Attentional and Psychophysiological Responses to Seasonal and Eating Stimuli in Seasonal Depression and Disordered Eating

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Abstract

Research indicates similarities in clinical presentation between seasonal depression and bulimia nervosa with respect to disordered eating symptoms such as overeating, carbohydrate craving, weight gain and seasonal pattern wherein more severe symptoms are reported during the winter. Despite the overlap, there has been no research on the specific cognitive profiles and schemas of each psychological disturbance that might help to distinguish the two conditions. This study examines the cognitive profile and psychophysiological reactions of individuals with seasonal depression symptoms, those with disordered eating, and healthy controls through the use of a modified Stroop task, an incidental recall task, and facial electromyographic (EMG) recording during an image viewing task. Results showed that those with seasonal depression symptoms were distinguished from healthy controls on the basis of higher *zygomaticus major* peak amplitude when viewing images of food. All three groups rated the summer images and binge food images more positively. Supplementary regression analyses were run on the entire dataset to examine the extent to which seasonality, typical depression symptoms, atypical depression symptoms, and the presence/absence of disordered eating symptoms might predict performance on the experimental tasks. Higher atypical depression symptoms were associated with more nonresponses for non-binge food words on the modified Stroop task as well as higher *zygomaticus major* peak amplitude when viewing images of binge foods, non-binge foods, and winter scenes. The presence of disordered eating was also associated with higher *zygomaticus major* peak amplitude when viewing winter scenes. In conclusion, the study did not find support for the position that there might be different cognitive profiles for seasonal depression and disordered eating. The findings are discussed within the context of the strengths and limitations of the study.

Keywords: seasonal depression, disordered eating, attentional bias, facial electromyography

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It is undeniable that the changing of seasons has a profound impact on everyday life. For instance, the type of clothing worn, activities engaged in, and foods that are consumed can all vary depending on what the current season is. Furthermore, mood and behaviour have been known to fluctuate as a function of season. In fact, the results of a U.S. survey study by Kasper, Wehr, Bartko, Gaist, and Rosenthal (1989) revealed that 92% of respondents reported varying degrees of changes in mood and behaviour over the different seasons. However, while seasonal changes are not uncommon, they are described as problematic by only a subset of individuals. Rosenthal et al. (1984) were the first researchers to study a population of individuals who experienced recurrent depressive episodes that coincided with a particular season. Labeled as Seasonal Affective Disorder (SAD), Rosenthal et al. (1984) stated that the defining feature in SAD patients was their "apparent sensitivity to changes in season and latitude and the approximately annual occurrence of their affective episodes" (p.77).

Currently, SAD is conceptualized in the DSM-IV-TR as a seasonal pattern specifier that can be applied to a pattern of Major Depressive Episodes occurring in any one of the following mood disorders: Bipolar I Disorder, Bipolar II Disorder, or Major Depressive Disorder, Recurrent (American Psychiatric Association, 2000). In order to meet the criteria for a seasonal pattern specifier, the episodes of depression must occur and remit at roughly the same time each year, with the pattern being experienced for a minimum of two years. Furthermore, it must be established that the occurrence of this pattern is not solely due to any type of seasonal stressor being experienced by the individual, such as the anniversary of a loved one's death. Finally, it must be established that the number of seasonal Major Depressive Episodes experienced by the

individual in his/her lifetime substantially outnumbers that of nonseasonal episodes (American Psychiatric Association, 2000).

Individuals who meet the criteria for SAD can be distinguished on the basis of the season that is associated with their functional impairment. The majority of cases tend to be classified as 'winter types', meaning that depressive symptoms are present in the fall and winter months and remit during the spring and summer (Rosenthal et al., 1984). Typically individuals with winter SAD experience an onset of depressive symptoms by October, which peak in January and February and then begin to subside in March (Kasper, Wehr et al., 1989). A much smaller subset of individuals are classified as 'summer types' (Wehr, Sack, & Rosenthal, 1987). These individuals report impairment throughout the summer months and are characterized by a decrease in appetite and sleep length (Wehr et al., 1991). The occurrence of winter depressive episodes is much more prevalent, with Kasper, Wehr et al. (1989) reporting a ratio of 4.5:1 in the occurrence of winter SAD types compared to summer SAD. Winter SAD is of interest for this literature review in particular and therefore for the remainder of this paper the term SAD will be used to denote winter SAD.

While not a part of the diagnostic criteria, there are a number of associated symptoms that are typically experienced by those with SAD. The presence of these symptoms is generally referred to as 'seasonality' (Kasper, Wehr et al., 1989). This label is used to describe the seasonal changes in mood, energy, sleep, appetite, food preference, and socialization patterns experienced by those with SAD. While it is true that these same areas of functioning are affected in individuals with nonseasonal depression, what is characteristic of SAD is the atypical nature of these vegetative-somatic symptoms. The symptoms that are typical of nonseasonal depression include weight loss (Michalak, Wilkinson, Hood, & Dowrick, 2002), early morning waking and

reduced appetite (Golden, Dalgleish, & Spinks, 2006). Due to the fact that SAD shows the reverse pattern with an increase in sleep, lethargy, carbohydrate craving, and weight gain, the term 'atypical' is used to describe the symptoms observed in SAD (Rosenthal et al., 1984).

Kasper, Rogers et al. (1989) have speculated that to view seasonality as a categorical construct whereby individuals are classified as either SAD or healthy is inaccurate and risks failing to identify a third group of individuals who experience seasonal fluctuations but whose functioning are not significantly impaired. The authors suggest that a dimensional approach should be applied to seasonality, whereby individuals are classified across a continuum that ranges from SAD to 'normal' individuals who do not experience significant changes in functioning across seasons. Research has shown that a large percentage of individuals experience seasonal fluctuations that are not severe enough to warrant the clinical diagnosis of SAD. Kasper, Rogers et al. (1989) use the term sub-syndromal SAD (S-SAD) to describe this population, who on the seasonality continuum, would fall in between the two extremes of SAD and 'normal' individuals. S-SAD individuals tend to be characterized by the high degree of seasonality seen in SAD but display core symptoms of depression such as anxiety and suicidal ideation to a much lesser degree (Lam, Tam, Yatham, Shiah, & Zis, 2001).

Prevalence Rates

Over the years, a substantial amount of epidemiological studies regarding SAD have been conducted (Agumadu et al., 2004; Elbi et al., 2002; Imai, Kayukawa, Ohta, Li, & Nakagawa, 2003; Kasper, Wehr et al., 1989; Magnusson, 2000; Magnusson & Stefansson, 1993; McConville, McQuaid, McCartney, & Gilmore, 2002; Michalak, Wilkinson, Dowrick, & Wilkinson, 2001; Rastad, Sjödén, & Ulfberg, 2005). However, in spite of this abundance of research, a common prevalence rate that is agreed upon by all researchers is yet to be

determined. Magnusson (2000) reviewed the results of 20 epidemiological studies on SAD and found an array of prevalence rates that ranged from 0% to 9.7%. From this review, the author surmised that the occurrence of SAD varies across geographical location and latitude, as well as gender and age (Magnusson, 2000). A telephone epidemiological survey conducted in Montgomery County, Maryland produced prevalence rates of 4.3% for SAD and 13.5% for S-SAD (Kasper, Wehr et al., 1989) while another U.S. study looking at prevalence rates in African American college students in Washington, D.C. yielded estimates of 5.4% for SAD and 9.5% for S-SAD (Agumadu et al., 2004). Prevalence rates in Iceland are somewhat lower than in the U.S., with SAD occurring in an estimated 3.8% of the general population and S-SAD in 7.5% (Magnusson & Stefansson, 1993). The first epidemiological study carried out in Japan yielded even lower figures, with SAD and S-SAD rates respectively estimated at 0.91% and 2.21% for high school students, and 0.45% and 1.16% for an adult population (Imai et al., 2003). In Turkey, a total of eight community-based samples across four latitudes were assessed to determine the prevalence of SAD and S-SAD, and estimates of 4.86% and 8.35%, respectively were produced (Elbi et al., 2002). In the United Kingdom, the findings of a study by Michalak and colleagues (2001) suggest that winter SAD occurs in 2.4% of the population whereas McConville et al. (2002) indicate a much higher prevalence rate of 6.7%. Finally, very high prevalence rates have been reported in Sweden, with SAD and S-SAD occurring in an estimated 8% and 10.8% of the general population, respectively (Rastad et al., 2005).

A possible explanation for these differing prevalence rates lies in the methodology used to identify SAD. The majority of epidemiological studies have made use of the Seasonal Pattern Assessment Questionnaire (SPAQ; Rosenthal, Bradt, & Wehr, 1987), a retrospective self-report measure designed as a screening tool for SAD. The widespread use of the SPAQ across

epidemiological studies is useful as it allows for a comparison of findings across studies. However, a reliance on the SPAQ has been identified as a limitation of prevalence studies as it is not intended to be used in the identification and diagnosis of SAD, but rather to simply detect seasonal changes in mood and behaviour. One major criticism of the SPAQ is that it has low specificity, which subsequently results in an overinflation of SAD caseness (Levitt, Boyle, Joffe, & Baumal, 2000; Thompson, Thompson, & Smith, 2004).

In the first Canadian epidemiological study of SAD, Levitt and colleagues (2000) accessed a community-based sample by telephone to determine the prevalence of SAD in Ontario as well as to compare rates yielded from the SPAQ with those figures obtained from a structured clinical interview. The structured clinical interview was based on the DSM-III-R criteria for depression combined with items from the SPAQ to assess seasonality. Findings showed that the SPAQ did in fact yield higher prevalence rates of SAD (5.0%) compared to structured clinical interview (2.9%; Levitt et al., 2000). Similarly, results of a study by Magnusson (1996) suggest that the SPAQ may over-identify cases of SAD, given that it resulted in higher prevalence rates than a structured clinical interview. Nayyar and Cochrane (1996) compared SAD prevalence rates yielded by prospective measures with those from the retrospective SPAQ and found significant differences between the data, with a higher proportion of SAD cases being identified by the SPAQ. In an attempt to validate a more recent assessment measure, the Seasonal Health Questionnaire (SHQ; Thompson & Cowan, 2001), Thompson and colleagues (2004) administered the SHQ and the SPAQ to all participants and then followed up with a structured clinical interview for DSM-III-R for a randomly selected subset of the sample. Prevalence rates for both measures were calculated and compared, with the findings revealing that the SHQ yielded a significantly lower prevalence rate for SAD (5.6%) than did the SPAQ

(10.7%). However, a common prevalence rate is still not agreed upon when measures other than the SPAQ are used, suggesting that there are other variables besides methodology that may be responsible for the wide range of prevalence rates obtained across studies.

It has been proposed that light plays a fundamental role in the development and maintenance of SAD (Rosenthal et al., 1984). Therefore, one explanation for why individuals become depressed in the wintertime can be attributed to the fact that the days are shorter and the amount of sunlight exposure is reduced. Because sunlight reduction during the winter is more extreme in the North, it has been theorized that populations situated in higher northern latitudes will have elevated prevalence rates of SAD (Rosen et al., 1990). In one of the first studies to test this latitude hypothesis, Rosen and colleagues (1990) collected data from populations who resided at four different locations in the United States. Findings showed that SAD and S-SAD occurred more frequently at higher latitudes, lending support to this hypothesis and offering a possible explanation for why prevalence rates vary so drastically across countries (Rosen et al., 1990).

However, the latitude hypothesis is not without its critics and its validity has been questioned by a number of researchers (Elbi et al., 2002; Magnusson & Stefansson, 1993; Mersch, Middendorp, Bouhuys, Beersma, & van den Hoofdakker, 1999). The latitude hypothesis posits that a positive correlation exists between latitude and the occurrence of SAD. However, in an epidemiological study of SAD done in Iceland, Magnusson and Stefansson (1993) found that of the general population, 3.8% could be classified as SAD and 7.5% as S-SAD, rates that are considerably lower than all four U.S. prevalence rates obtained by Rosen et al. (1990). This finding can be seen as a counterargument to the latitude hypothesis, given the fact that Iceland is situated at a higher latitude than all four U.S. locations that Rosen and colleagues (1990)

assessed. Elbi and colleagues (2002) assessed a total of eight groups in Turkey who resided in four regions located across different latitudes. The researchers failed to find a significant correlation between prevalence of SAD and latitude (Elbi et al., 2002). However, they noted that the four regions were separated only by a 5˚ difference in latitude and cautioned that this difference may not be large enough to have any bearing on the occurrence of SAD. Mersch and colleagues (1999) conducted a review of the available research on SAD and latitude in an attempt to resolve some of the ambiguity surrounding this relationship. The authors found that overall the relationship between latitude and prevalence was not significant. However, this was not the case when the studies were divided according to region (North America, Europe, or other country). In fact, analysis of the findings of the North American studies yielded a significant positive correlation between latitude and prevalence, and the studies done in Europe were characterized by a trend in the same direction. In summary, one can conclude that it appears that a relationship does exist between latitude and prevalence. However, this relationship is relatively weak and it is likely that a number of additional variables influence the occurrence of SAD (Mersch et al., 1999).

Although prevalence studies have yielded inconsistencies, the literature demonstrates a more stable picture of the relationship between SAD and gender. A vast amount of research exists showing that unipolar depression is more frequently diagnosed in women than in men (Nolen-Hoecksema, 1987). Similarly, SAD has been found to occur more frequently in women, with studies reporting female to male ratios that range from 2.7:1 to 9:1 (Kasper, Wehr et al., 1989; Lee & Chan, 1998; Lucht & Kasper, 1999; Rosenthal et al., 1984; Thompson & Isaacs, 1988; Wirz-Justice et al., 1986). Additionally, research shows that women tend to report more extreme seasonal changes in mood, sleep, appetite, weight, energy levels and socialization

patterns, as indicated by higher Global Seasonality Scores (GSS) on the SPAQ compared to men (Agumadu et al., 2004; Bartko & Kasper, 1989; Kasper, Wehr et al., 1989; Magnusson & Stefansson, 1993; Perry, Silvera, Rosenvinge, Neilands, & Holte, 2001). Other studies have found no sex differences with regards to prevalence rates (Imai et al., 2003), degree of seasonality, and the symptom profiles of men and women (Lucht & Kasper, 1999). However, a trend emerged that suggested that during fall and winter months women were more likely to report an increase in eating as well as a change in foods being consumed, such as an increase in carbohydrate craving (Lucht & Kasper, 1999). Additionally, the role that age plays in the occurrence of SAD has been investigated with higher rates of SAD being found to occur in younger individuals (Bartko & Kasper, 1989; Imai et al., 2003; Magnusson & Stefansson, 1993). Therefore, it appears that a certain subset of individuals may be more vulnerable to SAD, with Kasper, Wehr and colleagues (1989) finding a significant negative correlation between age and GSS for women only; women in the 21- to 40-year age group were found to have the highest GSS and after the age of 40 this score decreased significantly.

Etiology of SAD

A number of theories have been generated to explain the occurrence of SAD, but a single explanation is yet to be determined. However, although a single cause of SAD is unknown, there is an abundance of research that indicates that light therapy is an effective treatment choice for this population. The following section will discuss treatment in greater detail, but given that the majority of etiology theories acknowledge the role of light in SAD, it will also be mentioned in this section. The general consensus across the literature is that a change in sunlight exposure plays a major role in the development of SAD (Hawkins, 1992; Lewy, Lefler, Emens, & Bauer, 2006; Rosenthal et al., 1984). The photoperiod hypothesis is based on the premise that a

reduction of sunlight throughout the fall and winter months causes seasonal mood changes. This can also be tied into the latitude hypothesis, as discussed earlier, which theorizes that individuals who reside in higher northern latitudes will experience more seasonal mood changes due to the fact that they experience the shortest days and the most extreme reduction in daylight exposure (Rosen et al., 1990). However, as previously mentioned, the research concerning this hypothesis has yielded conflicting results, suggesting that additional factors are involved in the development of SAD. Consequently, a number of biological models of SAD have been formulated, which hypothesize that the decrease in sunlight interacts with an underlying biological mechanism to produce SAD.

One factor that has been investigated is the hormone melatonin and the role it might play in the occurrence of seasonal mood changes. Research concerning seasonal changes in animals has implicated melatonin secretion as playing a critical role (Lincoln, 1983). The melatonin hypothesis postulates that individuals with SAD are characterized by abnormal patterns of melatonin secretion (Dalgleish, Rosen, & Marks, 1996). A significant amount of research has measured the level of melatonin secreted in SAD patients (Jacobsen, Sack, Wehr, Rogers, & Rosenthal, 1987; Partonen, Vakkuri, Lamberg-Allardt, & Lönnqvist, 1996) as well as changes in melatonin in response to phototherapy (Partonen et al., 1996; Wehr et al., 1986). Melatonin levels for SAD patients and healthy controls have been compared over a 24-hour period in the wintertime and no significant differences have been found. Furthermore, light therapy did not alter the levels of melatonin in either group (Partonen et al., 1996). The failure to find significant findings concerning the role of melatonin in SAD led Rosenthal and Wehr (1992, as cited in Dalgleish et al., 1996) to conclude that its role in the development of SAD and the efficacy of light therapy is not a crucial one.

Additional theories concerning the etiology of SAD are based on circadian rhythms. Exposure to light is known to play a key role in regulating an individual's internal patterns. Therefore, Lewy, Sack, Singer, White, and Hoban (1988) have proposed that the internal clock of SAD patients has been disrupted by the reduction of sunlight in the wintertime and is asynchronous with the external clock. This is known as the phase-delay hypothesis and it purports that individuals with seasonal changes can experience a reduction in symptoms by undergoing a phase-shift. One way to identify the circadian phase of an individual is to study the dim-light melatonin onset (DLMO), which is a measurement of the amount of melatonin secreted during the onset of dim-light exposure. Research has shown that compared to controls the DLMO in SAD individuals is phase delayed (Lewy, Sack, Miller, & Hoban, 1987). This phase delay can be corrected through the administration of accurately timed light exposure, which results in a phase-shift (Lewy et al., 1987). Specifically, morning exposure to bright light should be superior to evening exposure in correcting the delay, thus resulting in a phase-advance. In terms of the optimal exposure time of bright light, morning exposure has been found to be superior to evening exposure, thus lending support to the phase-delay hypothesis (Lewy et al., 1998). However, not all individuals with SAD are characterized by phase-delayed rhythms which suggests that there are additional active mechanisms that result in the development of SAD (Wirz-Justice et al., 1993).

The role of neurotransmitters in the etiology of SAD has also been investigated. Serotonin (5-hydroxytryptamine, 5-HT) levels in certain regions of the brain have been found to fluctuate across seasons, with human post-mortem studies showing that winter months result in the most extreme reduction of 5-HT in the hypothalamus (Carlsson, Svennerhom, & Winblad, 1980). Research also shows that carbohydrate intake subsequently increases levels of serotonin

(Wurtman, 1982, as cited in Hill, 1992) as well as causes individuals with SAD to experience an increase in energy level and activity, whereas healthy controls tend to report feeling more lethargic after consuming carbohydrate-rich meals (Rosenthal et al., 1989). These findings suggest that that SAD sufferers may be attempting to compensate for low levels of 5-HT by frequently snacking on carbohydrate-rich foods. Serotonin selective reuptake inhibitors (SSRIs) work by increasing low levels of serotonin and have been found to be superior to placebo in alleviating winter depression symptoms (Moscovitch et al., 2004).

The last etiological theory of SAD to be discussed is the dual vulnerability hypothesis (DVH) proposed by Young, Watel, Lahmeyer, and Easton (1991). This theory proposes that the occurrence of SAD is the product of a combination of psychological and physiological factors that interact with one another. It suggests that certain individuals have a physiological vulnerability that leads them to exhibit vegetative-somatic seasonal changes in sleeping and eating patterns as well as energy level. Additionally, these individuals have a second psychological vulnerability that is reflected in their response to the seasonal changes with cognitive and affective symptoms of depression (Young et al., 1991). In a review of the available literature on the validity of the DVH, Young (1999) states that the occurrence of seasonal patterns in somatic functioning has been more heavily researched than the second vulnerability, suggesting that the role of psychological factors in the development and maintenance of SAD requires more thorough investigation.

Lam and colleagues (2001) have since extended the DVH and state that individuals can be classified into four separate categories (SAD, nonseasonal depression, S-SAD, control), depending on how they load on two separate factors: seasonality and depression. SAD is characterized by loading on both factors where relatively higher loading on seasonality results in

SAD with complete summer remission and relatively higher loading on depression results in SAD with incomplete summer remission. Nonseasonal depression is characterized by a low vulnerability to seasonality coupled with a high vulnerability to depression, whereas S-SAD individuals show the reverse pattern: high seasonality, low depression. Lastly, healthy controls show low loadings on both factors.

