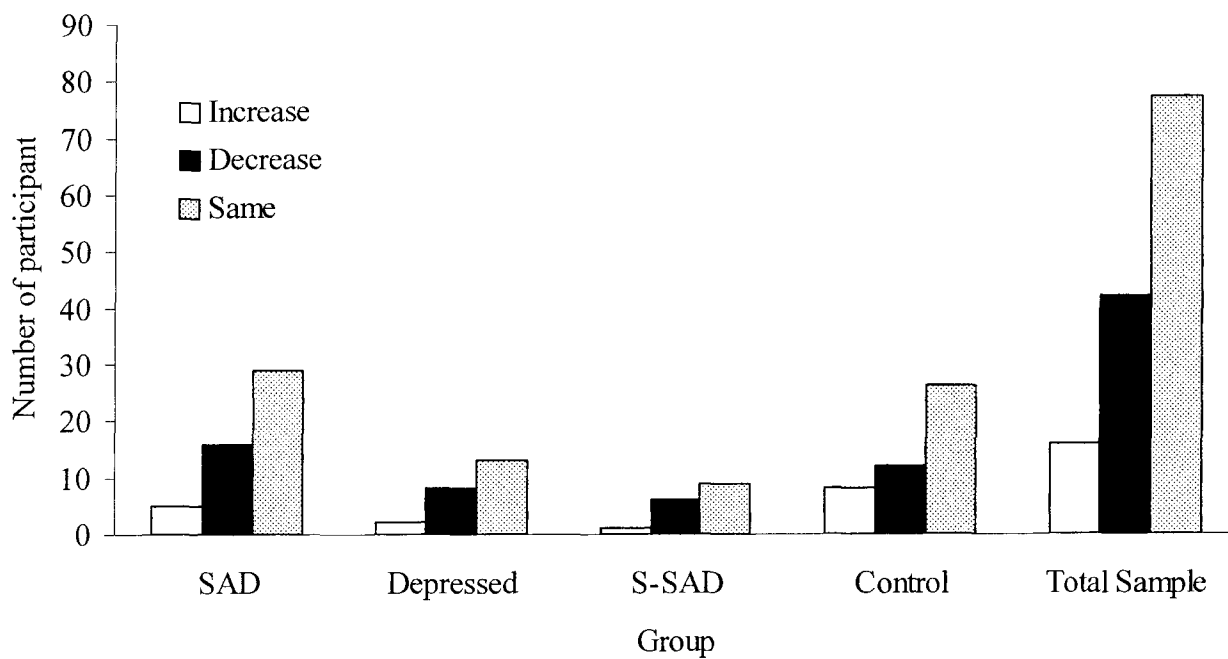


Figure 13. Number of participants who had a change in high-intensity team physical activity levels over the past year by Group and total sample