Treatment for SAD

The general consensus across the literature is that phototherapy is "first-line therapeutic approach" (Rosenthal, 1993, p. 2719) for SAD and consequently it is the most widely used. In the first study concerning the effectiveness of light therapy for 11 SAD patients, Rosenthal and colleagues (1984) found that exposure to bright white light was successful in significantly reducing symptoms in all 11 subjects. To date, light therapy as a treatment for SAD has been studied in an excess of 70 controlled studies (Lam et al., 2006). The results of a meta-analysis done on randomized controlled studies of light therapy with mood disorders reveal that both bright light therapy (ES = .84) and dawn simulation (ES = .73) result in a significant reduction in symptoms which classifies them as efficacious treatment options for SAD (Golden et al., 2005). Additionally, bright light therapy produces significant treatment gains when administered to individuals with nonseasonal depression (ES = .53) but when prescribed as an adjunct treatment to pharmacotherapy, a significant reduction in symptoms of nonseasonal depression was not noted, suggesting that light therapy did not offer benefits above and beyond pharmacotherapy (Golden et al., 2005).

Clinical response has been observed within one week of receiving treatment (Lam et al., 2006) but there is evidence to suggest that light administration over four weeks results in the greatest symptom improvement and is preferable to shorter durations of treatment (Bauer, Kurtz,

Rubin, & Marcus, 1994). Across the literature, the use of bright white light is most common and has been found to be superior to dim yellow light (James, Wehr, Sack, Parry, & Rosenthal, 1985; Rosenthal et al., 1984). Bielski, Mayor, and Rice (1992) compared a predominantly green- and yellow-band white fluorescent light with a "full spectrum" light that mimics the spectrum of sunlight and concluded that both are viable treatment options. More recently the use of different wavelengths has been studied, with the effects of blue narrow-band light surpassing those of dim red light exposure (Glickman, Byrne, Pineda, Hauck, & Brainard, 2006).

Some ambiguity exists surrounding the optimal time for light exposure. According to Lewy and colleagues (1987), light therapy works by correcting a phase-delay that is characteristic of SAD. If that is the case, then one would expect that in order to produce a reduction in symptoms, the light exposure must be administered in the morning (Lewy et al., 1987). In support of this hypothesis, a number of studies have found that morning exposure is superior to evening exposure (Lewy et al., 1987; Terman et al., 1989). However, there are also research findings that suggest that evening exposure to bright light is equally as effective as morning exposure (Hellekson, Kline, & Rosenthal, 1986; James et al., 1985; Yerevanian, Anderson, & Grota, 1986). In an attempt to clarify these discrepant findings, Avery and colleagues (1990) reviewed a number of studies on light therapy and concluded that the dissimilar findings may be accounted for by differences in methodology. The authors cautioned that not one study has found evening exposure to be superior to morning exposure and concluded that morning exposure to bright light is the preferred treatment option (Avery et al., 1990).

Terman, Amira, Terman, and Ross (1996) administered phototherapy to a group of individuals with SAD with the goal of determining which patient characteristics were predictive of response to light treatment. The authors found that responders and nonresponders to light

therapy could be discriminated on the basis of their symptom profile. Those who experienced a large number of atypical symptoms were found to respond best to bright light exposure, whereas those individuals who benefited least were characterized by the typical melancholic symptoms of depression including guilt, loss of appetite, insomnia, anxiety, and suicidality (Terman et al., 1996). Therefore, one could expect that S-SAD might have the highest response rates to phototherapy, given that they are characterized predominantly by atypical symptoms coupled with few depressive symptoms. In fact, Kasper, Rogers et al. (1989) found that compared to controls, S-SAD had high success rates with bright light exposure. On an ending note, it should be recognized that phototherapy is associated with a few limitations. Certain symptom profiles may be unresponsive to this approach, including individuals who present more of the typical melancholic symptoms of depression (Terman et al., 1996) and a very small subset of individuals may experience undesirable side effects such as headaches, nausea, and feeling jittery (Terman & Terman, 1999). Additionally, some patients may find that to comply with this treatment is very time-consuming and difficult to fit into their daily routine. Finally, any symptom relief that it provides is not necessarily permanent. Symptoms tend to resurface once the treatment is discontinued (Hellekson et al., 1986; James et al., 1985; Rosenthal et al., 1984).

More recently, the use of antidepressant medication to treat SAD has been researched (Lam et al., 2006; Moscovitch et al., 2004). In a randomized, double-blind study, Moscovitch and colleagues (2004) found that following eight weeks of treatment the SSRI sertraline produced a significantly greater decrease in anxiety and depression scores compared to the placebo group. Lam and colleagues (2006) carried out the first randomized controlled trial to directly compare the efficacy of light therapy with the medication fluoxetine for the treatment of SAD and found that both methods were equally successful in significantly reducing SAD

symptoms. The effects of light therapy were more fast-acting than fluoxetine, and after one week of treatment the phototherapy condition demonstrated the most improvement in symptoms. However, other than the first week there were no differences in clinical response rates for the two conditions for the remainder of the trial, suggesting that both are viable treatment options (Lam et al., 2006). These findings are promising and suggest that treatment options are available for those individuals seeking help for SAD.

Recently, Rohan and colleagues (2007) conducted the first controlled trial to compare the efficacy of cognitive-behavioural therapy for SAD with light therapy. Participants were randomly assigned to receive no treatment (Control), CBT, light therapy, or a combination of the two over a six-week period. Results showed that the combination treatment of CBT and light therapy resulted in a clinically significant decrease in symptoms in 73% of subjects compared to only 20% of controls. A review of the efficacy of light therapy for SAD suggests that 22-50% of patients show significant clinical improvement with morning light exposure (Terman & Terman, 2005). Therefore, it appears that the combination of CBT and light therapy for SAD is a promising option that is in need of further investigation. Additionally, the findings of Rohan et al. (2007) can be interpreted as support for the DVH, which implicate both biological and psychological processes in SAD. Therefore, it seems logical that targeting both of these mechanisms in treatment would be most effective. However, the researchers cautioned that this is the first time the efficacy of psychotherapy for SAD has been investigated and concluded that further studies regarding this area are required (Rohan et al., 2007).

SAD and Disordered Eating

Depression is not the only affective disorder that exhibits seasonal fluctuations in mood and behaviour and to date a vast amount of research has focused on the presence of seasonal

variability in individuals with eating disorders (Blouin et al., 1992; Fornari et al., 1994; Ghadirian, Marini, Jabalpurwala, & Steiger, 1999; Lam et al., 1996; Levitan, Kaplan, & Rockert, 1996; Yamatsuji et al., 2003). SAD sufferers experience increased appetite, carbohydrate craving, and weight gain, symptoms that are present in disordered eating populations, particularly bulimia nervosa (BN), which suggests that these two pathologies are not entirely distinct. Rosenthal and colleagues (1984) had SAD patients describe their eating habits and found that eating was not found to be pleasurable but rather was frequently described as a "craving", "compulsion", and "pressure to eat" (p. 73). Perry and colleagues (2001) studied eating patterns in a nonclinical sample and found that individuals with the highest GSS reported the highest levels of eating dissatisfaction across all seasons except for summer. It should be noted that in both of these studies by Rosenthal et al. (1984) and Perry et al. (2001) participants did not meet the diagnosis for an eating disorder. Nonetheless these findings draw a parallel between SAD and symptoms typical of eating disorder pathology.

A review of the literature on studies concerning the comorbidity of eating disorders and mood disorders shows that the occurrence of mood disorders in individuals with BN has been found to range from 24.1% to 90% and from 31% to 88.9% in AN (Godart et al., 2007). The authors cite changes in diagnostic criteria and differences in methodology as possible explanations for these wide ranging prevalence rates (Godart et al., 2007). Hardin and colleagues (1990) administered the SPAQ to a number of clinical and nonclinical populations and found that those with eating disorders were characterized by high GSS and seasonal variations that were not entirely unlike the SAD and S-SAD groups. Furthermore, BN has a significantly higher likelihood of meeting the criteria for SAD or S-SAD compared to age-matched comparison subjects (Blouin et al., 1992; Lam et al., 1996) and to individuals with anorexia nervosa (AN;

Fornari et al., 1994; Ghadirian et al., 1999; Lam et al., 1996). Additionally, individuals who have a history of both AN and BN as well as those who are classified as Eating Disorder Not Otherwise Specified (ED-NOS) are more seasonal than those diagnosed solely as AN (Fornari et al., 1994). Tan and Prystanski (2008) found that individuals who experienced seasonal mood changes (SMC), as assessed with the SPAQ and the SIGH-SAD which is a measure of typical and atypical depressive symptoms, could be differentiated from sub-syndromal seasonal mood changes, nonseasonal mood changes, and control on the basis of their responses to certain items on the Eating Disorder Diagnostic Scale (EDDS; Stice, Telch, & Rizvi, 2000). Specifically, SMC were characterized by the greatest fear of weight gain and engaged in fasting or skipping meals more frequently in an attempt to prevent weight gain among all the groups. Additionally, analysis revealed that SMC reported feeling more fat, and admitted to bingeing and feeling a loss of control more frequently in the past three months than those in the control group (Tan & Prystanski, 2008).

Lam and colleagues (1996) administered the SPAQ to a clinical sample of females with eating disorders and found that 35% met the criteria for SAD (28% winter type, 7% summer type) whereas only 8% of the control group was diagnosed as SAD. Similarly, Ghadirian et al. (1999) studied a sample of outpatients from an eating disorder clinic and found that of 139 BN individuals, 35.9% could be classified as SAD. It should be noted that the study by Ghadirian et al. (1999) had drawbacks in that it failed to include a control group. Thus a prevalence rate that is representative of the general population could not be estimated. However, Lam, Solymon, and Tompkins (1991) did include a control group and found that none of these individuals met the criteria for SAD, whereas 42% of the BN group did. Conversely, a comorbidity study done in Japan yielded much lower rates of seasonality in eating disorder outpatients, with 6.7% of BN

patients being classified as SAD and 36.6% as S-SAD (Yamatsuji et al., 2003). Nonetheless, the combined rate of SAD and S-SAD for BN (43.3%) was greater than that for nonclinical controls (10.4%). However, as noted previously, Imai and colleagues (2003) found Japan's prevalence rate of SAD to be 0.91% which is considerably lower than rates found in North America and other countries. Therefore, the low comorbidity rate for BN and SAD found by Yamatsuji et al. (2003) is not entirely surprising given the low occurrence of SAD in Japan to begin with.

Throughout the fall and wintertime BN patients tend to experience an increase in appetite, binge eating, and weight gain compared to healthy controls (Blouin et al., 1992) and a greater degree of variability in affect, energy level, weight and perceived weight compared to AN (Fornari et al., 1994). The link between BN and seasonality is strongly established in the literature and generally AN is not thought of as being characterized by a high degree of seasonal variability (Ghadirian et al., 1999). Studies on seasonal patterns have found that compared to other eating disorder diagnostic groups or healthy controls, BN tends to be characterized by the highest GSS as measured with the SPAQ (Fornari et al., 1994; Lam et al., 1996; Yamatsuji et al., 2003). Additionally, Lam and colleagues (1996) did not find any significant differences between healthy controls and AN (binge eating/purging subtype or restricting subtype) in terms of SAD prevalence rates.

Levitan et al. (1996) attempted to clarify which characteristics or symptoms, if any, distinguish a seasonal BN patient from a nonseasonal one. The findings show that seasonal versus nonseasonal BN individuals could be differentiated in a number of areas. To begin with, seasonal BN began engaging in binge episodes at a younger age and the frequency of their current binge episodes per month outnumbered those of nonseasonal BN. As well, seasonal BN were characterized by greater fluctuation in weight over the course of their lifetime and had a

poorer understanding of their own feelings and emotions (Levitan et al., 1996). BN patients with seasonal variations have also been found to display more fluctuations in body weight across the seasons as well as preferred foods (Ghadirian et al., 1999). Lastly, the six areas that comprise GSS (sleep length, social activity, mood, weight change, appetite, and energy level) distinguish seasonal from the nonseasonal BN, with seasonal individuals reporting greater changes across all of these areas (Ghadirian et al., 1999).

Blouin and colleagues (1992) have found that seasonal binge eating patterns of BN patients tended to vary with the amount of darkness in a particular month. Specifically, meteorological data pertaining to the average amount of dark hours in each month of the year was collected and then correlated with participants' responses on a modified SPAQ regarding which month(s) they were most likely to binge, purge, and feel worst in. Analyses revealed that months characterized by the greatest number of darkness hours were identified by participants as the most problematic in terms of low mood and disordered eating (Blouin et al., 1992). Therefore, these findings suggest that disordered eating symptoms may be regulated by light exposure. In a double-blind placebo controlled study, Blouin et al. (1996) administered bright light therapy to a group with BN for one week. Results showed that compared to the placebo condition, those who received light therapy displayed a significant reduction in depressive symptoms. However, there were no significant differences observed in terms of how often or how much an individual binged (Blouin et al., 1996). Conversely, a similar study by Braun, Sunday, Fornari, & Halmi (1999) found that BN individuals in the treatment condition showed a significant decrease in how often they engaged in binge eating compared to those in the placebo group. Interestingly, both the placebo and light therapy group exhibited a significant reduction in depressive symptoms, with no significant differences existing between the two groups in terms

of how much their depression scores decreased. Differences in sample characteristics and methodology can be cited as possible explanations for these discrepant findings. In Blouin et al. (1996) the average score on the Beck Depression Inventory was 22 compared with a much lower score of 14.9 for the participants in Braun et al. (1999). Therefore, it appears that those who showed a significant improvement in depressive symptoms were characterized by a higher degree of depression to begin with which may account for why the two samples showed different response rates to light therapy. In terms of the effect of light therapy on binge eating, it is possible that timing of the administration of treatment had an effect on efficacy. Blouin and colleagues (1996) used evening exposure to bright light whereas Braun et al. (1999) administered bright light in the morning, which has been deemed the optimal exposure time (Avery et al., 1990).

In summary, a number of similarities between SAD and BN have been noted. This includes being characterized by disordered eating symptoms such as carbohydrate craving and weight gain, and exhibiting seasonal variations in mood and behaviour across the seasons. Finally, both groups have been found to respond to phototherapy, suggesting that these two psychopathologies may share a common underlying psychopathological mechanism that is responsive to the effects of light.

Eating Disorders

The following section is a review of the eating disorder literature. Eating disorders have been cited as one of the most prevalent psychiatric problems among women (American Psychiatric Association, 2000). BN has been found to occur in approximately 1-3% of the general population, and roughly 90% of diagnosed cases are female (American Psychiatric Association, 2000). The diagnostic criteria for BN, as outlined in the DSM-IV-TR are as follows:

(1) recurrent episodes of overeating where a loss of control is experienced, (2) engaging in inappropriate compensatory mechanisms, such as vomiting or use of diuretics or laxatives to avoid gaining weight, (3) this pattern occurs at least two times a week for a minimum of three months, (4) self-evaluation is based on shape and weight to an excessive degree, and (5) this pattern is not evident solely during episodes of AN (American Psychiatric Association, 2000). Oftentimes, individuals may demonstrate one or more of these symptoms of disordered eating without meeting the diagnostic criteria for BN. When this is the case, a diagnosis of Eating Disorder Not Otherwise Specified or ED-NOS may be warranted (American Psychiatric Association, 2000). Examples of ED-NOS include meeting all of the BN criteria except for the fact that the binge eating and inappropriate compensatory mechanisms occur less than two times a week or have lasted less than three months in duration; adopting inappropriate compensatory mechanisms following the consumption of small amounts of food or; continually chewing and spitting out, but not swallowing, large amounts of food (American Psychiatric Association, 2000). Lastly, individuals may meet the research criteria for binge eating disorder (BED), which the DSM-IV lists under the diagnostic criteria for ED-NOS. BED is characterized by the frequent bouts of binge eating typical of BN but without the use of inappropriate compensatory mechanisms to prevent weight gain (American Psychiatric Association, 2000).

The role of genetics in the occurrence of BN has been thoroughly investigated but the results remain largely inconclusive. Fairburn, Cowen, and Harrison (1999) reviewed a number of twin studies concerning the heritability of BN and found that estimates are characterized by a great deal of variability, with figures ranging from 0-83%. The authors concluded that the etiology of eating disorders should be viewed as multifaceted and should take a number of factors such as environment and neurobiology, in addition to genetics, into account. Leon,

Fulkerson, Perry, and Cudeck (1993) investigated personality and behavioural characteristics associated with eating disorders in adolescent females and found that a high degree of body dissatisfaction coupled with negative emotionality and a poor awareness of internal states put an individual at an increased risk for developing disordered eating. Finally, a link between dieting and the onset of binge eating has been established, with one study finding that 46% of a BN sample had tried dieting before engaging in their first binge episode (Brewerton, Dansky, Kilpatrick, & O'Neil, 2000).

Lastly, the presence of maladaptive cognitions related to shape and weight in disordered eating populations have been studied (Laessle, Kittl, Fichter, & Pirke, 1988). As previously stated, there is a high degree of comorbidity between eating disorders and mood disorders (Godart et al., 2007). Laessle and colleagues (1988) sought to investigate whether maladaptive cognitions in AN and BN individuals were correlated with the experience of depressive symptoms. The authors found that having a negative attitude towards one's body accounted for the most variance in depression scores in the eating disorder sample overall, and that perfectionism was correlated with depression in the BN group whereas a drive for thinness was correlated with depression scores in the AN group (Laessle et al., 1988). These findings allude to the important role that cognitions play in the development and maintenance of eating disorders.

Information Processing in Emotional Disorders

A review of the literature indicates that SAD and BN share a great deal of overlap in disordered eating symptoms as well response to bright light therapy. One area that has not received as much attention from researchers is the similarities and differences that exist between these two disorders in terms of their cognitive profiles. The general consensus across the literature is that the emotions and behaviours of an individual are strongly shaped and influenced

by their cognitive processes (Beck & Clark, 1988). However, the theory and mechanisms behind how these processes operate has not been agreed upon and numerous cognitive models for psychopathology have been proposed (e.g., Bandura, 1977, as cited in Beck & Clark, 1988; Beck, 1967, as cited in Beck & Clark, 1988; Ellis, 1962, as cited in Beck & Clark, 1988; Peterson & Seligman, 1985, as cited in Beck & Clark, 1988). One model that has been widely accepted and researched is Beck's cognitive theory (CT) which proposes that the maladaptive cognitions of an individual are responsible for the onset and maintenance of their emotional disturbance. A further tenet of CT is that these cognitions are content-specific to a particular psychological state. This is known as the content-specificity hypothesis, which purports that affective states can be distinguished on the basis of a specific cognitive profile that is unique to that disorder in particular (Beck & Clark, 1988).

CT distinguishes between adaptive and maladaptive cognitions. This theory acknowledges that it is essential that humans develop the ability to effectively process meaningful information from their surroundings in order to function. This includes actively selecting, transforming, encoding, storing and retrieving the copious amounts of information that they encounter (Beck & Clark, 1988). CT proposes that one characteristic of individuals with affective disorders is a flawed information processing system which results in an apparent bias related to their psychological state (Beck & Clark, 1988). For example, CT acknowledges that there is utility in showing withdrawal in response to adverse life events. However, this theory proposes that depressed individuals are characterized by a recurrent pattern of persistent and exaggerated withdrawal in response to unpleasant circumstances, such as loss or failure, because of their negative cognitions and misinterpretations regarding the event (Beck & Clark, 1988). Individuals who consistently respond in this manner are at risk of developing a maladaptive

schema (Beck & Clark, 1988). A schema is defined as a "functional structure of relatively enduring representations of prior knowledge and experience" (Beck, 1967, p. 283, as cited in Beck & Clark, 1988). Therefore, when individuals are processing the information about the environment around them, they are essentially using a schema or their expectations based on past experience to help them process, encode, organize, and retrieve information. Schemas are strengthened through the processing and storing of information that is already consistent with the schema and the failing to attend to inconsistent information (Beck & Clark, 1988). The information processing systems of individuals with psychological disturbances are controlled by their maladaptive schema. The content-specificity hypothesis proposes that these maladaptive schemas are specific to the disorder, meaning that there is a specific schema for depression, and a separate one for anxiety, and so on (Beck & Clark, 1988).

Content-Specificity in Nonseasonal Depression

Individuals who are clinically depressed are characterized by an extremely negativistic schema. The majority of their thoughts concerning themselves, the world and the future tend to be negatively themed (Beck & Clark, 1988). CT purports that psychopathology is characterized by a maladaptive schema and information processing system that affects among others, the function of memory. Mood has been shown to affect memory processes in individuals without any type of emotional disturbance (Clark & Teasdale, 1985). Clark and Teasdale (1985) exposed subjects to a series of positive, negative, and neutral words when in a normal mood state and then performed a mood induction task where subjects were made to feel either happy or sad. The subject's ability to recall the words presented prior to the mood induction task was then assessed. Results showed that women were more likely to recall positive words than negative words when

in a happy mood and more showed a higher recall for negative words compared to positive words when in a depressed state (Clark & Teasdale, 1985).

An alternative means to assess memory bias, which can provide insight into the schema of the self is to use a self-referent encoding task (SRET) coupled with an incidental recall test. This SRET involves presenting participants with a series of words that are positive, negative or neutral followed by an incidental recall or recognition test. Mathews and Bradley (1983, as cited in Bradley & Mathews, 1988) found that healthy controls had higher recall for words that they had rated as descriptive of themselves, compared to those words that they had rated as whether or not they were descriptive of someone else. Therefore, one could hypothesize that if a negative self-schema prevails in depression, then a negative bias should influence an individual's encoding and retrieval processes of relevant information, and subsequently more negative words should be recalled/recognized. Dobson and Shaw (1987) found that depressed subjects endorsed a higher number of depressive words as self-descriptive whereas healthy controls used more nondepressed words to describe themselves. However, the authors did not find any significant patterns within the two groups in terms of which words had the highest recall rates (Dobson & Shaw, 1987). Conversely, Bradley and Mathews (1988) did find a recall bias for negative self-referent adjectives in a sample of depressed individuals. Additionally, another study found that even when depressed individuals endorsed both depressed and nondepressed words as being self-descriptive they had the highest recall rates for negative adjectives, whereas nondepressed individuals had higher recall rates for self-descriptive words not of a depressive nature (Derry & Kuiper, 1981). Neshat-Doost, Taghavi, Moradi, and Dalgleish (1998) sought to determine whether or not negative self-schema existed in a group of clinically depressed youth by presenting them with a series of positive, negative, and neutral words via computer and later

testing their memory in both a recall and recognition test. Results showed that the depressed group exhibited a significant recall bias for the negative words compared to positive words, whereas healthy controls showed no difference in their recall of positive and negative words. No group differences were found for recognition of any of the word types (Neshat-Doost et al., 1998).

There is also evidence of a recall bias for relevant stimuli in psychopathological states other than depression. The results of a meta-analysis looking at memory bias in anxiety disorders suggest that compared to low anxiety individuals, high anxiety individuals tend to have higher recall rates for stimuli that are considered highly threatening (Mitte, 2008). The vast amount of research concerning the cognitive profiles and schemas of depression and anxiety provides support for the content-specificity hypothesis (Beck & Clark, 1988) the basic tenet being that affective states can be differentiated on the basis of differences in information processing with regards to relevant content.

Content-Specificity in SAD

More recently, cognitive profile and schema have been investigated in patients with SAD (Dalgleish, Spinks, Golden, & du Toit, 2004; Golden et al., 2006; Hodges & Marks, 1998; Rohan, Sigmon, & Dorhofer, 2003; Rohan, Sigmon, Dorhofer, & Boulard, 2004). A preliminary investigation regarding the cognitive profile of SAD revealed that in comparison to healthy controls, both SAD and nonseasonal depression were characterized by more negative automatic thoughts as well as dysfunctional attitudes (Hodges & Marks, 1998). However, there were no significant differences between SAD and nonseasonal depressed individuals on these two variables, suggesting that SAD may be characterized by a cognitive profile that is similar to nonseasonal depression. Golden et al. (2006) also found that compared to controls SAD had

elevated levels of dysfunctional attitudes in the wintertime but following the remission of symptoms throughout the summer months the dysfunctional attitudes scores for SAD decreased significantly. It should be noted that regardless of the season, Rohan and colleagues (2003) observed no differences between individuals with a history of SAD and controls in terms of scores of the Dysfunctional Attitudes Scale (DAS; Weissman & Beck, 1978). However, these scores followed a slightly different pattern throughout the year, with SAD having more dysfunctional attitudes in the fall and wintertime compared to summer, whereas controls reported more dysfunctional attitudes in the fall compared to other seasons. Also, as measured with the Automatic Thoughts Questionnaire (ATQ; Hollon & Kendall, 1980), SAD has been found to have more frequent automatic negative thoughts in the winter months compared to summer or fall (Rohan et al., 2003) and the same pattern has been found for S-SAD (Rohan et al., 2004). An additional finding is that regardless of the season both groups are characterized by more negative thoughts than controls (Rohan et al., 2003; Rohan et al., 2004). The tendency to engage in negative thinking more so than controls during the summertime when symptoms are in full remission suggests that this variable may be trait-like in nature.

Finally, while only a few studies have looked at memory in SAD patients, the use of a SRET revealed that in comparison to controls, SAD endorsed more negative adjectives as being self-descriptive (Dalgleish et al., 2004). However, SAD failed to show the recall bias for the negative self-descriptive words that has been demonstrated in nonseasonal depression (Bradley & Mathews, 1988; Derry & Kuiper, 1981). These findings suggest that similarities as well as differences exist between the cognitive profiles of SAD and nonseasonal depression. It is also possible that SAD individuals may be characterized by a seasonal schema and might possibly

show a recall bias for season-related words. Therefore, one can conclude that more research concerning schema and content-specificity in SAD is needed.

Content-Specificity in Disordered Eating

CT has also been applied to the area of eating disorders (Cooper, 2005). Its premise is that the schema of an individual with an eating disorder is characterized by an unduly reliance and preoccupation with weight, shape, and food which results in faulty information processing (Vitousek & Hollon, 1990). Therefore, one could expect that a memory bias may exist in eating disorder populations for words related to shape, weight, and food. Sebastian, Williamson, and Blouin (1996) studied recall rates for words related to fatness, neutral body related words, and neutral control words across three separate groups: eating disordered individuals (AN, BN, ED-NOS), individuals preoccupied with weight as determined by scores on the Body Shape Questionnaire (BSQ; Cooper, Taylor, Cooper, & Fairburn, 1987), and healthy controls. Analyses revealed those with an eating disorder exhibited a memory bias for only the fat-related words (e.g., obese, cellulite) whereas the other two groups were unbiased in terms of which type of words they recalled (Sebastian et al., 1996). These findings suggest that disordered eating individuals demonstrate a bias that is specific to weight and shape, and not to body words that are neutral.

Hunt and Cooper (2001) sought to replicate the findings of Sebastian et al. (1996) and additionally included a group of non-eating disordered individuals with a primary diagnosis of nonseasonal depression. A combination of positive and negative valenced words were included and were classified under one of the following constructs: food, weight/shape, emotional, neutral body, and neutral controls. For the food and weight/shape categories, a word was classified as positive if it was related to thinness and negative if it was related to fatness. The findings

provided partial support for those of Sebastian et al. (1996). BN had higher recall rates for both positive (e.g., thin) and negative words (e.g., bulging) related to weight and shape than they did for the emotional words such as 'happy' or 'useless' (Hunt & Cooper, 2001). However, this bias was not evident when put in comparison with recall of neutral body or neutral control words. Additionally, compared to controls BN showed a recall bias for the food words but there were no significant differences between BN and depressed individuals. It should be noted that while the SRET has been used to compare the cognitive profiles of SAD and nonseasonal depressed individuals (Dalgleish et al., 2004), no research has studied the similarities or differences that may exist between SAD and BN in terms of a recall bias. The degree to which SAD shows a memory bias for food, weight, or shape related words is worthy research to pursue, given the overlap between SAD and BN in terms of disordered eating symptoms and weight gain.

Attentional Bias in Emotional Disorders: The Stroop Task

An additional measure of information processing biases is the modified Stroop task, an experimental paradigm that has been widely used to examine the content-specificity of various psychopathologies by providing a measurement of attentional bias. This task has been used across a wide range of clinical disorders including seasonal depression (Drake, Schwartz, Turner, & Rosenthal, 1996; Rohan et al., 2004; Sigmon et al., 2007; Spinks & Dalgleish, 2001), nonseasonal depression (Gotlib et al., 2004; Kerr, Scott, & Phillips, 2005; Markela-Lerenc, Kaiser, Fiedler, Weisbrod, & Mundt, 2006), eating disorders (Channon, Hemsley, & de Silva, 1988; Dobson & Dozois, 2004; Rofey, Corcoran, & Tran, 2004), bipolar disorder (Kerr et al., 2005) and social phobia (Gotlib et al., 2004). Long before the Stroop task was used to study the attentional processes in clinical samples, it was employed as a simple measure of attention and interference in experimental situations. The original Stroop task involves presenting a colour

word (e.g., red) that is printed in an incongruent ink colour (e.g., blue ink) and having the subjects identify the ink colour as quickly as possible, rather than reading the word. The original Stroop task was done using stimulus cards, with 100 colour words printed on a card (Stroop, 1935). Stroop found that individuals consistently took a longer time to say the ink colour when it was incongruent with the semantic meaning of the word being presented, compared to when they had to say the ink colour of solid coloured squares (non-words). These findings led Stroop to conclude that his subjects were demonstrating a marked interference effect, which is also referred to as the Stroop effect.

Since Stroop's original study, a prolific amount of research has been done on the interference effect and various modifications have been made to the task methodology across studies (MacLeod, 1991). For instance, Stroop (1935) presented his subjects with lists of words and timed how long it took them to complete the entire stimulus card. The interference effect was calculated by subtracting the length of time it took to complete the control card of coloured squares from the incongruent colour word card (Stroop, 1935). Advances in technology have resulted in the computerized Stroop task, in which subjects are presented with words one at a time and their response rate to each individual word is timed. Additionally, the means by which an individual makes his or her response has varied from orally speaking the colour to making a selection on a keypad. Some studies have found less interference when responses are made manually (e.g., Redding & Gerjets, 1977) whereas others have found no differences in interference size between these two modalities (e.g., Roe, Wilsoncroft, & Griffiths, 1980). Finally, numerous modifications have been made to the task across studies, including variations in the modality used to present the stimuli and variations in the colours used (see MacLeod, 1991 for a review).

Stroop (1935) posited that the interference effect for naming colours occurs because individuals tend to engage more frequently in reading word stimuli than they do in naming colours. Therefore, because they have more practice with reading, the associations for seeing a word and saying it aloud are stronger than they are for seeing a colour and naming it aloud. One framework that has been applied to explain the existence of the Stroop effect is a connectionist model by Cohen, Dunbar, and McClelland (1990). This approach is rooted in cognitive psychology and purports that the level of interference on the Stroop task is dependent on the strength of individual processing paths. This model proposes that processing paths consist of three types of units: input, intermediate, and output. When an individual is engaging in a cognitive task, such as the Stroop task, a pattern of activation will form at the input unit (e.g., seeing the colour word printed in an incongruent ink colour), and then spread along the processing pathway to the intermediate and then finally the output unit when a response is made (e.g., identifying the ink colour). According to this model, one can think of two separate pathways that are involved in the Stroop task: a colour-naming pathway and a word-naming pathway. Performance on the Stroop is determined by processing strength of each of these pathways. Therefore, because individuals generally have more experience with word-reading than they do with colour-naming, the strength of the word-reading pathway is stronger, which results in longer response times and a greater interference effect for colour-naming (Cohen et al., 1990).

In more recent years, the relationship between attentional bias and emotion has been studied in variety of clinical populations through the use of what is known as the emotional Stroop task which is essentially a modified Stroop task. This version is similar to the original task in that subjects are required to name the colour of ink of the presented word. However,

rather than seeing words of various colour names, individuals are exposed to words that are related to a certain psychological disturbance, such as depression or anxiety. The amount of interference is determined by calculating the difference in response latency between the stimulus word and a matched neutral word (Williams, Mathews, & MacLeod, 1996). Similar to the SRET and recall tasks, it can be theorized that performance on the Stroop task can provide an objective indication of self-schema and cognitive profile. Williams et al. (1996) conducted a review of a number of studies using the Stroop task to measure attentional bias across various psychopathologies and concluded that in general, performance on the Stroop test is impeded in a specific clinical population only when the words that are included are very closely related to that particular emotional disturbance. Therefore, it appears that individuals pay more attention to words that are related to their psychological disturbance, thus displaying a greater interference effect.

Stroop Performance in SAD

Recently, the content-specificity hypothesis has been tested in SAD by measuring attentional bias through the use of the modified Stroop task (Rohan et al., 2004; Sigmon et al., 2007; Spinks & Dalgleish, 2001) as well as the original Stroop Colour-Word Task (Drake et al., 1996). Drake and colleagues (1996) administered the original Stroop task to a group of SAD individuals and healthy controls and found that the performance of both groups was superior in the summer compared to the winter, leading the authors to theorize that attentiveness may display seasonal variations. Sigmon and colleagues (2007) administered a computerized Stroop task that included words related to light, darkness, depression, as well as neutral words to a group of SAD, nonseasonal depressed and healthy individuals. Analyses revealed that both seasonal and nonseasonal depression individuals took significantly longer than controls to name

the colours of the dark-related and depression-related words, but that no differences existed between these two groups. Furthermore, those in the nonseasonal depression group took the longest to name the colours of the light-related words, and no significant differences in response rates for SAD and controls were found. This finding is surprising given that such a strong link between SAD and light exists. Because SAD was shown to display an interference effect for dark-related words, the authors have proposed that perhaps individuals with SAD have a schema that is based on a lack of light. However, the authors also caution that it is possible that the dark-related words (e.g., gloomy, bleak) were tapping into depressive mood. Additionally, Rohan et al. (2004) administered a Stroop task consisting of light-related, dark-related, and neutral words to S-SAD individuals and healthy controls and failed to find any significant group differences. However, Spinks and Dalgleish (2001) administered the Stroop task to a clinical sample of SAD patients and found slower response rates for colour-naming of seasonal words and words that had a negative connotation (e.g., hopeless) compared to naming the colour of neutral words or a string of 0's. A regression analyses with winter mood (Step 1), amount of Stroop interference (Step 2), and an interaction between winter mood and Stroop effect (Step 3) was found to successfully predict symptoms in the summertime. Specifically, a high degree of interference for negative words in the wintertime was associated with the most symptom reduction in the summer months whereas those who displayed a high degree of symptoms in the winter coupled with a small interference effect on the Stroop test for negative words had the poorest outcome in the summer (Spinks & Dalgleish, 2001). This research suggests that attentional biases for certain stimuli may exist in SAD and that more research concerning the Stroop effect in SAD is needed.

Stroop Performance in Disordered Eating

The modified Stroop task has also been used to evaluate the role of attention in eating disorders. Channon and colleagues (1988) found that both controls and AN outpatients took longer to name the colour of food words (e.g., sugar, butter) compared to control words but that the interference effect for AN was significantly greater than that for controls. Compared to healthy controls BN has been found to have slower response times for colour-naming words related to body size (Davidson & Wright, 2002; Fairburn, Cooper, Cooper, McKenna, & Anastasiades, 1991) and eating and shape (Fairburn et al., 1991). Rofey et al. (2004) administered a modified Stroop task to a group of non-clinical undergraduate females who were classified as having either troubled or healthy eating pattern. Results showed that among individuals with negative mood, those who reported more bulimic symptoms responded slower to food words than those who reported fewer bulimic symptoms. As well, those with the most disordered eating symptoms had the highest recall rates of food words that were presented in the Stroop task. Carter, Bulik, McIntosh, and Joyce (2000) assessed performance on the Stroop task in a sample of BN individuals prior to and following receiving treatment. The authors found an increase in processing speed following treatment. However, at both times patients responded significantly slower to words that were related to food and body compared to neutral control words (Carter et al., 2000).

In 2004, a meta-analysis concerning information processing and Stroop performance in eating disorders was carried out (Dobson & Dozois, 2004). Dobson and Dozois (2004) reviewed 28 empirical studies and concluded that compared to controls BN displayed an interference effect for food words (ES = .59) but that this effect was not as great in AN (ES = .20). Analyses also revealed that compared to controls, both BN and AN demonstrate an attentional bias towards body and weight related words on the Stroop task (ES of .57 and .45, respectively). A

more recent meta-analysis of Stroop studies with ED samples found an overall interference effect for food words (ES = .34), and in AN a small ES of .26 and in BN a medium ES of .43 (Brooks, Prince, Stahl, Campbell, & Treasure, 2011). Interestingly, there is a lack of research concerning disordered eating populations and their performance on the Stroop task with words of a depressive and/or seasonal nature. This would be interesting to pursue, given the high comorbidity rates between BN and affective disorders (Godart et al., 2007) and the large amount of overlap with SAD with respect to seasonality and vegetative symptoms.

Psychophysiological Reactions

In addition to self-report measures of emotion and behavioural observations, measures of psychophysiological reactions can provide information on an individual's psychological processes. One such measure of psychophysiology is electromyography (EMG), which is a procedure for measuring muscle movement. In fact, Cacioppo and Petty (1981) have described muscular activity as the "acting out" of an individual's "mental processes" (p. 441) and Gehricke and Shapiro (2000) found that while no differences existed between the self-reports of depressed and nondepressed individuals with regards to emotional reactions to positive and negative affective imagery, EMG revealed discernible differences between the two groups in terms of facial muscle activity. Facial expressions are widely recognized as obvious indicators of affect and studies have found that not only can different patterns of covert facial muscle activity discriminate between various emotional states but can also differentiate between clinical and nonclinical populations (Schwartz et al., 1978; Schwartz, Fair, Salt, Mandel, & Klerman, 1976). Research has consistently found distinct patterns in facial muscle activity in response to negative affective imagery and positive affective imagery (Achaibou, Pourtois, Schwartz, & Vuilleumier, 2008; Brown & Schwartz, 1980; Dimberg & Petterson, 2000; Larsen, Norris, & Cacioppo, 2003;

Sirota & Schwartz, 1982). Specifically, exposure to unpleasant affective imagery is known to produce an increase in activity over the *corrugator supercilli*, which is the region that knits the eyebrows when frowning. Exposure to pleasant affective stimuli, on the other hand, is associated with an increase in activity over the *zygomaticus major*, which is the muscle that elevates the lips when smiling. Furthermore, research has shown that these patterns of facial activity are more pronounced on the left side of the face (Dimberg & Petterson, 2000), which may speak to a dominance issue between the left and right hemisphere of the brain. That is, the right hemisphere controls the left side of facial activity and is hypothesized to play a larger role in the expression of spontaneous emotion (Borod & Koff, 1990).

These EMG patterns have been observed in response to a variety of presentation modes. Brown and Schwartz (1980) had participants listen to hypothetical situations that were of a happy, sad, angry, or fearful nature and that ranged from low to high intensity. Facial muscle activity was measured while subjects imagined the scenes read to them and an increase in *zygomaticus major* activity was found to be associated with the happiness imagery while *corrugator supercilli* activity was observed for sadness imagery. Similar patterns have been observed during exposure to both pictures and sounds that have a positive or negative affective valence (Larsen et al., 2003). Finally, an increase in *zygomaticus major* activity was observed while viewing pictures of happy faces and heightened *corrugator supercilli* activity was associated with exposure to angry faces (Achaibou et al., 2008). Finally, these patterns of facial activity in response to angry or happy faces were observed even when participants are explicitly told to suppress their natural reaction (Dimberg, Thunberg, & Grunedal, 2002). Hence, when participants were told to frown at happy faces or smile at angry faces, the natural pattern of an increase in zygomatic activity in response to pleasant stimuli and an increase in corrugator

activity in response to unpleasant stimuli were still observed (Dimberg et al., 2002). This suggests that EMG is a valid measure of spontaneous emotional reactions that are both subtle and very difficult to suppress.

EMG patterns in response to affective imagery have also been found to differentiate between clinical and nonclinical individuals but the findings across studies have been inconsistent (Gehricke & Shapiro, 2000; Schwartz et al., 1978; Schwartz et al., 1976; Sloan, Bradley, Dimoulas, & Lang, 2002). Schwartz et al. (1976) found that depressed and nondepressed participants had similar EMG reactions to sad and angry imagery, but that depressed individuals displayed significantly less zygomatic activity in response to happy imagery compared to their nondepressed counterparts. Conversely, Gehricke and Shapiro (2000) found that depressed individuals were characterized by a decrease in both zygomatic and corrugator muscle activity compared to healthy controls in response to happy and sad imagery. Sloan et al. (2002) found that depressed and nondepressed individuals demonstrated similar EMG reactions to unhappy facial expressions but that depressed individuals actually showed an increase in corrugator activity in response to happy facial expressions. Additionally, Schwartz and colleagues (1976) asked participants to imagine a typical day in their life while their EMG activity was recorded. The results revealed that the pattern of activity in nondepressed individuals was not unlike the pattern generated from exposure to pleasant imagery whereas depressed patients tended to exhibit a pattern more consistent with that produced from exposure to negative affective imagery (Schwartz et al., 1976). Schwartz and colleagues (1978) administered a tricyclic antidepressant to depressed patients and found that clinical improvement of symptoms was correlated with a significant decrease in corrugator activity. Furthermore, the authors found that those individuals who demonstrated the greatest reduction in symptoms after

two weeks of medication were characterized by the highest levels of corrugator activity at baseline, compared to those who showed little clinical improvement (Schwartz et al., 1978).