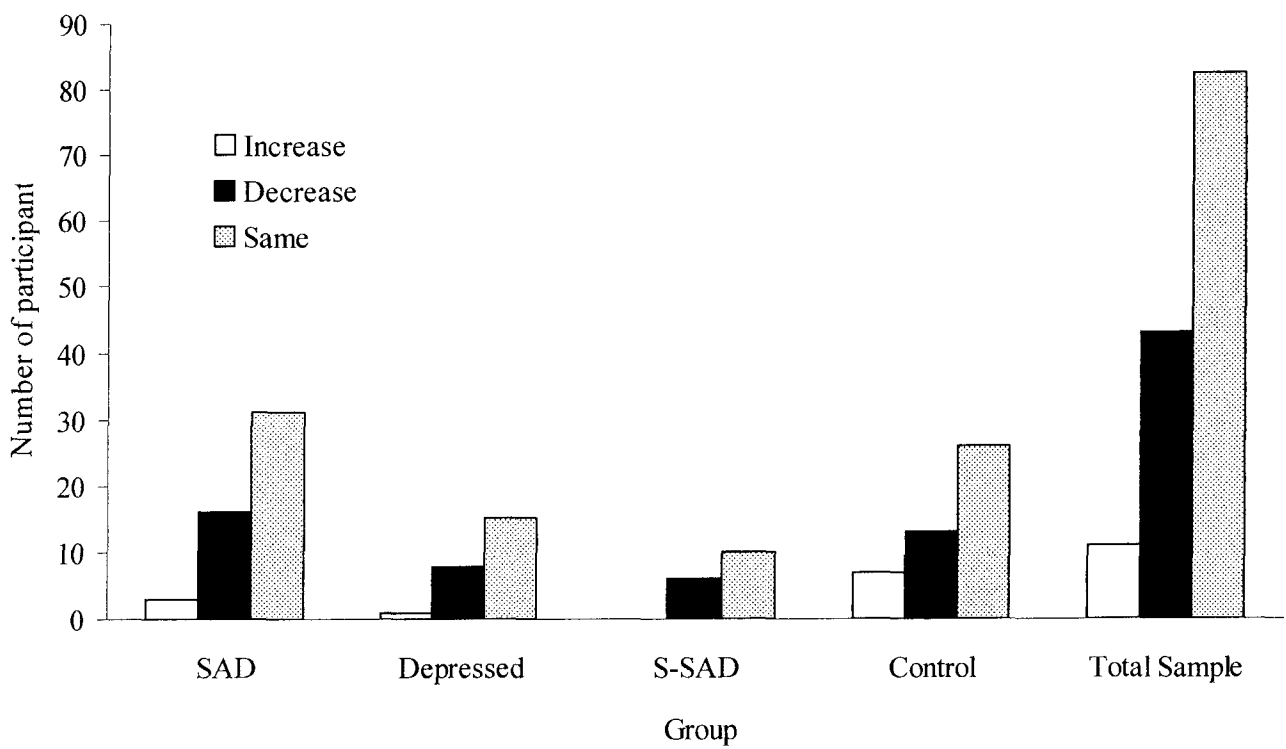


Figure 14. Number of participants who had a change in medium-intensity team physical activity levels over the past year by Group and total sample.



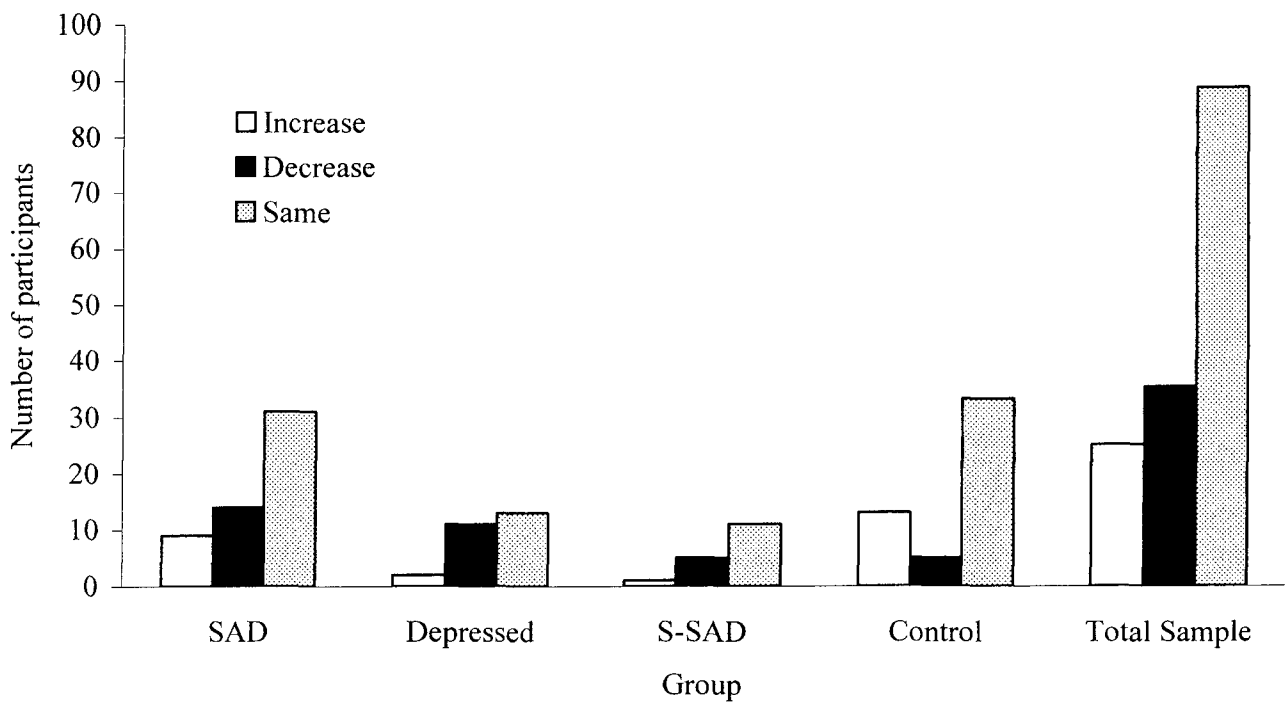


Figure 15. Number of participants who had a change in low-intensity team physical activity levels over the past year by Group and total sample