EMG facial activity has recently been studied in individuals with BN compared to healthy controls. Mauler, Hamm, Weike, and Tuschen-Caffier (2006) presented BN patients and healthy controls with images of food while their facial muscle activity was recorded. Results showed that BN individuals showed a substantial increase in corrugator activity in response to food cues which the authors indicate is suggestive of the experience of negative emotion, whereas the control participants exhibited lower levels of corrugator activity in response to pictures of food and other pleasant images (Mauler et al., 2006). Interestingly, BN and control participants assigned similar pleasantness ratings to images of food, which suggests that BN patients may not be cognizant of their thoughts and feelings toward food (Mauler et al., 2006). Furthermore, these findings speak to the ability of the EMG task to detect extremely subtle emotional reactions of an individual.

Recently, psychophysiological reactions have been studied in SAD (Rohan et al., 2003; Sigmon et al., 2007) and S-SAD individuals (Rohan et al., 2004) through the measurement of skin conductance levels. Rohan and colleague (2003) exposed participants to scenes that varied in light intensity in an attempt to better understand light sensitivity in SAD patients. The scenes that were presented were classified as bright light, low light or ambiguous. There were no significant differences in skin conductance level in response to bright or dark stimuli, but compared to controls, women with a history of SAD were characterized by elevated skin conductance toward the ambiguous intensity slides during the fall more so than when these images were viewed in the winter or summer (Rohan et al., 2003). The authors cautioned that it is likely that habituation is at least partly responsible for this finding (Rohan et al., 2003).

However, the methodology of Rohan et al. (2003) was carried out with a sample of S-SAD individuals and significant differences in skin conductance response were observed (Rohan et al., 2004). Compared to controls, S-SAD evidenced a greater skin conductance response to slides that were low in light intensity and the skin conductance levels of S-SAD were greater for low intensity slides than they were for bright light and ambiguous slides. The authors cite that differences in sample make-up may account for these discrepant findings and advocate for more research into the area of psychophysiological reactions in SAD. Finally, skin conductance levels in response to winter and summer scenes were measured in seasonal and nonseasonal depression as well as controls (Sigmon et al., 2007). Analysis revealed that a greater skin conductance response to winter scenes compared to summer scenes was observed solely in SAD individuals. These results imply that there are psychophysiological reactions unique to SAD and that more research into this area is required. It should be noted that research concerning EMG patterns in SAD, as well as disordered eating populations, is lacking in the literature.

Summary

SAD is characterized by a regular occurrence of depressive episodes in the fall and winter that remit during the spring and summer months. The symptoms of SAD are said to be atypical depressive symptoms due to the fact that they are the reverse of what is characteristic of nonseasonal depression. Specifically, SAD tends to show an increase in sleep, carbohydrate craving, and weight gain, whereas the typical symptoms of nonseasonal depression include difficulty sleeping, loss of appetite and weight loss. A number of SAD symptoms, including carbohydrate craving, increased appetite, and weight gain are also characteristic of eating disorders, particularly BN and BED. Theories of information processing, such as Beck's cognitive theory and content-specificity hypothesis suggest that each psychopathological

disturbance is characterized by a unique cognitive profile and schema. Little is known about the cognitive profiles of individuals with SAD and whether or not they share any commonalities with the cognitive profiles of those with Eating Disorders (ED). The Emotional Stoop task is an experimental paradigm of information processing that may be useful in detecting minor nuances that could distinguish between these psychological conditions. This task provides a measurement of processes of attention and possible attentional biases that may exist for certain stimuli relevant to one's emotional disturbance. Furthermore, measures of psychophysiological reactions can provide insight into psychological processes that self-report measures may fail to detect. EMG can be used to measure facial muscular activity in response to relevant stimuli. To date no research has studied the psychophysiological responses of SAD versus disordered eating individuals to photographs of food and/or photographs of winter and summer scenes.

Present Study

The primary purpose of the present study was to further our understanding into the cognitive profiles and psychophysiological reactions that might differentiate SAD from disordered eating (DE) individuals. Participants were classified into one of three groups: SAD, DE, or Control. The SAD group was made up of nonclinical individuals who report depressive symptoms with a winter seasonal pattern. The DE group consisted of nonclinical individuals who met the criteria for bulimia nervosa, binge eating disorder, or eating disorder not otherwise specified. It should be noted that individuals in the SAD group did not meet the criteria for DE and vice versa. The control group was comprised of healthy individuals with no depression or disordered eating. Further details regarding group classification are included in a later section of this paper.

The three groups were compared on their performance on a modified Stroop task, an incidental recall task, and their psychophysiological reactions relating to facial electromyography (EMG) in response to visual presentations of different food and season images. The modified Stroop test contained five different word lists (body shape words, binge food words, non-binge food words, winter words, summer words) and their yoked neutral words. In the incidental recall task, the groups were measured on the number of words they could recall from each word list subsequent to the modified Stroop test. In the EMG task, the groups were shown visual images (binge foods, non-binge foods, winter scenes, summer scenes) while their facial muscle (*corrugator supercilli* and *zygomaticus major)* movements were measured. They also rated each scene on its degree to which it appeared appetizing (food images) or appealing (season images).

The modified Stroop test and the incidental recall task provided assessments of attentional bias. Greater attentional bias was defined as longer response latency between stimulus word and yoked neutral word and greater proportion error in the modified Stroop test, as well as higher proportion of accurate recall from particular word lists from the Stroop test during the incidental recall task. The EMG task yielded information on psychophysiological reactions to stimulus images. Greater psychophysiological reaction was measured in two ways: mean amplitude in microvolts (μV) measured as the difference in the total voltage in the EMG between each image presentation (i.e., the event) and its baseline, and maximum peak amplitude in microvolts (μV) measured as the difference in peak voltage between image presentation and the baseline.

A total of four hypotheses were developed for this study:

1. SAD would show a greater attentional bias toward the seasonal words than DE who would demonstrate this pattern to a greater extent than Control.

2. DE would show a greater attentional bias toward the body shape words and the binge food words than SAD who would demonstrate this pattern to a greater extent than Control.
3. DE would show a greater negative (*corrugator supercilli)* psychophysiological reaction to images of binge foods than SAD or Control and SAD would demonstrate a stronger reaction than Control.
4. SAD would show a greater negative *(corrugator supercilli)* psychophysiological reaction to images of winter scenes than DE or Control and DE would demonstrate a stronger reaction than Control.

Method

Pilot Study

To develop the stimulus materials for the current study, two separate efforts were undertaken. The stimulus word development for the modified Stroop task was conducted in June 2009 and the stimulus image development for the EMG task was carried out in August 2009 by the same group of researchers.

Stimulus Word Development For the Modified Stroop Task. The development of stimulus words for the modified Stroop task consisted of three stages.

Stage One. In the first stage, the researcher, thesis supervisor, and a peer Master's student, as well as six individuals from the community generated words that were representative of the following concepts: summer, winter, body shape, binge foods, and non-binge foods (see Appendix A). In addition to generating words on their own, the researchers also used a thesaurus to identify other relevant words and consulted published studies to obtain words that have been used in previous research (Black, Wilson, Labouvie, & Heffernan, 1997; Davidson & Wright,

2002; Fairburn et al., 1991; Francis, Stewart, & Hounsell, 1997; Green, Wakeling, Elliman, & Rogers, 1998; Israeli & Stewart, 2001; Rofey et al., 2004). Following this stage, all of the generated words were compiled into individual lists for each of the concepts.

Stage Two. In the second stage, a second group of individuals rated the generated words according to how accurately they felt that they described the given concept. The raters (N = 43) for this task were individuals from the general community and Clinical Psychology graduate students at Lakehead University. Of these, 10 were males, 32 were females. One participant did not specify the gender. The mean age of the raters was 23.43 years (SD = 5.02) with a range of 17 to 46 years. Twenty-eight were students and 15 were nonstudents. Several raters had high school diplomas (n = 18), followed by baccalaureate degrees (n = 15), college diplomas (n = 4), or post-graduate degree (n = 4). One person reported eighth grade or less education while another did not indicate the highest level of education completed. Finally, 100% of the sample selected the option 'White, not of Hispanic origin' for ethnicity. All raters were informed that their ratings of the words would be used to develop stimulus words to be used in future research, that their participation was completely voluntary, that they were free to withdraw without penalty at any time, that there were no associated psychological risks or benefits associated with the word ratings, that their responses would remain anonymous and confidential, and that their rating data collected would be stored securely for a 7-year period (see Appendix B).

The raters were given the option of completing a paper copy of the questionnaire (see Appendix C) or an online version at http://cbtc.utoronto.ca/opinio/s?s=302 that was created with Opinio, a web-based software program which is used to create surveys as well as to collect, store and report data. The raters were asked to fill out their demographic information regarding their age, sex, marital status, ethnicity, and education (see Appendix D). Following this section, they

were provided with the words that were generated in the first stage of the stimulus word development and were asked to consider how representative each of the words was of a given concept (e.g., body shape). They were instructed to rate the representativeness of each word on a scale from 1 to 9, with 1 representing '*does not relate to the concept at all*' and 9 representing '*is extremely representative of the concept*'. If a rater was not familiar with the word he/she was instructed to mark DK for '*Don't Know*'. Each of the words generated in the first stage of the stimulus word development was rated for how representative it was of its respective concept. The word-rating task took approximately one hour to complete.

Stage Three. All of the data collected in the second stimulus word development stage was entered into the computer software program Statistical Package for the Social Sciences - Version 11.0 (SPSS - 11.0). As previously mentioned, words were rated on a scale of 1 to 9, with higher scores indicating a greater degree of representativeness for the given concept.

In order to develop a list of words that was highly representative for the concept in question, ratings for a given word were averaged across all of the raters. Prior to analyses, it was decided that only words that were rated on average as 7 or higher would be selected for use in the Stroop task for the main study. Furthermore, it was decided that words that received a response of DK by three or more people (equivalent to 6.98% of the total sample or more) would be excluded, regardless of the average rating the word received, in an attempt to include words that are widely recognized by most people. This only had to be done with the word 'curvaceous', which was rated as DK by three raters. Lastly, in order to ensure that there would be no overlap among the word lists, if a word received an average rating of 7 or higher for more than one concept, it was excluded. This only had to be done with the word 'ice cream', which received an average rating of above 7 for both summer and binge-foods. The five words that received the

highest mean ratings for a concept were chosen to represent that given concept in the modified Stroop task in the main study (see Table 1 for the averaged ratings of final word lists for each concept). Each stimulus word also had a unique neutral word yoked to it that was matched on word length, number of syllables, and part of speech (see Table 2). None of the neutral words reflected the construct under investigation in the study, were positive or negative in valence, or were affective-laden.

Development of Stimulus Images For the EMG Task. The development of stimulus images for the EMG task consisted of three stages.

Stage One. In the first stage, two sets of images were collected. The first consisted of 40 images that were considered to be representative of foods that people are likely to binge eat, as well as non-binge foods. The second set consisted of 64 scenes that were considered to be representative of the seasons (summer and winter). The internet search engine Google was used to obtain a wide assortment of images. A free photo-editing software download from www.picnik.com, was used to ensure consistency in the size dimensions of each image. Furthermore, only food images that were displayed against a white background were used so as to maintain a degree of consistency across the pictures and to reduce possible distractions from stimuli in the backdrops. The two sets of images collected were subjected to rating of concept representativeness (see procedure below).

Stage Two. A total of 35 individuals consisting of Lakehead University students and members of the community were recruited to rate the images for concept representativeness so as to determine the final set of images to be used in the EMG task. Thirteen of the raters were male, and 22 were female. The age of the raters ranged from 17 to 55 years, with an average age of 23.46 years (standard deviation = 6.30). Twenty-one of the raters indicated that they were

students, whereas 14 stated that they were not enrolled in school. Of the 21 raters enrolled in school, three indicated that they were graduate students in Clinical Psychology. Raters were asked to select the highest level of education they have attained from one of the following options: eighth grade or less (n = 1), high school graduate (n = 17), college graduate (n = 3), university graduate (n = 9), or graduate school (n = 3). Two of them did not indicate the highest level of education completed. In terms of ethnicity, 33 raters selected 'White, not of Hispanic origin', one selected 'Aboriginal', and one selected 'Black, not of Hispanic origin'.

Opinio was used to administer the image rating task online at http://cbtc.utoronto.ca/opinio/s?s=303. Raters were told that their ratings would be used to develop image materials to be used in future research. Participation in this stimulus image development stage was completely voluntary and raters were free to withdraw without penalty at any time. There were no associated psychological risks or benefits associated with the rating task. Finally, the raters were informed that their responses would remain anonymous and confidential and that the data collected would be stored securely for a 5-year period (see Appendix E).

Those who chose to partake in the stimulus image development process were asked to fill in their demographic information regarding age, sex, marital status, education, ethnicity, and place of residence (Appendix F). Following this section, the raters were presented with one image of food at a time and were instructed to consider how likely people are to binge eat on the food in the picture on a scale from 1 (*not at all likely*) to 9 (*extremely likely*). They were instructed to select N/A if they did not recognize the food in the picture.

Following the rating of food images, the raters engaged in a similar rating task regarding seasonal images. They viewed a total of 32 scenery images depicting the summer season and

then rated on a scale of 1 (*not representative at all*) to 9 (*extremely representative*) how well they thought each image represented the concept of summer. They also rated an additional 32 scenes depicting the winter season on the same 9-point scale in terms of how well each image represented the concept of winter. This image-rating task took approximately 30 minutes to complete.

Stage Three. All of the data collected was entered into the computer software program Statistical Package for the Social Sciences - Version 11.0 (SPSS - 11.0). The ratings for each image (binge food, non-binge food, winter, summer) were averaged across raters. Keeping in mind that the rating scale for food images asked raters to rate each food image on the likelihood that people would binge eat that food on a scale of 1 (*not at all likely*) to 9 (*extremely likely*), food images with a mean rating of 7 or higher were selected for potential use as binge food pictures in the EMG viewing task. Those with mean ratings of 3 or lower were selected for potential use as non-binge food pictures. To develop the final selection of binge food and non-binge food images for the EMG viewing task, the six images with top ratings were chosen for each of the categories.

Similarly, the ratings for each season image were averaged across all raters. Rating scales ranging from 1 (*not representative at all*) to 9 (*extremely representative*) were used for winter and summer images. Scenes with mean ratings of 7 or higher were selected for potential use as winter and summer images in the EMG viewing task. Among these, 12 final seasonal images (six winter, six summer) were selected to represent a range of seasonal activities. Table 3 displays the mean ratings for the stimulus images used in the EMG task and Appendix G displays copies of the stimulus images.

To prepare the final 24 images (12 food, 12 season) for EMG recordings during the main study, each image was equalized on its spatial-average luminance at 20 cd/m^2 to avoid the influence of participants' reactions by differential brightness of images. The average was assessed with a Prichard spectroradiometer with a 5^0 aperture setting centered on each of the images.

Main Study

Sample description. A total of 126 individuals completed the questionnaire portion of the study. Eighteen participants completed the paper version of the questionnaire and 108 completed the questionnaire online. Of the 126 who submitted the questionnaire, a total number of 85 participants (27 males, 58 females) came into the lab to engage in the experimental tasks (age M = 28.11, age SD = 13.05). Of those who completed the experimental tasks, 52 met the classification criteria for one of the three groups: SAD (n = 16), DE (n = 11), or Control (n = 25). The remaining 33 participants who did not meet the classification criteria were not included in the main analyses. It should be noted that this included four participants who met the criteria for both SAD and DE. The data from these dual diagnoses participants were excluded from the main analyses as these participants could not be classified as belonging to one of the three groups.

Of the 52 individuals (18 males, 34 females) who met the inclusion criteria for one of the three groups, 36 of them were students and 16 were nonstudents. In terms of ethnicity, the majority of participants identified themselves as White (N = 49) whereas two participants were Asian and one self-identified as "Other". The SAD group (age M = 28.62, age SD = 3.42) had a total of 12 females and four males, as well as 10 students and six nonstudents. Two individuals in the SAD group met the criteria for a Major Depressive Episode (MDE) as assessed by the Diagnostic Inventory for Depression. The DE group (age M = 38.91, age SD = 17.55) consisted

of six females and five males, and was comprised of six students and five nonstudents. None of the individuals in the DE group met the criteria for MDE. The Control group (age *M* = 27.80, age *SD* = 13.21) had 16 females and nine males. Of those in the Control group, 20 were students whereas five were nonstudents. The criteria for MDE was not met by anyone in the Control group. The reader is referred to Table 4 for a more comprehensive description of the demographic characteristics of the pooled sample as well as for each of the three groups.

Group classification. The participants were classified into one of the following groups: SAD, DE, or Control. The measures that were used for the classification were the Structured Interview Guide for the Hamilton Rating Scale for Depression – Seasonal Affective Disorder Version – Self-Rating (SIGH-SAD-SR; Williams, Link, & Terman, 1994), Seasonal Pattern Assessment Questionnaire (SPAQ; Rosenthal et al., 1987), Diagnostic Inventory for Depression (DID; Zimmerman, et al., 2004), and the Eating Disorder Diagnostic Scale (EDDS; Stice, et al., 2000). Details on these measures are provided in a later section below.

Participants in the SAD group had a total score of at least 20 on the SIGH-SAD with a minimum of 10 on the 21-item HDRS subscale component and a minimum of 5 on the atypical subscale component. These cutoff scores are in accordance with the large majority of the literature that has used the SIGH-SAD (Goel, Terman, Terman, Macchi, & Stewart, 2005; Rohan et al., 2007; Terman et al., 1996; Terman & Terman, 2006; Terman, Terman, & Ross, 1998) for the identification of SAD cases. It is noteworthy that individuals in the SAD group did not also meet the criteria for the disordered eating group.

The DE group was recruited from the eating disorder program at the Sister Margaret Smith Centre, as well as Lakehead University and the general community. Their classification was accomplished with the EDDS which was used to detect for the presence of bulimia nervosa

(BN), binge eating disorder (BED), or eating disorder not otherwise specified (ED-NOS) as it pertains to BN. It should be noted that those participants classified as DE did not also meet the criteria for the SAD.

Finally, the Control group consisted of individuals with a SIGH-SAD $\leq$ 8 (Eastman, Young, Fogg, Liu, & Meaden, 1998; Goel et al., 2005; Goel, Terman, & Terman, 2003), GSS $\leq$ 7, and negative on the DID and on the EDDS.

Measures. The measures that were used for group classification are described below.

Demographic and General Information (see Appendix H). This portion of the research questionnaire asked the participant to fill in demographic information such as age, sex, marital status, ethnicity, residence, and medication/drug use. It also asked the participant to indicate whether or not they had a problem with colour-blindness.

Seasonal Pattern Assessment Questionnaire (SPAQ; Rosenthal et al., 1987; see Appendix I). The SPAQ is a retrospective self-report consisting of multiple scales designed to measure seasonal variations in mood and behaviour. The scale that is relevant to the present study is the Global Seasonality Score (GSS) that provides a measurement of the degree to which sleep length, appetite, weight, energy, mood, and socialization fluctuate across seasons. Each item is scored from 0 (*no change*) to 4 (*marked change*) and then summed to produce a measure of seasonality which is indicated with the GSS. The GSS can range from 0 to 24. A GSS that falls between 0 and 7 signifies a lack of seasonality and scores of 12 or higher indicate high seasonality. Additionally, the degree to which the individual feels that their functioning is impaired due to seasonal changes is rated on a scale from 0 (*not a problem*) to 5 (*a disabling problem*).

The psychometric properties of the SPAQ have been studied extensively (Magnusson, 1996; Mersch et al., 2004; Raheja, King, & Thompson, 1996). The GSS has been found to have good internal consistency (Cronbach's $\alpha = .85$) and the specificity for the overall measure is very high (94%; Mersch et al., 2004). However, the sensitivity of the SPAQ is not as impressive (44%; Mersch et al., 2004) and it may be inadequate for discriminating between SAD and S-SAD (Magnusson, 1996). However, it should be noted that the participants in Mersch et al. (2004) were assessed during the summertime, which could have some bearing on the outcome of the study. However, despite the criticism it has received the SPAQ continues to be the most widely used instrument in the identification of SAD. For the present study, a GSS ≤ 7 as measured by the SPAQ was used to classify individuals into the Control group.

Structured Interview Guide for the Hamilton Rating Scale for Depression – Seasonal Affective Disorder Version – Self-Rating (SIGH-SAD-SR; Williams et al., 1994; see Appendix J). The SIGH-SAD-SR is a retrospective self-report designed to measure the severity of symptoms of depression. It contains 29 items that inquire about the respondent's functioning in the past week. It is based on the Hamilton Depression Rating Scale – 29 items *(*HDRS; Rosenthal, Genhart, Jacobsen, Skwerer, & Wehr, 1987) and contains 21 items that assess for the presence and severity of typical depressive symptoms that are considered to be more cognitive and affective in nature. It also contains eight addendum items to assess for the presence and severity of atypical depressive symptoms that are vegetative-somatic in nature and characteristic in SAD. Items H1, H2, A1, A6, H9c, A7, H10, H11, H12, H14, H16, H17, and H19, are responded to on a scale that ranges from 0 to 4. Items A3, A5, H6, H13, H15, and H20 are responded to on a scale that ranges from 0 to 3. Items H3, H4, H5, A5, H7, H8, H9, H15, H18, and H21 are responded to on a scale from 0 to 2. Following completion of the measure, the

scores for the 29 items are summed to produce a total score (SIGH-SAD Total), with higher values indicative of a more severe depressive profile. In addition, it is possible to obtain a two other scores obtained by summing the responses to items 1-21 that load on the typical depression symptoms (SIGH-Typical) and items 22-29 that load on the atypical depression symptoms (SIGH-SAD Atypical), respectively.

It is noteworthy that the SIGH-SAD-SR does not have specified cut-off scores for differentiating between high and low depression severity. There has been variation in the cut-off scores used in the literature with Partonen and colleagues (1993, as cited in Mersch et al., 2004) considering a SIGH-SAD score of 19 or higher as being indicative of SAD whereas Moscovitch and colleagues (2004) used a more stringent cut-off score of 22. However, in general, the majority of research tends to require a minimum SIGH-SAD score of 20, in addition to a score of 10 or greater on the 21 typical depression symptom items plus a minimum score of 5 on the eight atypical items (Goel et al., 2005; Rohan et al., 2007; Terman et al., 1996; Terman & Terman, 2006; Terman et al., 1998). A total SIGH-SAD score of 8 or less is typically used to signify the absence of depressive symptoms (Eastman et al., 1998; Goel et al., 2005; Goel et al., 2003).

Bagby, Ryder, Schuller, and Marshall (2004) reviewed 70 studies regarding the psychometric properties of the HDRS and summarized that it is adequate in a number of areas. Estimates for internal consistency range from .46-.97, Pearson's *r* for interrater reliability is between .82 and .98 and test-retest reliability for the overall scale ranges from .81 to .98. The authors also conclude that the convergent, discriminant, and predictive validity of the HDRS are adequate (Bagby et al., 2004). However, Bagby et al. (2004) caution that the interrater and test-retest coefficients for individual items are less impressive and cite poorly designed items that measure an outdated conceptualization of depression to be a major flaw of this scale.

Nonetheless, the HDRS has remained an instrument that is widely used in the identification of depressive symptoms, especially the extended version that incorporates atypical symptoms for use in SAD research.

For the present study, the SIGH-SAD was used to classify individuals into one of the three groups. SAD individuals had a SIGH-SAD Total score $\geq$ 20 with SIGH-SAD Typical $\geq$ 10 and SIGH-SAD Atypical $\geq$ 5. Control and DE individuals needed to have a SIGH-SAD Total score of $\leq$ 8.

Eating Disorder Diagnostic Scale (EDDS; Stice et al., 2000; see Appendix K). The EDDS was developed as a self-report measure designed to assess the DSM-IV diagnostic criteria for AN, BN, and binge-eating disorder (BED). It consists of 22 items in total. The first four items inquire about the individual's concern about their weight and shape. Items 5 through 8 are concerned with overeating and a loss of control experienced during these episodes. The following six items (#9 to #14) inquire about behaviours associated with binge eating. Items 15 through 18 assess the use of compensatory mechanisms to prevent weight gain. Finally, the last four items (#19 to #22) ask about the individual's weight, height, menstrual cycle, and use of birth control.

For the present study, a positive caseness of BN and BED were of particular interest. The criteria for BN are (a) regular eating binges accompanied by a sense of a loss of control and consumption of large amounts of food, (b) regular use of compensatory mechanisms, and (c) undue influence of shape or body weight on the evaluation of oneself. The criteria for BED are (a) regular eating binges accompanied by a sense of loss of control and consumption of large amounts of food, (b) at least three features associated with binge eating on the EDDS items 9 to 13, (c) the experience of marked distress over the binge eating, and (d) absence of compensatory

behaviours. For the present study, the diagnosis of BN or BED was determined by a clinical psychologist. Participants who did not meet the full set of diagnostic criteria for BN or BED but who did meet the criteria for Eating Disorder Not Otherwise Specified (ED-NOS) as it relates to BN were also included in the analyses. This included individuals who met all of the BN criteria except for the fact that the binge eating and inappropriate compensatory mechanisms occurred at a frequency of less than two times a week or had lasted less than three months in duration; use of inappropriate compensatory mechanisms following the consumption of small amounts of food or; repeatedly chewing and spitting out, but not swallowing, large amounts of food (American Psychiatric Association, 2000).

Details concerning the development and scoring of the EDDS items are outlined in Stice et al. (2000). It should be noted that BED is not listed in the DSM-IV as an official disorder due to a lack of sufficient information. Rather, it can be found in the DSM section "Appendix B Criteria Sets and Axes Provided for Further Study" and is accorded its own set of research criteria. BED is relevant to the present study because of its binge eating characteristic which is found in both BN and SAD.

An investigation into the psychometric properties of the EDDS has shown that it has good test-retest reliability (Stice et al., 2000). AN diagnoses had a test-retest kappa coefficient diagnosis of .95 at one week and an overall accuracy rate of .98. The one-week test-retest kappa coefficient for BN diagnoses was .71 and overall accuracy was .91. Lastly, BED diagnoses had a test-retest kappa coefficient of .75 at one week and an overall accuracy rate of .89. The internal consistency of the scale is good (Cronbach's α = .91 and .86 at retest) and the same can be said for the criterion validity [κ = .93(AN), .81 (BN), and .74 (BED)]. Since the initial development and validation of the EDDS, subsequent studies have concluded that the measure is characterized

by strong psychometric properties (Stice, Fisher, & Martinez, 2004). For the present study, individuals in the DE group had to meet the criteria for BN, BED, or ED-NOS pertaining to BN as assessed by the EDDS. Individuals in the SAD and Control group did not meet any criteria for an eating disorder as measured by the EDDS.

Diagnostic Inventory for Depression (DID; Zimmerman et al., 2004; see Appendix L). The DID is a self-report scale that was developed to assess for the symptom inclusion criteria for the DSM-IV (American Psychiatric Association, 2000) major depressive episode, the psychosocial impairment as a result of the depression, and the respondent's subjective quality of life. It has 38 items. The first 23 items tap into symptom severity to assess the DSM-IV inclusion criteria for major depressive episode. The criteria that are compounded (such as hypersomnia or insomnia) are subdivided into single components with a single DID item to assess each component. The next five items (#23 to #28) tap into psychosocial functioning and degree of impairment into different aspects of living. Item 29 looks at the number of days that the respondent has been unable to carry out his/her daily activities. Items 30 through 36 examine the respondent's satisfaction with his/her different areas in his/her life. The final two items look at, respectively, the respondent's satisfaction with his/her life and rating of overall quality of life.

The diagnosis of an individual as suffering from major depression is guided by the DSM-IV-TR algorithm in which the respondent has to meet the required number of inclusion criteria, including the compulsory symptoms of depressed mood and/or anhedonia, which have lasted every day or nearly every day in the previous two weeks. Given that the use of symptom presence and duration of symptoms as case definition of depression has been found to yield the best trade-off between sensitivity (80.1%) and specificity (82.6%; Zimmerman et al., 2004), the researchers intended to use these criteria to identify depression in participants. However, due to

the very low number of clinically depressed participants in the study, the DID was not used in the classification of SAD. However, it was used to rule out the presence of major depression in the Control group.

The DID shows adequate to excellent performance in its internal consistency, test-retest reliability, discriminant validity, convergent validity, and sensitivity to clinical change, and it correlated significantly with a diagnosis of major depressive disorder. Details on the scale development and testing can be found in the study by Zimmerman et al. (2004).

Recruitment of participants. Participants were recruited from Lakehead University, the Sister Margaret Smith Centre, and the general community after obtaining ethics approval from the relevant institutions. Both males and females of at least 18 years of age were invited to participate in the study. Clients from the Sister Margaret Smith Centre of St. Joseph's Care Group, including individuals from the eating disorder program, were invited to participate in the study.

The university population was informed about the study via emails distributed by course instructors, through the university Communication Bulletins (see Appendix M), and through postings around campus (see Appendix N). These recruitment advertisements directed interested individuals to the weblink http://cbtc.utoronto.ca/opinio/s?s=321where they could learn more about the nature of the study as well as complete an online version of the screening questionnaire should they have been inclined to do so. The recruitment notices also provided interested individuals with contact information for each of the researchers. Individuals from the Sister Margaret Smith Centre were informed about the study by postings in the clinic. These recruitment advertisements included contact information for the researchers as well as directed

individuals to the front desk should they have been interested in receiving a paper copy of the questionnaire and/or more information pertaining to the study.

To recruit community participants, notices for the study appeared in the Chronicle Journal Helping Hands section to provide members of the community with information regarding the study (see Appendix M). Furthermore, recruitment advertisements (see Appendix N) were posted on public message boards in places such as grocery stores, restaurants, and community centres. Confederation College also granted permission to post notices on their premises.

Individuals who were interested in the study had the option of filling out a paper copy of the screening research questionnaire or an online version at http://cbtc.utoronto.ca/opinio/s?s=321. Those interested in completing a paper version could pick up a copy outside SN 1003 or could have one mailed to them upon request. The paper copy questionnaire package consisted of a cover page (see Appendix O) that explained the nature of the study, an informed consent page (see Appendix P), the screening research questionnaire (see Appendices I-L), and a debriefing form (see Appendix Q).

The online screening research questionnaire began with an introduction page that provided detailed information about the study. Responses to the online screening were collected and stored with the use of Opinio, which is a secure web-based data collection tool. Prior to engaging in the actual screening questionnaire, participants were required to go over an introduction page describing the nature of the study (see Appendix R) as well as an informed consent form (see Appendix S). Potential participants were told that the researchers were interested in having individuals who were characterized by a wide range of scores on measures of cognitions, emotions, and behaviours partake in the screening questionnaire. Individuals were informed that their participation in the screening questionnaire would be completely voluntary

and that they were free to withdraw without penalty at any time. As a part of the informed consent process, participants were asked to create a personal code. Following the completion of the consent form, participants were then directed to the screening research questionnaire. The use of the personal code ensured that the identity of the participant was not directly linked to his or her research questionnaire, thus ensuring anonymity of their responses. Furthermore, this code allowed the researcher to refer back to participants' consent forms in order to be able to contact them to come into the lab for the experimental portion of the study**.** Participants were then directed to the demographic section (see Appendix H) followed by the research questionnaire consisting of the SPAQ, SIGH-SAD, EDDS, and DID (see Appendices I-L), and finally, the debriefing form (see Appendix Q). This screening research questionnaire took approximately 30 minutes to complete. All participants who took part in the questionnaire portion of the study had their name entered into a random prize draw for a $50 gift certificate redeemable at Wal-Mart. Participants were contacted by the researcher within two days of submitting the questionnaire and were invited to come into the lab to participate in the experimental tasks.

Experimental procedure. Individuals who agreed to participate in the experimental tasks came into the lab one at a time to meet with the researcher and engage in the study. Participants were asked to not eat in the one hour prior to coming into the lab in order to control for the effect of appetite satiation on performance across participants. In order to minimize experimenter bias as well as respect the privacy of the participant, the experimenter was blind to the group classification of each participant. Participants were informed that the purpose of the current research was to assess people's judgment and reaction times in simple computer tasks that featured single words and images.

Prior to beginning any of the experimental tasks, the researcher went over the cover page (see Appendix T) for the study as well as the informed consent form (see Appendix U). Participants were informed that in exchange for their participation they would have their name entered into a draw for one of two $50 gift certificates redeemable at Wal-Mart. Also, those participants who were Introductory Psychology students received one bonus point towards their final grade. After answering any questions the participant had, the researcher dimmed the lights and began the study. The order of experimental tasks completed was as follows: the modified Stroop task, the incidental recall task, and the EMG image-viewing task.

Modified Stroop task. The researcher introduced the participant to the first experimental task, the modified Stroop task. Participants were told that the task was testing their ability to colour-name a word that would be presented briefly on a computer screen. They had to indicate as quickly and accurately as possible the colour that the word was presented in through the use of a colour-coded keypad that had been pre-programmed so that each button represented one of the four colours (red, blue, yellow, green). In order to familiarize the participants with the use of the colour-coded keypad and ensure that they understood the task, they completed a practice run, containing 20 stimuli consisting of solid shapes printed in one of the four colours. The practice trial consisted of a 1,500 millisecond (ms) fixation cross-hair in the middle of a black screen, and a 1,500 ms coloured shape. A 1,500 ms inter-trial interval consisting of a blank black screen separated each trial. Following the practice trial, participants engaged in the test phase.

The modified Stroop task test phase consisted of a total of five categories of stimulus words: winter words, summer words, binge food words, non-binge food words, and body shape words, and a unique neutral control word that was yoked to each stimulus word (see Table 2).

As in the practice trial, each word trial consisted of a 1,500 ms fixation cross-hair followed by a 1,500 ms stimulus word or neutral word presentation. There was a 1,500 ms inter-trial interval with a blank black screen separating each trial. Each word stood approximately 8 cm high on a black background. The stimulus words were printed in one of four colours: red, blue, yellow, green. The order of stimulus word presentation was randomized across all of the word categories. The colour presentation was also randomized with the stipulation that no colour was presented more than twice consecutively. Also, each colour was represented equally in each of the six word categories. Additionally, it was ensured that words belonging to the same condition were presented no more than twice consecutively. Participants used a colour-coded keypad to identify the colour of the stimulus word. The interference effect for each stimulus word was calculated by calculating the difference in response latency measured in ms between each stimulus word and its yoked neutral word. Additionally, the computer was programmed to keep track of any errors made in colour naming. Incorrect responses as well as a failure to respond to a particular item were both classified as errors.

Recall task. Following the completion of the modified Stroop task, participants engaged in an incidental recall test for the words that were presented in the modified Stroop task. Participants were asked to name aloud the words they thought they had seen in the colour-identification task. The computer used had a built-in microphone and the program Audacity was used to record the participants' responses. Once the participant had completed the experimental tasks, the researcher typed out the words listed in the incidental recall task and calculated proportion of accurate recall.

Facial EMG. Following the completion of the recall task, the participant underwent facial EMG while viewing images of food (binge and non-binge) and seasons (winter and

summer) on a computer screen. The researcher attached five Ag-AgCl cup electrodes (10 mm, 1.5 m shielded wire) on the face of the participant. Prior to fastening these electrodes, Nuprep was used to gently abrade the skin. The electrodes were then attached to the face of the participant using two-sided sticky adhesive collars. Medical tape was also used over the electrodes to ensure that they were securely fastened to the participant's face. The electrodes were placed on the face of the participant in accordance with the guidelines for human EMG research, as specified by Fridlund and Cacioppo (1986). Specifically, bipolar electrodes were placed on the left side of the face over the *corrugator supercilli* (*CS*) muscle region and the *zygomaticus major* (*ZM*) muscle region, as well as one in the center of the forehead that acted as a grounding electrode. The ends of the electrodes were plugged into a bipolar touchproof adaptor. This adaptor connected to ANT amplifiers with BIP inputs to record bipolar channels for EMG. In order to achieve conductance, the electrodes were filled with Electrogel, which is a water-soluble gel. The raw EMG signal was amplified by a factor of 20,000 at a sampling rate set at 500 Hz with a high-pass filter set at 30 Hz. The data was separated into trial periods, each of which consisted of one baseline period and one event period that followed immediately after. The data was rectified with an absolute value function and smoothed with a time constant of 10 ms with contour-following integrator. There were two points of interest for the analysis of the EMG data: the difference in total amount of energy between the trial period and its respective baseline period (mean amplitude), as well as difference in the maximum peak amplitude of energy for each trial period compared to peak baseline activity.

For the EMG task, individuals engaged in an image-viewing task that depicted binge foods, non-binge foods, scenes of summer, and scenes of winter, while their facial muscle activity was continuously recorded through the attached electrodes. Participants were informed

that this section of the study was measuring their sweat gland activation response to various images so as to not draw the participants' attention to the true purpose of this task (Sato, Fujimura, & Suzuki, 2008). Participants were also told to avoid moving excessively throughout the task in order to ensure that the electrodes remain securely fastened (Fridlund & Cacioppo, 1986).

A total of 24 pictures were presented, with each of the four categories (binge foods, non-binge foods, summer, winter) containing an equal number of six pictures each (see Appendix G). Each image was approximately the same size (12 cm x 15 cm). The presentation of food and season images was counterbalanced across participants, so that half of the participants in each group viewed the set of food images first while the other half saw the set of seasonal images first. The presentation of images within a given set (food or season) was randomized across participants. Furthermore, the images were presented with the stipulation that no image from the same condition (binge, non-binge, summer, winter) was presented more than twice consecutively.

The task began with the 10,000 ms presentation of a cross-hair on the centre of the screen which participants were instructed to fixate on. After 10,000 ms had passed, an image belonging to one of the four conditions appeared on the computer screen for a total of 10,000 ms. During this time, participants saw the question "How appealing/appetizing is this image to you?" on the computer screen beneath the image, and they were asked to indicate their response on a 5-point Likert scale, ranging from 1 (*extremely unappealing*) to 5 (*extremely appealing*). The word 'appetizing' was used in the rating task for the food images while the 'appealing' was used for the rating of seasonal images. Participants used a handheld keypad to indicate their response. After 10,000 ms had elapsed, the cross-hair re-appeared on the screen for another 10,000 ms

prior to the presentation of the next image. The period of fixating on the cross-hair served as the baseline period for the following stimulus that was presented. Therefore, each cross-hair presentation (baseline) and stimulus presentation (event) pair served as one trial period for the analysis. Following the completion of the EMG task, the participant was thanked and debriefed by the researcher (see Appendix V).

Results

Design

For the present study, the independent variable was Group classification (SAD, DE, Control). The dependent variables (which are described below) were derived from performance on the modified Stroop task, an incidental recall task, facial EMG activity on an image viewing task, and valence ratings assigned in the image rating task.

1. Response latency on the Stroop task was calculated as the difference in response latency (ms) between a stimulus word (body shape, binge, non-binge, winter, summer) and its yoked neutral word. Therefore, positive values indicate that the stimulus words had greater response latency than their yoked neutral words. In instances where a response latency value is negative, it means that performance was actually faster on stimulus words than it was for the yoked neutral words.
2. Proportion error was calculated as the number of incorrect responses and nonresponses divided by the total number of stimulus words in a particular word list (body shape, binge food, non-binge food, winter, summer).
3. Proportion recall accuracy was defined as the number of words (body shape, binge food, non-binge food, winter, summer) accurately recalled from each word list divided by the total number of words in that particular word list.

4. Peak amplitude of facial EMG activity was defined as the maximum amount of activity in microvolts (μV) at a given time during the stimulus presentation (binge food, non-binge food, winter, summer) minus the baseline period activity.
5. Facial EMG mean amplitude was defined as the amount of activity in microvolts (μV) during the stimulus presentation (binge food, non-binge food, winter, summer) period minus the baseline period activity.
6. Valence ratings were defined as the mean of the rating assigned to a particular group of images (binge food, non-binge food, winter, summer) in the image-viewing task.

Software Used in the Statistical Analyses

The computer software program, Statistical Package for the Social Sciences – Version 11.0 (SPSS-11.0) was used to carry out pre-analyses issues (see section titled *Pre-analyses Issues* below) as well as the main analyses (see section titled *Main Analyses*), which included Univariate and Repeated Measures Analysis of Variance, as well as correlations. Additionally, SPSS was used for Multiple Linear Regression which served as supplementary analyses.

Pre-analyses Issues

Univariate outliers. The data was screened for the presence of within-group univariate outliers that could have an undue effect on the results. Univariate outliers are cases with an extreme value on one variable (Tabachnick & Fidell, 2001). Specifically, values that are greater than a *z*-score of $\pm$ 3.29 are considered to be potential outliers. In the present study, standardized scores were computed for all of the raw scores within each group in the data set. Data points that were identified to be outliers were transformed to a raw score that was equivalent to $\pm$3.29 standard score to reduce their influence (Tabachnick & Fidell, 2001). In the entire dataset, there were 26 cases of univariate outliers identified across all of the dependent variables. These

outliers appear to be evenly distributed and are not associated with any one dependent variable in particular.

Normality. Mulitvariate normality is the assumption that each variable and all linear combinations of the variables are normally distributed (Tabachnick & Fidell, 2001). For the present study, histograms were used to assess for normality for each dependent variable within each group. For a number of the variables, the assumption of normality was not violated, and the skewness values were close to zero.

However, there were some variables that were positively skewed, thus violating the assumption of normality. These include *CS* and *ZM* facial muscle activity for binge food images in the SAD group, the proportion error for binge food words and summer words on the Stroop task for the DE group, and the total recall of winter words and *ZM* activity for non-binge food images and summer images for the Control group. One possible means of dealing with skewness is to transform the data (Tabachnick & Fidell, 2001). However, in the present study data transformation was decided against, as it can make interpretation of the data difficult (Tabachnick & Fidell, 2001). Therefore, it is important to note that the validity of the results may be less robust due to some deviations from normality for some of the variables.

Internal Consistency of Scales

The reader is referred to Table 6 for Cronbach's alpha, a measure of internal consistency, for the SIGH-SAD and GSS, as well as for the ratings assigned to the images in the image-viewing task. For the present study, the internal consistency of the SIGH-SAD and the GSS were above adequate with all values exceeding .81 and most exceeding .88 (Cortina, 1993). However, with the exception of the ratings for the winter images, the reliability of the valence ratings for images used in the image-viewing task was rather low ($\alpha < .70$).

Validity of Group Classification

The validity of the group classification was investigated by testing for group differences on the variables that were used to delineate the groups (see Table 5 for within-group and pooled sample descriptive statistics of these variables). An ANOVA performed on the SIGH-SAD Total as a function of Group revealed a significant Group effect, $F(2, 49) = 119.53$, $p < .001$, $\eta^2 = .83$, power > .99. Post-hoc Tukey test revealed that SAD ($M = 29.44$, $SD = 8.41$) scored significantly higher than either DE ($M = 13.36$, $SD = 4.67$) or Control ($M = 3.04$, $SD = 2.17$). Also, DE scored significantly higher than Control.

Separate ANOVAs were also carried out on the typical and atypical subscales of the SIGH-SAD. An ANOVA on the SIGH-SAD Typical subscale as a function of Group revealed a significant Group effect, $F(2, 49) = 76.69$, $p < .001$, $\eta^2 = .76$, power > .99. Post-hoc Tukey test revealed that SAD ($M = 19.62$, $SD = 6.06$) scored significantly higher than both DE ($M = 8.09$, $SD = 4.91$ and Control ($M = 2.44$, $SD = 2.00$). Also, DE scored significantly higher than Control. An ANOVA on the SIGH-SAD Atypical subscale as a function of Group revealed a significant Group effect, $F(2, 49) = 74.77$, $p < .001$, $\eta^2 = .75$, power > .99. Post-hoc Tukey test revealed that SAD ($M = 9.81$, $SD = 3.25$) scored significantly higher than both DE ($M = 5.27$, $SD = 3.20$) and Control ($M = .60$, $SD = .76$). Also, DE scored significantly higher than Control.

An ANOVA that was carried out on the GSS as a function of Group found a significant effect, $F(2, 49) = 27.84$, $p < .001$, $\eta^2 = .53$, power > .99. Post-hoc Tukey test revealed that SAD ($M = 12.44$, $SD = 4.35$) had significantly higher GSS than DE ($M = 8.09$, $SD = 5.03$) and that both SAD and DE scored significantly higher than Control ($M = 3.60$, $SD = 2.43$).

An ANOVA carried out on degree of impairment as measured by the SPAQ revealed a significant effect as a function of Group, $F(2, 29) = 18.78$, $p < .001$, $\eta^2 = .43$, power > .99. Post-

hoc Tukey test revealed that both SAD (M = 1.69, SD = 1.19) and DE (M = 1.00, SD = .89) identified a significantly higher degree of impairment than Control (M = .12, SD = .33). There were no other significant group differences.

Main Analyses

A visual inspection of the data was first undertaken through the use of histograms that displayed the group means and their standard error (*SE*) bars for each of the dependent variables. *SE* bars provide inferential information based on graphically represented data (Cumming & Finch, 2005). In cases where n is at least 10, *SE* bars can be doubled in length to yield confidence intervals of approximately 95%. *SE* bars can also be used to compare two independent means. Cumming and Finch (2005) found that when the gap between the non-overlapping *SE* bars of two groups is at least the size of the average of the two *SE* bars, the mean difference between the two groups is significant at $p < .05$. It is noteworthy *SE* bars can only be used to make inferences for between-subjects comparisons. *SE* bars are irrelevant for making within-subjects comparisons because the relationship between the two means is not taken into consideration (Cumming & Finch, 2005).

Following a visual inspection of the histogram, the data was then subjected to statistical analysis to look for mean group differences. In some cases, ANOVA with Group as the between-subject factor was used, and post-hoc Tukey test was employed to follow up on significant Group effects. In other instances, a mixed-design repeated measures ANOVA was used in which the between-subject factor was always Group (SAD, DE, Control) and the within-subject factor varied depending on the experimental task. Pillai's criterion was used to test for an omnibus effect because of its robustness to smaller sample sizes and unequal n's (Tabachnick & Fidell, 2007). Significant group effects were followed up with post-hoc Tukey tests. Significant within-

subject effects were interpreted with the Huynh-Feldt correction if the assumption of sphericity was violated. The descriptive statistics of the dependent variables are presented in Tables 7 to 12.

The results of the proposed statistical analyses are discussed below. Each section begins with a description of the pattern of results as displayed by the histogram for the dependent variable in question, followed by an interpretation of the presented error bars, and ending with a write-up of the statistical analyses.

Stroop performance: Response latency.

Body shape words. A histogram displaying the group means for response latency for body shape words on the Stroop task shows that SAD and DE both had positive response latency, meaning that they took longer to respond to the body shape words than to the yoked neutral words (see Figure 1). Although SAD latency was longer than DE latency, the *SE* bars for these two groups share quite a bit of overlap, which suggests the differences between these two groups on response latency for body shape words is not significant. The error bars of the SAD and DE groups share no overlap with those of the Control group. In fact, the Control group showed a negative response latency which indicates a faster response times for body shape words than for yoked neutral words. However, the gaps between *SE* bars of any of the three groups are not large enough to suggest a significant difference.

A univariate ANOVA with Group as the independent variable on the response latency of body shape words on the Stroop task yielded no significant findings.

Food words. A histogram displaying the group means for response latency for binge food words and non-binge food words on the Stroop task shows some differences between groups and word type (see Figure 1). SAD and Control have positive mean response times for binge food words indicating a longer response time to these words than to the yoked neutral words. The

response latency for SAD was a little longer than that for Control. The DE group had a very small negative response latency that was close to zero suggesting that its response time to the binge words was only very slightly faster than to the yoked neutral words. There is much overlap between the three groups in terms of their error bars suggesting that a significant group difference is unlikely.

For the non-binge food words, DE has a positive mean response latency whereas SAD and Control both have negative mean response latencies that are very close to zero. Hence, DE took longer to respond to non-binge food words than to yoked neutral words but both SAD and Control were similarly only very slightly faster in their reaction times to non-binge words than to the yoked neutral words. When looking at within-group trends, both SAD and Control took longer to respond to binge words than non-binge words. The reverse was evident for the DE group. There is a considerable amount of overlap between the *SE* bars of the DE group with the other two groups. A repeated measures ANOVA with Group as the between-subjects factor and Food Word Type (binge, non-binge) as the within-subjects factor was performed on response latency. No significant findings were obtained.

Season words. A histogram displaying the group means for response latency for winter words and summer words on the Stroop task indicates different trends for the groups as well as for season word type (see Figure 1). The DE group shows a positive mean response latency for winter words suggesting that it took longer to respond to winter words than to yoked neutral words. Surprisingly, SAD and Control had similar negative mean response latency and therefore were similarly faster in their response time to winter words than to the yoked neutral words. However, although the *SE* bars for the DE group do not overlap with the error bars for the other two groups, the gap between the error bars is not large enough to suggest a significant difference.

With regards to the summer words, the histogram shows that the SAD group has a positive mean response latency whereas both DE and Control have negative mean response latency with DE having a longer latency. SAD therefore took longer to react to the summer words than to the yoked neutral words whereas the opposite pattern was seen for DE and Control with DE being faster than Control. There is some overlap between the SE bars across the three groups for the response latency for summer words.

An examination for within-group trends suggested that both SAD and Control were faster in responding to winter words. The reverse was seen for DE.

A repeated measures ANOVA with Group as the between-subjects factor and Season Word Type (winter, summer) as the within-subjects factor was performed on response latency revealed a significant Group x Word Type effect, $F(2, 48) = 3.92$, $p = .026$, $\eta^2 = .14$, power = .68. In ascending order, the response latency means for the seasonal images across the three groups are: SAD on winter images ($M = -33.46$, $SD = 84.21$), Control on winter images ($M = -32.38$, $SD = 123.02$), DE on summer images ($M = -22.07$, $SD = 74.51$), Control on summer images ($M = -3.37$, $SD = 76.96$), SAD on summer images ($M = 14.70$, SD = 85.27), and DE on winter images ($M = 44.88$, $SD = 75.05$). Figure 2 provides a graphical representation of the response latency for each of the three groups on winter and summer words. The pattern suggests that DE had a longer response latency to winter words than summer words, while the opposite trend seemed to occur for SAD and Control.

To follow up on the significant interaction between Group and response latency of season words, and to determine whether or not the trend observed in Figure 2 was significant, the following tests were conducted. Separate paired *t*-tests comparing winter and summer word response latency were carried out for each group. No significant findings were obtained. Then,

an ANOVA with Group (SAD, DE, Control) as the independent variable was performed on response latency for winter words. No significant effects were found. A similar ANOVA was then performed on response latency for summer words. Again no significant effects were obtained.

Stroop performance: Proportion error.

Body shape words. A histogram displaying the group means for proportion error for body shape words on the Stroop task shows that Control had the highest mean, followed by SAD and finally, DE (see Figure 3). There is much overlap between the *SE* bars for the three groups on this variable.

An ANOVA as a function of Group performed on the proportion of errors on the body shape words did not yield significant results.

Food words. As can be seen in the histogram in Figure 2, SAD had the highest proportion of error for binge food words on the Stroop task, followed by Control and then DE (see Figure 3). The *SE* bars for the three groups all share overlap. With respect to proportion error of non-binge food words, SAD and DE have similar means that are higher than that of the Control group. The *SE* bars amongst the three groups show a high degree of overlap. Within-group examination showed a trend where all three groups made more errors in non-binge food words than binge food words. The discrepancy in proportion error between the binge and non-binge words varies with DE showing the greatest discrepancy and Control the least.

A repeated measures ANOVA with Group as the between-subjects factor and Food Word Type (binge, non-binge) as the within-subjects factor was performed on the proportion error. No significant results were found.

Season words. The histogram in Figure 3 shows that Control has the highest proportion of error for winter words, followed by SAD and then DE (see Figure 2). The *SE* bars for the three groups overlap considerably. With respect to proportion error for summer words, Control has the highest mean, followed by SAD, and finally DE. The error bars overlap considerably for the three groups on this variable. For within-group description of the data, SAD made slightly more errors on summer than winter words, the reverse was seen for Control, and DE showed no difference between winter and summer words.

A repeated measures ANOVA with Group as the between-subjects factor and Season Word Type (winter, summer) as the within-subjects factor on the proportion error did not yield any significant findings.

Incidental recall task.

Body shape words. A histogram displaying the group means for the average number of body shape words accurately recalled shows that SAD had the highest average recall, followed by DE and Control who were very similar to one another (see Figure 4). However, there was considerable overlap between the *SE* bars across these three groups.

A univariate ANOVA with Group as the independent variable was carried out on the proportion of body shape words recalled during the recall task. No significant effect was found.

Food words. A histogram displaying the group means for the average number of binge food words accurately recalled shows that Control had the highest average recall, followed by DE and then SAD (see Figure 4). There was considerable overlap between the SE bars for the three groups. With regards to the group means for the average number of non-binge food words accurately recalled, a histogram shows that SAD had the highest average recall, followed by Control and then DE (see Figure 4). However, these differences do not appear to be significant as

the SE bars overlap with one another. Within-group examination shows a pattern of both DE and Control having better recall of binge words than for non-binges whereas no difference was seen for the SAD group.

A repeated measures ANOVA with Group as the between-subjects factor and Food Word Type (binge, non-binge) as the within-subjects factor was performed on the proportion of food words that were accurately recalled. Results did not show a significant effect.

Season words. A histogram displaying the group means for the average number of winter words accurately recalled shows that SAD had the highest average recall, followed by DE and then Control (see Figure 4). However, these differences do not appear to be great and the error bars overlap a fair amount. With respect to the average number of summer words accurately recalled, DE had the highest recall rate followed by Control and then SAD (see Figure 4). The gap between the *SE* bars of the DE and SAD groups is not large enough to suggest a significant difference. Within-group variations suggest that SAD recalled winter words better than summer words, the reverse was seen for the DE group, and the Control group showed no preferential recall for either winter or summer words.

A repeated measures ANOVA with Group as the between-subjects factor and Season Word Type (winter, summer) as the within-subjects factor was performed on the proportion of season words that were accurately recalled. Results did not show a significant effect.

EMG Activity – Mean amplitude.

***Food images*.** A histogram displaying the group means for the *CS* mean amplitude in response to binge food images shows that SAD had the highest mean, followed by DE and then Control (see Figure 5). The same pattern was found for the non-binge food images (see Figure 5). For both variables, the *SE* bars were not separated by gaps large enough to indicate

significant differences. Within-group examination of the graphical data suggests very little difference in *CS* mean amplitude between binge and non-binge food images for all three groups.

A repeated measures ANOVA with Group as the between-subjects factor and Food Image Type (binge, non-binge) as the within-subjects factor was carried out on the *CS* mean amplitude. No significant effects were found.

A histogram displaying the group means for the *ZM* mean amplitude in response to binge food images shows that SAD had the highest mean, followed by DE and then Control (see Figure 6). The same pattern was found for the non-binge food image (see Figure 6). In all cases, the *SE* bars were not separated by gaps large enough to indicate significant differences. SAD had a higher *ZM* mean amplitude in response to non-binge food images than binge food images, whereas the opposite trend was observed for the other two groups.

A repeated measures ANOVA with Group as the between-subject factor and Food Image Type (binge, non-binge) was performed on the *ZM* mean amplitude. No significant effects were found.

Season images. A histogram displaying the group means for the *CS* mean amplitude in response to winter images shows that the three groups were almost identical (see Figure 5). The same pattern was found for the summer images (see Figure 5). Within-group examination of the graphical data suggests that all three groups appear to respond similarly to winter images and to summer images.

An ANOVA with Group serving as the between-subjects factor and Season Image Type (winter, summer) as the within-subjects factor was carried out on the *CS* mean amplitude. No significant effects were found.

A histogram displaying the group means for the *ZM* mean amplitude in response to winter images shows that SAD had the highest mean, closely followed by DE, and then by Control (see Figure 6). The same pattern was found for the summer images (see Figure 6). The *SE* bars do not suggest a significant group effect. An inspection of the graphical data suggests that both SAD and DE made little distinction between winter and summer images in their *ZM* mean amplitude whereas Control had a higher *ZM* mean amplitude for summer images than for winter images.

A repeated measures ANOVA with Group serving as the between-groups factor and Season Image Type as the within-groups factor was carried out on the *ZM* mean amplitude. No significant effects were found.

EMG Activity – Peak amplitude.

Food images. Figure 7 which presents group means for the maximum *CS* peak amplitude activity in response to binge food images shows that SAD had the highest mean, followed by Control and then DE. Similarly, SAD showed the highest peak amplitude responses for the non-binge food images, followed by DE and Control. SAD had slightly higher peak amplitude for non-binge food images than for binge food images, whereas the reverse was seen for DE and Control groups. However, the *SE* error bars for both image types and for all three groups shared a fair amount of overlap with one another. Within-group variation shows that SAD had higher *CS* peak amplitude for non-binge food images than for binge food images, whereas the reverse pattern was seen for DE and Control.

A repeated measures ANOVA with Group as the between-subject factor and Food Image Type (binge food, non-binge food) was carried out on the *CS* peak amplitude. No significant effects were found.

A histogram displaying the group means for the maximum *ZM* peak amplitude activity in response to binge food images shows that SAD had the highest mean followed by DE and Control who did not differ from each other (see Figure 8). The *SE* error bars for the SAD group do not share any overlap with those for DE or Control. Similarly, SAD has the highest mean for non-binge food images, followed by Control and then DE (see Figure 8). Once again, the *SE* bars for the SAD group do not overlap with those of DE or Control. Within-group variation shows that both SAD and Control (to a lesser degree) had higher *ZM* peak amplitude for non-binge food images than for binge food images, whereas the reverse pattern was seen for DE

A repeated measures ANOVA with Group as between-subject factor and Food Image Type carried out on the *ZM* peak amplitude revealed a significant effect as a function of Group, $F(2, 49) = 3.84$, $p = .028$, $\eta^2 = .13$, power = .67. Post-hoc Tukey test revealed that SAD ($M = 58.29$, $SD = 65.26$) was characterized by significantly higher *ZM* peak amplitude than Control ($M = 25.89$, $SD = 22.00$) for food images. However, no significant within-group differences were found.

Season images. A histogram displaying the group means for the maximum *CS* peak amplitude in response to winter images shows that SAD had the highest mean, followed by DE and then Control (see Figure 7). Similarly, SAD had the highest mean in response to summer images, followed by Control and then DE (see Figure 7). Within group examination showed similar trends for SAD and DE where the *CS* peak amplitude for winter images was only slightly higher than for summer images, whereas Control had higher *CS* peak amplitude for summer images than for winter images. However, the *SE* bars for each image type share a fair amount of overlap across the three groups.

A repeated measures ANOVA with Group serving as the between-subjects and Season Image Type (winter, summer) as the within-subjects factor was carried out on the *CS* peak amplitude. No significant effects were found.

A histogram displaying the group means for the maximum *ZM* peak amplitude in response to winter images shows that SAD had the highest mean, followed by Control who had a slightly higher mean than DE (see Figure 8). The same pattern was also shown for peak amplitude in response to the summer images (see Figure 8). The *SE* bars for the seasonal images in the SAD group do not share any overlap with those of DE or Control but the gap is not large enough to indicate a significant difference. Within-group examination of Figure 8 shows that all three groups had higher *ZM* peak amplitude for summer than for winter images, with the most discernible discrepancy in season images for SAD, followed by DE and finally by Control.

A repeated measures ANOVA with Group serving as the between-subjects factor and Season Image Type (winter, summer) as the within-subjects factor was also carried out on the *ZM* peak amplitude. No significant effects were found.

Image Valence Ratings.

Food images. A histogram displaying the group means for the average valence ratings do not suggest any apparent group differences in terms of valence ratings for binge or non-binge food images (see Figure 9). All three groups appear to rate binge foods as more appetizing than non-binge foods.

A repeated measures ANOVA with Group as the between-subject factor and Food Image Type (binge, non-binge) as the within-subject factor revealed a significant effect for Food Image Type, $F(1, 49) = 12.13$, $p = .001$, $\eta^2 = .20$, power = .93, with binge food images receiving

significantly higher ratings (M = 3.48, SD = .10) than non-binge food images (M = 2.87, SD = .11). However, no significant effects as a function of Group were found.

Season images. A histogram displaying the group means for the average valence ratings for seasonal images revealed only slight group differences, with SAD assigning slightly lower ratings to both summer and winter images than the other two groups who were similar to each other in their ratings (see Figure 9). However, the *SE* bars share overlap, suggesting that group differences are negligible.

A repeated measures ANOVA on the valence ratings with Group as the between-subject factor and Season Image Type (winter, summer) as the within-subject factor revealed a significant effect for Season Image Type, $F(1, 49) = 4.98$, $p = .03$, $\eta^2 = .92$, power = .59, with summer images receiving significantly higher ratings (M = 3.31, SD = .08) than winter images (M = 2.97, SD = .13). However, no significant effect as a function of Group was found.

Correlations Between Image Valence Ratings and EMG Activity. In order ascertain the association between the psychophysiological recording data and the valence ratings of images seen in the EMG task, within group bivariate correlations were computed between the EMG activity (*CS* peak amplitude, *ZM* peak amplitude, *CS* mean amplitude, *ZM* mean amplitude) for the images (binge food, non-binge food, winter, summer) with the valence ratings of the same images. The analyses showed that the *ZM* mean amplitude for summer images within the DE group was significantly correlated with the valence ratings assigned to the same summer images, $r(9) = .70$, $p = .016$. No other correlations were found to be significant.

Supplementary Analyses

It is notable that of the 85 participants who completed the experimental tasks, only 52 could be classified into one of the three groups based on their scores on the classification

measures. Of the 33 participants whose data were excluded from the main analyses were four individuals who met the classification criteria for both SAD and DE. Supplementary regression analyses were therefore run in an attempt to utilize all of the collected data, including the four cases of 'dual diagnosis' to determine whether differences in findings might emerge with the addition of 33 more participants. This strategy utilizes a continuum paradigm to see which of the underlying classification dimensions (depression scores, seasonality scores, disordered eating scores) would predict performance on the experimental tasks.

The scores on the classification measures revealed an inconsistent relationship between participants' scores on the SIGH-SAD and their GSS in that those who had high GSS need not necessarily meet the SIGH-SAD criteria for SAD group classification. Correlations were calculated between the GSS and the three subscales of the SIGH-SAD (Total, Typical, Atypical) within each group to ascertain whether the lack of association between the two measures were consistent for all groups.

Results revealed that GSS was significantly correlated with the SIGH-SAD Total score only for Control, $r(23) = .44$, $p = .029$. No other correlations were significant. This suggests that the GSS (a measure of seasonality) and the SIGH-SAD Typical (a measure of the typical depression symptoms in SAD) and SIGH-SAD Atypical (a measure of the atypical depression symptoms in SAD) were tapping into different constructs. Therefore, it was reasoned that regression analyses could be used to determine the unique contribution of SIGH-SAD Typical, SIGH-SAD Atypical, and the GSS to the prediction of performance on the experimental tasks. A supplementary analysis was therefore undertaken.

For the additional analyses, GSS, SIGH-SAD Typical score, SIGH-SAD Atypical score, and whether or not a person met the criteria for DE as determined by the EDDS were entered as

predictors at the first step with performance on the experimental task serving as the dependent variable for each of the analyses. With the exception of DE criteria which was a categorical variable (Yes / No), the rest of the predictors were continuous variables. Two-way interaction terms among GSS, SIGH-SAD typical, SIGH-SAD atypical, and DE were then entered at the second step. The predictor variables for the purpose of the regression analyses will be referred to as follows: GSS, SIGH-SAD typical, SIGH-SAD atypical, and DE.

Because the data from the total pooled sample ($N = 85$) was used in the supplementary analyses, the entire sample was checked for univariate outliers. Standardized scores were calculated to identify univariate outliers for each of the dependent variables and data points that were identified to be outliers were transformed to a raw score that was equivalent to ± 3.29 standard score to reduce their influence (Tabachnick & Fidell, 2001). Normality was checked with histograms. The results of the supplementary regression analyses findings for each dependent variable are reported below.

Stroop Performance: Response Latency

Body shape words. A linear regression was run on response latency for body shape words on the Stroop task as the criterion variable with the following entered as predictor variables at the first step: GSS, SIGH-SAD Typical, SIGH-SAD Atypical, and DE. Two-way interaction terms among GSS, SIGH-SAD Typical, SIGH-SAD Atypical, and DE were then entered at the second step. No significant results were obtained. The same regression was repeated on binge food words, non-binge food words, summer words, and winter words. No significant results were obtained.

Stroop Performance: Proportion Error

The proportion error is defined as the total number of incorrect responses plus non-responses divided by the total number of words in the category. However, it is possible that making incorrect responses is not necessarily the same as making no response at all. Incorrect responses were defined as pressing a coloured key that was incongruent with the colour of the stimulus whereas a nonresponse was defined as failing to press any of the coloured keys for a particular stimulus. Therefore, the analyses on proportion error as reported below reflect three types of proportion error. The first is the total proportion error which is computed on the basis of (incorrect responses + nonresponses) / total number of words in the category. The second is proportion of incorrect responses which is computed on the basis of incorrect responses / total number of words in the category. The third is the proportion of nonresponses which is calculated on the basis of nonresponses / total number of words in the category.

Separate regression analysis were run on the following criterion variables: total proportion error for body shape words, total proportion error for binge food words, total proportion for non-binge food words, total proportion error for summer words, total proportion error for winter words. The predictors were GSS, SIGH-SAD Typical, SIGH-SAD Atypical, DE and all two-way interactions among them. No significant effects were obtained in any of the analyses.

Separate regression analysis were the run on the proportion of incorrect responses for body shape words, binge food words, non-binge food words, summer words and winter words. As before, the predictors were GSS, SIGH-SAD Typical, SIGH-SAD Atypical, DE and all two-way interactions among them. No significant effects were found.

Separate regression analyses were run on the proportion of nonresponses for body shape words, binge food words, non-binge food words, summer words and winter words. The

predictors were GSS, SIGH-SAD Typical, SIGH-SAD Atypical, DE and all two-way interactions among them. The one analysis that showed a significant finding was on non-binge food words, (ΔR^2 = .12, ΔF = 2.65, p = .039) with SIGH-SAD Atypical (β = .48, t = 2.63, p = .01) as a significant predictor. None of the other predictor variables were significant.

Incidental Recall Task

Separate regression was run on the proportion of accurate recall for body shape words, binge food words, non-binge food words, winter words, and summer words. The predictor variables were GSS, SIGH-SAD Typical, SIGH-SAD Atypical, DE, and their two-way interaction terms. None of the analyses showed significant findings.

EMG Activity – Mean Amplitude

Separate regression analyses were performed on the *CS* peak amplitude for binge food images, non-binge food images, winter images, and summer images. The predictors were GSS, SIGH-SAD Typical, SIGH-SAD Atypical, DE, and their two-way interaction terms. No significant effects were found. Similarly, no significant effects were observed for the same type of regression analyses performed on the *ZM* peak amplitude.

EMG Activity – Peak Amplitude

Separate regression analyses were performed on the *CS* peak amplitude for binge food images, non-binge food images, winter images, and summer images. The predictors were GSS, SIGH-SAD Typical, SIGH-SAD Atypical, DE, and their two-way interaction terms. No significant effects were found.

The same regression analyses were then run on the *ZM* peak amplitude. The results showed significance for *ZM* peak amplitude in response to binge food images, (ΔR^2 = .12, ΔF = 2.65, p = .04) with SIGH-SAD Atypical as the significant predictor (β = .46, t = 2.52, p = .014).

None of the other predictor variables were significant. SIGH-SAD Atypical score and *ZM* peak amplitude correlated significantly for binge food images, $r(81) = .30$, $p = .006$.

Another significant effect was seen for *ZM* peak amplitude in response to non-binge food images, ($\Delta R^2 = .13$, $\Delta F = 2.83$, $p = .03$) with SIGH-SAD Atypical as the significant predictor ($\beta = .45$, $t = 2.44$, $p = .017$). None of the other predictor variables were significant. There was a significant correlation between SIGH-SAD Atypical and *ZM* peak amplitude for non-binge food images, $r(81) = .30$, $p = .007$.

A third significant effect was observed for *ZM* peak amplitude in response to winter images, ($\Delta R^2 = .17$, $\Delta F = 2.81$, $p = .031$) with SIGH-SAD Atypical ($\beta = .50$, $t = 2.70$, $p = .008$) and DE ($\beta = .24$, $t = 2.06$, $p = .043$) as the significant predictors. None of the other predictor variables were significant. A significant correlation between SIGH-SAD Atypical and *ZM* peak amplitude for winter images, $r(81) = .27$, $p = .013$, was observed.

Image Valence Ratings

Separate regression analyses were performed on the image valence ratings for binge food images, non-binge food images, winter images, and summer images. The predictors were GSS, SIGH-SAD Typical, SIGH-SAD Atypical, DE, and their two-way interaction terms. No significant effects were found.

Discussion

Overview of the Present Study

The present study was carried out for the purpose of studying the cognitive profiles and psychophysiological reactions of individuals with symptoms of seasonal depression (SAD) and individuals with disordered eating (DE) and gaining insight into how these areas might differentiate between the two groups. A control group consisting of healthy individuals was

included for comparison. A modified Stroop task using body shape words, food words (binge and non-binge), and season words (winter, summer) as well as an incidental recall task subsequent to the modified Stroop task were used to compare the cognitive profiles of the groups. Measurement of facial electromyography (EMG) during an image-viewing task of food (binge, non-binge) and seasons (winter, summer) was used to assess psychophysiological reactions over the facial muscle regions of the *corrugator supercilli* and the *zygomaticus major*. The images were rated on their valence of appeal (season images) or appetizing (food images).

Attentional Bias

Hypotheses 1 and 2 both dealt with cognitive processes and attentional bias. As mentioned previously, it is generally accepted that the emotional states and behaviours of an individual are the by-product of that person's cognitive processes (Beck & Clark, 1988). Beck's cognitive theory (CT) proposes that maladaptive cognitive processes are at the root of psychological problems. However, this is not to say that all psychopathology can be summarized with just a few general maladaptive cognitions; rather, the idea is that each psychological disorder is characterized by a distinct set of cognitive processes, which thereby forms the basis of the content-specificity hypothesis (Beck & Clark, 1988). This set of cognitive processes sets the stage for the way in which in individual perceives and reacts to the world around them, thus forming the basis of schema (Beck & Clark, 1988).

For the purpose of this project, the interest was in comparing and contrasting the schemas and information processing systems of SAD and DE individuals. Two experimental tasks (modified Stroop task and incidental recall task) were used to shed light on the cognitive processes of SAD, DE, and control individuals. Both of these tasks provide a measure of attentional bias, which provides one with an indication of information-processing and schema.

Hypothesis 1 stated that SAD would show a greater attentional bias toward the seasonal words than DE who would demonstrate this pattern to a greater extent than Control. Attentional bias was defined as increased response latency for seasonal words on the Stroop task as well as an increased proportion of error for the winter and summer words on the Stroop task. Also, a greater recall of seasonal words on the incidental recall task was also characteristic of demonstrating attentional bias. Hypothesis 1 was not supported. While statistical tests indicated that the groups differed in their response latency to summer versus winter words, follow up tests could not find the source of the significance. When the group means on response latency to winter words are examined, the SAD individuals actually had the fastest response times for the winter words which is contrary to Hypothesis 1. Furthermore, the three groups did not differ on the proportion of errors that they made on the Stroop task or on the proportion of accurate recall on the incidental recall task.

The lack of support for the first hypothesis is unexpected because it has been shown that SAD individuals do show increased response latency for words of a seasonal nature (Spinks & Dalgleish, 2001). However, it is possible that the seasonal words used in the present study might not be the most schematically relevant stimuli for SAD individuals. For example, SAD has been shown to display an interference effect for words of a depressive or dark-related nature (Sigmon et al., 2007). Also, Spinks and Dalgleish (2001) found that in addition to increased response latencies for seasonal words, SAD took significantly longer to respond to words that were classified as negative emotional. The present study did not include any words that were of a negative emotional nature. Therefore, it is possible that the results failed to show significant differences because the seasonal content in the present study was not tapping into the SAD schema. However, it is notable that SAD individuals have been found to show increased

response latency on the Stroop task during winter as well as during the summer when their symptoms have remitted (Spinks & Dalgleish, 2001), suggesting that the seasonal words are tapping into an underlying schema in SAD. Therefore, it is possible that seasonal items are schematically relevant for SAD individuals, but that the particular words used in this study were not the optimal set of words. The set of words included in the Stroop task were derived from a pilot study conducted by the researchers. The individuals who participated in the pilot study ranked words on how representative they felt each word was of a given concept (i.e., winter) and then the words with the highest overall mean ratings were included in the Stroop task. Those who participated in the pilot study were not asked to provide any information pertaining to their seasonal patterns. Therefore, it is possible that the pilot study group was comprised mostly of individuals with mild seasonal variations and that the words most relevant to a SAD schema were not selected.

It is also possible that methodology played a role in the lack of support for Hypothesis 1. The administration of the Stroop task varies across studies. For the present study, participants were given up to 1,500 milliseconds to identify the colour of the stimuli on the screen. If a response was not made within 1,500 milliseconds, the stimuli would automatically change to the next word. However, it is possible that this was too short of a time for participants to make their response and that perhaps longer response times would have been observed had participants not been cut off at the 1,500 ms mark. There have been some studies that have allowed participants up to 2,400 ms to make a response (Markela-Lerenc et al., 2006), while others do not allow as much time and set a cut-off time of 1,500 ms (Braet & Crombez, 2003; Coffey, Berenbaum & Kerns, 2003).

An additional methodological limitation that could possibly explain the lack of significant findings could be the way in which the words were presented in the Stroop task. For the present study, the words in the Stroop task were presented in a random order, with the words of different categories intermixed. This approach to stimuli presentation is very common across the literature (e.g., Coffey et al., 2003; Markela-Lerenc et al., 2006). However, it has been suggested that greater attentional bias might be observed when the words of a certain category are presented in blocks (Braet & Crombez, 2003; Williams et al., 1996). Therefore, it is a possibility that the pattern of results may have been different had the words in the Stroop task been presented in a blocked format.

Hypothesis 2 stated that DE would show a greater attentional bias toward the body shape words and the binge food words than SAD who would demonstrate this pattern to a greater extent than Control. With regards to the body shape words, hypothesis 2 was not supported with any significant findings. This is surprising because the Stroop task has been used extensively within the area of eating disorder research and results have consistently shown that an attentional bias is present for words related to body shape in bulimic populations (Carter et al., 2000; Davidson & Wright, 2002; Dobson & Dozois, 2004; Fairburn et al., 1991) as well as anorexic individuals (Dobson & Dozois, 2004). It is a possibility that the heterogeneous nature of the DE group in the present study affected the outcome of the results. This group was composed of individuals who met the criteria for bulimia nervosa, binge eating disorder, and eating disorder (bulimia nervosa) not otherwise specified. Therefore, it is important to consider that alternative outcomes may have been obtained had the DE group been more homogenous in nature. Moreover, this group had only 11 individuals which could have reduced the power of the statistical tests to detect a significant result.

An additional explanation for why no significant findings resulted for the body shape words could have to do with the words that were included in the body shape category. For the present study, words that pertained to fatness as well as thinness were included in the body shape category. While Hunt and Cooper (2001) found that individuals with bulimia nervosa had higher recall rates for thin-related and fat-related words, other studies have found a memory bias in individuals with eating disorders for fat-related words only (Sebastian et al., 1996). Therefore, it could be beneficial for future research to look at fat-related and thin-related words as distinct categories, to see how performance may differ between the two.

With regards to the binge food words, hypothesis 2 was not supported. This is surprising given that past research has found disordered eating individuals to display longer response latency for words that are food-related in nature (Channon et al., 1988; Dobson & Dozois, 2004). It should be noted that the study by Channon and colleagues (1988) compared performance on the Stroop task between anorexic individuals with controls and found greater interference for food words. The current study did not include anorexic individuals in the group. However, two meta-analyses (Brooks et al., 2011; Dobson & Dozois, 2004) found that bulimic individuals had greater interference for food-words (ES of .46 and .59, respectively) than anorexic individuals (ES of and .23 and .20, respectively). Therefore, it is puzzling as to why an increase in response latency for food-words was not displayed by the DE group in the present study.

As suggested above, the lack of differences across group performance might lie in the stimuli used in the Stroop task and how it was generated. That is, it might be the case that although the words used in the Stroop task are representative of the concept in question (i.e., body shape), they might not be the best fit for that concept. Given that the pilot study participants were not asked to provide any information regarding their eating attitudes and behaviours, it is

not possible to say whether individuals with maladaptive eating patterns were included. It is a possibility that the pilot study group was not representative of the populations who partook in the experimental tasks, and that because of this, the words generated by the pilot study are not the most schematically relevant for DE individuals. However, it is noteworthy that the literature was reviewed extensively and many of the words that have appeared in past research were used in the body shape and binge food categories.

Furthermore, as mentioned above, factors such as the cut-of time off time and stimuli presentation format for the Stroop task are possible methodological limitations. It is plausible that a different pattern of results would have emerged had some changes to the methodology been made.

It is also surprising that differences in recall were not found. A recent study found that individuals with binge eating disorder were found to display a memory bias for negatively valenced shape/weight related words compared to positively valenced words with and without body-related content and negatively valenced words not relating to body shape (Svaldi, Bender, & Tuschen-Caffier, 2010). Additionally, the disorder was characterized by decreased recall rates for positively valenced weight/shape words compared to overweight controls. It is noteworthy that in the present study did not divide the body shape words into separate positive and negative valenced categories, but rather included all body shape words (whether positive or negative in nature) in one category. Conversely, a recent meta-analysis found that memory bias for food words was more prominent in individuals who restrict their eating (i.e., anorexic or restrained eaters) compared to bulimic individuals (Brooks et al., 2011). It is important to point out that in the present study the disordered eating group did not consist of any individuals who met criteria for anorexia nervosa.

Psychophysiological Reaction

Hypotheses 3 and 4 dealt with the psychophysiological reactions in an EMG task in response to various seasonal images as well as images of food. Psychophysiological responses have been said to be able to provide information on psychological processes and for the purpose of this study, the psychophysiological response that was of interest was facial EMG activity. Facial activity is regarded as an indicator of affect, with increases in *corrugator supercilli* activity resulting from exposure to unpleasant stimuli and increases in *zygomaticus major* activity resulting from exposure to pleasant stimuli (Achaibou et al., 2008; Sirota & Schwartz, 1982). For the purposes of the present study, differences in *corrugator supercilli* and *zygomaticus major* activity in response to season and food images across SAD and DE individuals were of interest.

The EMG data was obtained for each image type (binge, non-binge, summer, winter). The mean amplitude and maximum peak amplitude were measured.

Hypothesis 3 stated that DE would show a greater negative psychophysiological reaction to images of binge foods than SAD or Control and SAD would demonstrate a stronger reaction than Control. This hypothesis was not supported as DE did not display any significant EMG patterns in response to food images that set them apart from the other two groups. This finding is unexpected given that previous research has demonstrated that bulimic individuals have shown an increase in *corrugator supercilli* activity in response to food cues, compared to controls (Mauler et al., 2006). However, not unlike the findings of Mauler and colleagues (2006), the present study did find that DE, SAD, and controls assigned similar 'appetizing' ratings to the food images, with the binge food images receiving significantly higher ratings than the non-binge food images.

One finding that stood out was that SAD showed heightened *zygomaticus major* activity in response to images of food. The *ZM* is the muscle that elevates the lips when smiling and increases in *zygomaticus major* activity are typical following exposure to pleasant stimuli (Achaibou et al., 2008; Dimberg et al., 2002; Larsen et al., 2003). Therefore, it appears as though the SAD group found the food images pleasant, thus resulting in significantly higher peak levels of *zygomaticus major* activity. Due to the fact that SAD individuals characteristically experience weight gain and changes in food preference during fall and winter months (Kasper, Wehr, et al., 1989), it is not surprising to discover that they exhibit a psychophysiological reaction to images of food that set them apart from the Controls. However, it is surprising that the DE group did not show any significant EMG patterns, given the fact that food and eating is a defining component of their clinical symptoms.

Hypothesis 4 stated that SAD would show a greater negative psychophysiological reaction to images of winter scenes than DE or Control and DE would demonstrate a stronger reaction than Control. This hypothesis did not receive support as there were no significant differences between the groups on facial muscle activity for winter or summer images. This finding is surprising given that research has shown that SAD individuals are characterized by unique psychophysiological reactions to that set them apart from controls and nonseasonally depressed individuals (Rohan et al., 2003; Sigmon et al., 2007). However, it is noteworthy that previous studies that have measured psychophysiological reactions in SAD individuals have done so by taking measures of skin conductance (Rohan et al., 2003; Rohan et al., 2004; Sigmon et al., 2007). To the best of the researchers' knowledge, this is the first study to measure facial EMG activity in SAD.

The lack of significant findings may also be partially accounted for the methodology used in the current study. Participants viewed seasonal images one at time and were asked to assign a rating to each image in response to the question 'How appealing do you find this image?" It should be noted that the summer images did receive higher mean ratings than the winter images, with no differences existing between the groups. It is possible that the participants were looking at the images on more of a superficial level, and were therefore not affected by the image as much as they could have been due to a lack of self-referential wording in the task instructions. For example, it seems plausible that had the participants been asked to think of how much they themselves would enjoy being in the particular situation depicted by the image, that their psychophysiological reactions would have differed from the situation where they are asked to simply look at the image and rate it on how pleasant they find it. Therefore, it seems possible that a person who dislikes winter could still find an image of winter appealing, but when asked to imagine themselves in that actual winter scene they could find themselves experiencing a much more adverse reaction.

An additional explanation for why no group differences were found could lie in the group composition itself. Past studies have found that EMG patterns differentiate clinical from non-clinical populations (Gehricke & Shapiro, 2000; Schwartz et al., 1978; Schwartz et al., 1976; Sloan et al., 2002). In the present study, the SAD group was comprised of primarily of subclinical cases, due to a small sample size. It is plausible that the heterogeneity of the group can account for lack of difference in EMG activity between the groups.

Additional Findings

Supplementary analysis with the entire database, which included the three groups as well as the participants who were not classified into groups, was carried out to determine the degree

to which seasonality, the typical depression symptoms, the atypical depression symptoms and presence/absence of disordered eating could predict performance on the experimental tasks. Some interesting findings were found.

To begin with, increased *zygomaticus major* peak amplitude in response to binge food images was determined to be associated with higher atypical depression scores which cover vegetative-somatic symptoms such as appetite and food cravings. Therefore, it is not surprising that individuals who report the most prominent changes in eating patterns exhibit the strongest psychophysiological reactions to images of binge foods. Furthermore, the atypical depression items ask specifically about increased food cravings for sweet and starchy foods, which are not unlike the foods classified as binge foods in the present study (french fries, cookie, chocolate, nachos, cupcakes, and potato chips).

The findings also revealed that higher atypical depression scores was associated with an increase in *zygomaticus major* peak amplitude in response to images of both binge and non-binge foods. Therefore, it appears as though individuals who had greater severity of vegetative-somatic depression symptoms respond more to food (binge and non-binge images) in a facial muscle region that is normally associated with pleasant affect. This corresponded to the valence ratings of the food images in which the non-binge foods average (M = 2.89) fell around the middle of a 5-point scale which assessed the degree of appetizing, and the binge food averaged higher (M = 3.43) towards the more appetizing end. In other words, none of the food images were deemed to be unappetizing. As stated above, this finding is not surprising given that the atypical subscale of the SIGH-SAD assesses individuals' reported changes in eating and appetite, with higher scores indicating recent, profound changes in eating habits and appetite.

It was also found that the individuals with more severe atypical depression symptoms responded to winter images with higher peak amplitude in the *zygomaticus major* muscle region when compared to individuals with less severe atypical depression symptoms. This finding is somewhat unexpected because individuals experiencing a high degree of the atypical vegetative-somatic symptoms, such as often seen in cases of SAD, would be more likely to show adverse reactions to images of winter, rather than increases in *zygomaticus major* activity that generally is the result following exposure to pleasant stimuli. That being said, it is important to note that having these vegetative-somatic symptoms does not automatically indicate the presence of seasonal depression. Thus, the individuals in the present study who present with high levels of atypical depression scores need not necessarily have SAD.

It was also found that individuals with disordered eating also showed higher peak amplitude in the *zygomaticus major* muscle group in response to winter images when compared to those with no disordered eating. This observation is unexpected and difficult to explain. It is noted that this finding is similar to the one involving atypical depression symptoms. As already mentioned above, individuals with more severe atypical depression symptoms had higher peak amplitude in their *zygomaticus major* muscle group when viewing winter images than did those with less severe atypical depression symptoms. Given the high comorbidity between eating disorders and SAD (Blouin et al., 1992; Lam et al., 1996), it does seem plausible that having higher atypical SIGH-SAD scores or meeting DE criteria would show similar psychophysiological reactions to images of winter.

Finally, it was found that individuals with more severe atypical depression symptoms made more no response to non-binge words in the modified Stroop task than those with less severe atypical depression symptoms. The reason for this is not clear.

Summary

Individuals with symptoms of seasonal depression can be distinguished from healthy controls on the basis of a higher peak amplitude activity in the *zygomaticus major* muscle region, which is associated with pleasant affect, when viewing images of food. The individuals with disordered eating did not differ from these two groups. The summer images and binge food images were rated more positively by all three groups. Higher atypical depression symptoms were associated with more non-response in the modified Stroop task involving non-binge foods which might indicate stronger interference effect and therefore stronger attentional bias. As well, higher atypical depression symptoms were associated with higher peak amplitude in the *zygomaticus major* muscle region when viewing images of both foods (binge and non-binge) and images of winter scenery. The presence of disordered eating was also associated with higher peak amplitude in the *zygomaticus major* muscle group when viewing winter scenes.

Strengths and Limitations of the Present Study

The present study provides a comparison of SAD, DE and healthy Controls on attentional bias and psychophysiological reactions to both seasonal and eating-related stimuli. The measures used in the study all have strong psychometric properties with the majority of them having a Cronbach's alpha exceeding .81. Furthermore, the group classification appears to be valid, with the three groups displaying significant differences. The severity of both typical and typical depressive symptoms in the SAD group were high, with typical scores equaling at least 10, atypical scores of at least 5, and total SIGH-SAD scores exceeding 20.Additionally, although the GSS and degree of impairment as measured by the SPAQ were not used to classify individuals, SAD was characterized by a significantly higher GSS and degree of impairment compared to the other groups. All of the participants classified in the DE group had a positive caseness on the

EDDS for BN, BED, or ED-NOS. Additionally, those individuals in the control group did not meet the criteria for BN, BED, or ED-NOS on the EDDS and had total scores on the SIGH-SAD that fell below 8. Therefore, it appears that the cutoff scores used in the present study to classify participants into one of the three groups were appropriate. Furthermore, individuals who met the criteria for both SAD and DE were excluded from analyses to ensure homogeneity of the groups.

An additional strength for the present study pertains to the degree of precision that went into selecting the stimuli for the experimental tasks. The words to be used in the Stroop task and the images in the image viewing task were chosen based on a review of the literature followed by conducting a pilot study in order to select stimuli that were considered to be the most representative of their respective categories. As well, the images were controlled for luminance level in case the amount of brightness might have acted as a confound in responding to or rating the images.

There were a number of weaknesses in the study. The most obvious is the reliance on a largely subclinical sample. Although the SAD group had markedly high scores on the SIGH-SAD (mean score of 29.44), they did not meet the criteria for clinical depression either because they failed to meet the necessary number of symptoms and/or their clinical impairment was not considered to be at a level that warranted a diagnosis. It is possible that despite the elevated depression symptoms, there might be differences between individuals who meet the clinical criteria and those who do not. A further limitation of the present study lies in that the Global Seasonality Score (GSS) as well as an impairment rating was not used in conjunction with SIGH-SAD scores to classify individuals in the SAD group. Therefore, it is possible that individuals in the SAD group were experiencing both atypical and typical depressive symptoms at the time of testing, but do not necessarily experience significant changes in functioning over

the seasons that cause them at least a moderate degree of impairment. However, the use of the SIGH-SAD without concomitant use of the SPAQ to define seasonal depression follows the standard practice in this area of research (e.g., Moscovitch et al., 2004; Terman et al., 1996).

An additional weakness of the present study is the fact that data collected from four individuals who met the criteria for SAD as well as DE was not included in any of the main analyses. Due to the fact that such a small number of participants could be classified as dual diagnoses, it was decided to exclude them from the SAD and DE groups. However, it should be noted that data from these four individuals were included in the supplementary regression analyses.

It is also possible that certain methodology factors could be considered as limitations. As mentioned previously, the cut-off time of 1,500 ms on the Stroop task may have been an inadequate amount of time for many participants to make a response. Also, it is possible that the image-viewing task was not self-referent enough for the participants. It is possible that asking participants "How appealing/appetizing do you find this image?" was not actually capturing their real emotional response to the image. Perhaps had participants been asked to imagine themselves in that particular scene or eating the food displayed on the screen, they would have displayed more extreme psychophysiological reactions. As well, the majority of the images used in the EMG task had low internal consistency, suggesting that they did not fit well together This could account for the absence of expected significant findings in the study. Finally, the participants were instructed to not move excessively during the EMG task. This could have restricted their movements including their facial muscle activity.

Conclusion

Individuals with seasonal depression symptoms did not differ from those with disordered eating in their attentional bias to season, food, and body shape stimuli. No differences were found either in their psychophysiological responses to scenes of food and seasons in an electromyography task. The atypical depression symptoms predicted muscle movement in the facial region that is typically associated with positive affect when viewing food images and winter scenes. The presence of disordered eating predicted activity in the same facial muscle region when viewing winter scenes.

Implications for Future Research

The current study highlights a number of methodological factors that should be considered in future research. To begin with, it seems likely that extending the response latency period for the Stroop task would be beneficial. It is possible that the cut-off time of 1,500 ms used in the current study did not allow participants ample time to make their responses. Additionally, it may be wise to increase the number of words included in each stimulus category, to more wholly represent a given concept.

In terms of the EMG image-viewing task, future researchers should consider ensuring that participants feel more involved with the scene being shown, by asking them to imagine themselves in the displayed scenario. It seems likely that doing so might evoke a stronger emotional reaction from the individual that would be evident through their facial muscle activity. Additionally, it is possible that instructing participants to move as little as possible in order to ensure that the EMG electrodes remain securely fastened, might actually have resulted in participants making a deliberate effort to restrain their facial muscle movements. Therefore, it is important for future researchers to consider the ramifications that telling participants to limit their movements when having electrodes attached to them might have.

Directions for Future Research

The present study would need to be replicated with a clinical sample so that individuals who meet the diagnostic criteria for seasonal depression make up the SAD group. Also, it could be beneficial to expand the stimuli used in the Stroop task for future research, such as including word categories that tap into depressed mood, as well as the concepts of light and dark, to gain more insight into the schema of individuals with SAD.

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Table 1

Stimulus Word Ratings: Means (and Standard Deviations) of Words Used in the Modified Stroop Task

Word	Mean (*SD*)	Word	Mean (*SD*)
Body Shape		Summer	
Fat	8.53 (0.69)	Beach	8.66 (0.58)
Thin	8.42 (1.27)	Camping	8.42 (1.13)
Skinny	8.37 (1.42)	August	8.39 (1.28)
Obese	8.32 (1.36)	Heat	8.32 (0.96)
Full-figured	8.18 (1.06)	Vacation	8.32 (1.32)
Binge Food		Winter	
Potato Chips	8.61 (0.79)	Snow	8.84 (0.37)
Chocolate	8.32 (1.38)	Cold	8.70 (0.78)
Fast Food	8.24 (1.44)	Christmas	8.68 (0.67)
Pizza	8.21 (1.36)	Ice	8.62 (0.68)
French Fries	8.05 (1.87)	December	8.54 (0.90)
Non-binge Food			
Sprouts	8.11 (1.75)		
Broccoli	8.03 (1.95)		
Cabbage	8.03 (1.95)		
Squash	8.00 (1.77)		
Onions	7.97 (2.05)		

Table 2

Stimulus Words and Yoked Neutral Words For The Modified Stroop Task

Word	Length	# of Syllables	Part of Speech	Neutral Word
Body Shape				
Fat	3	1	Adjective	Wet
Thin	4	1	Adjective	Late
Skinny	6	2	Adjective	Subtle
Obese	5	2	Adjective	Curly
Full-Figured	10	3	Adjective	Linguistic
Binge Food				
Potato Chips	11	4	Noun	Invitations
Chocolate	9	3	Noun	Apartment
Fast Food	8	2	Noun	Shoelace
Pizza	5	2	Noun	Paper
French Fries	11	2	Noun	Streetlight
Non-binge Food				
Sprouts	7	1	Noun	Thought
Broccoli	8	3	Noun	Calendar
Cabbage	7	2	Noun	Perfume
Squash	6	1	Noun	Arrows
Onions	6	2	Noun	Legend
Summer				
Beach	5	1	Noun	Tower
Camping	7	2	Verb	Talking
August	6	2	Noun	Record
Heat	4	1	Noun	Dare
Vacation	8	3	Noun	Reminder
Winter				
Snow	4	1	Noun	Cane
Cold	4	1	Adjective	Bare
Christmas	9	2	Noun	Blueprint
Ice	3	1	Noun	Lid
December	8	3	Noun	Relative

Table 3

EMG Image Ratings: Means (and Standard Deviations) of Images

Image	Mean (*SD*)	Image	Mean (*SD*)
Binge Food		Summer	
Potato Chips	8.35 (1.01)	Image #52	8.38 (0.83)
Chocolate Bar	7.91 (1.52)	Image #54	8.34 (0.74)
Cookie	7.85 (1.33)	Image #60	8.59 (1.18)
Cupcakes	7.70 (1.07)	Image #62	8.16 (0.95)
French Fries	7.67 (1.29)	Image #63	8.38 (1.16)
Nachos	7.64 (1.62)	Image #80	8.22 (1.01)
Non-binge Food		Winter	
Onion	1.09 (0.29)	Image #86	8.75 (0.51)
Mushrooms	1.27 (0.72)	Image #92	8.03 (1.03)
Broccoli	1.44 (0.76)	Image #98	8.45 (0.85)
Tomatoes	1.47 (0.75)	Image #102	8.87 (0.48)
Cabbage	1.56 (1.13)	Image #105	8.81 (0.48)
Asparagus	1.70 (1.31)	Image #112	8.68 (0.54)

Note: Participants rated food images on how likely people are to binge eat on the food pictured on a scale from 1 (*not at all likely*) to 9 (*extremely likely*). The winter images were rated on how well they represented the concept of winter on a scale ranging from 1 (*not at all representative*) to 9 (*extremely representative*). The summer images were rated on how well they represented the concept of summer on a scale ranging from 1 (*not at all representative*) to 9 (*extremely representative*). Refer to Appendix G to see the actual summer and winter images.

Table 4

Demographic Characteristics of the Pooled Sample and by Group

Characteristic	SAD (n = 16)	DE (n = 11)	Control (n = 25)	Pooled Sample Across Group (N = 52)	Total Sample (N = 85)
Sex					
Male	4 (25.00%)	5 (45.50%)	9 (36.00%)	18 (34.60%)	27 (31.80%)
Female	12 (75.00%)	6 (54.50%)	16 (64.00%)	34 (65.40%)	58 (68.20%)
Age (years)	M = 28.62 SD = 3.42	M = 38.91 SD = 17.55	M = 27.80 SD = 13.21	M = 30.40 SD = 14.74	M = 28.11 SD = 13.05
Marital Status					
Single	11 (68.80%)	7 (63.60%)	19 (76.00%)	37 (71.20%)	64 (75.30%)
Common-law	1 (6.30%)	0 (0.00%)	2 (8.00%)	3 (5.80%)	7 (8.20%)
Married	3 (18.80%)	2 (18.20%)	4 (16.00%)	9 (17.30%)	10 (11.80%)
Divorced	1 (6.30%)	2 (18.20%)	0 (0.00%)	3 (5.80%)	4 (4.70%)
Separated	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)
Widowed	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)
Ethnicity					
Aboriginal	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	4 (4.70%)
White	16 (100%)	10 (90.90%)	23 (92.00%)	49 (94.20%)	76 (89.40%)
Black	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)
Asian	0 (0.00%)	1 (9.10%)	1 (4.00%)	2 (3.80%)	3 (3.50%)
Latino or Hispanic	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)
Other	0 (0.00%)	0 (0.00%)	1 (4.00%)	1 (1.90%)	2 (2.40%)

Table 4 (Continued)

Demographic Characteristics of the Pooled Sample and by Group

Characteristic	SAD (n = 16)	DE (n = 11)	Control (n = 25)	Pooled Sample Across Group (N = 52)	Total Sample (N = 85)
Educational Status					
Non-student	6 (37.50%)	5 (45.50%)	5 (20.00%)	16 (30.80%)	23 (27.10%)
Student	10 (62.50%)	6 (54.50%)	20 (80.00%)	36 (69.20%)	62 (72.90%)
Program Year					
First	5 (31.30%)	3 (27.30%)	8 (32.00%)	16 (30.80%)	33 (38.80%)
Second	4 (25.00%)	2 (18.20%)	0 (0.00%)	6 (11.50%)	9 (10.60%)
Third	0 (0.00%)	0 (0.00%)	6 (24.00%)	6 (11.50%)	11 (12.90%)
Fourth	0 (0.00%)	0 (0.00%)	3 (12.00%)	3 (5.80%)	4 (4.70%)
Fifth or higher	1 (6.30%)	1 (9.10%)	2 (8.00%)	4 (7.70%)	5 (5.90%)
Prior Diagnosis					
Depression	3 (18.80%)	2 (18.20%)	1 (4.00%)	6 (11.50%)	9 (10.60%)
Seasonal Depression	1 (6.30%)	0 (0.00%)	0 (0.00%)	1 (1.90%)	1(1.20%)
Eating Disorders	0 (0.00%)	1 (9.10%)	0 (0.00%)	1 (1.90%)	2 (2.40%)
Anxiety	8 (50.00%)	1 (9.10%)	1 (4.00%)	10 (19.20%)	11 (12.90%)
Medication*	6 (37.50%)	2 (18.18%)	2 (8.00%)	10 (19.23%)	14 (16.47%)

* Use of mood altering medication included: Cipralex, Celexa, ratio-Citalopram, Zoloft, Zoplicone, Paxil, Clonazepam, novo-venlafaxine, apo-lorazepam, Quetiapine fumarate, Prozac, Wellbutrin, Cymbalta

Table 5

Mean Scores (and Standard Deviations) on the Classification Measures

Measure	SAD (n = 16)	DE (n = 11)	Control (n = 25)	Pooled Sample Across Group (N = 52)	Total Sample (N = 85)
SIGH-SAD					
Typical subscale	19.62 (6.06)	8.09 (4.91)	2.44 (2.00)	8.92 (8.61)	9.33 (7.65)
Atypical subscale	9.81 (3.25)	5.27 (3.20)	0.60 (0.76)	4.42 (4.67)	4.39 (4.33)
Total score	29.44 (8.41)	13.36 (4.67)	3.04 (2.17)	13.35 (12.67)	13.72 (11.31)
GSS	12.44 (4.35)	8.09 (5.03)	3.60 (2.43)	7.27 (5.33)	8.54 (5.53)
Degree of impairment	1.19 (1.28) [mild-moderate]	0.55 (0.82) [none-mild]	0.00 (0.00) [none]	0.48 (0.94) [none-mild]	0.53 (1.01) [none-mild]

Note: Degree of impairment is rated on the SPAQ and consists of none (0), mild (1), moderate (2), marked (3), severe (4), and disabling (5).

Table 6

Reliability for SIGH-SAD Items, GSS, and EMG Image Ratings

Item	Cronbach's α
SIGH-SAD	
SIGH-SAD Total	.94
SIGH-SAD Typical	.89
SIGH-SAD-Atypical	.81
GSS	.88
EMG Image Ratings	
Binge food	.66
Non-binge food	.61
Winter	.82
Summer	.56

Table 7

Mean (and Standard Deviation) Response Latency in Milliseconds(ms) on Modified Stroop Task

Word Type	SAD (n = 16)	DE (n = 11)	Control (n = 25)	Pooled Sample Across Group (N = 52)	Total Sample (N = 85)
Body Shape	44.20 (116.84)	56.84 (81.34)	-10.41 (99.11)	20.62 (104.23)	11.72 (97.38)
Binge Food	33.23 (108.22)	-0.76 (96.95)	27.69 (102.89)	57.59 (122.11)	28.48 (119.73)
Non-binge Food	-0.71 (81.67)	16.73 (69.12)	-0.45 (79.58)	3.10 (77.00)	2.19 (75.61)
Winter	-33.46 (84.21)	44.88 (75.05)	-32.38 (123.02)	-16.05 (106.10)	-18.07 (101.90)
Summer	14.70 (85.27)	-22.07 (74.51)	-3.37 (76.96)	-1.73 (78.71)	-0.83 (75.65)

Note: Mean values that are negative indicate that the response latency for the stimulus words was greater than response latency for yoked neutral words. Positive values indicate that the response latency for the stimulus words was less than the response latency for yoked neutral words

Table 8

Mean (and Standard Deviation) Proportion Error on Modified Stroop Task

Word Type	SAD (n = 16)	DE (n = 11)	Control (n = 25)	Pooled Sample Across Group (N = 52)	Total Sample (N = 85)
Body Shape	0.10 (0.13)	0.07 (0.10)	0.11 (0.16)	0.10 (0.14)	0.10 (0.15)
Binge Food	0.12 (0.18)	0.05 (0.13)	0.10 (0.16)	0.10 (0.16)	0.09 (0.14)
Non-binge Food	0.15 (0.15)	0.15 (0.18)	0.11 (0.15)	0.13 (0.16)	0.11 (0.14)
Winter	0.06 (0.10)	0.05 (0.10)	0.10 (0.16)	0.08 (0.13)	0.08 (0.13)
Summer	0.07 (0.10)	0.05 (0.13)	0.08 (0.13)	0.07 (0.12)	0.07 (0.11)

Note. Proportion error = (number of errors + number of nonresponses) / total number of words in Word Type list.

Table 9

Mean (and Standard Deviation) Proportion of Words Accurately Recalled on Incidental Recall Task

Word Type	SAD (n = 16)	DE (n = 11)	Control (n = 25)	Pooled Sample Across Group (N = 52)	Total Sample (N = 85)
Body Shape	1.56 (0.89)	1.27 (1.49)	1.24 (1.36)	1.35 (1.25)	1.33 (1.19)
Binge Food	0.62 (0.88)	0.82 (0.60)	0.92 (0.95)	0.81 (0.86)	0.87 (0.88)
Non-binge Food	0.62 (0.96)	0.36 (0.67)	0.52 (0.77)	0.52 (0.80)	0.48 (0.75)
Winter	0.50 (0.63)	0.45 (0.69)	0.36 (0.70)	0.42 (0.67)	0.39 (0.64)
Summer	0.25 (0.45)	0.64 (0.81)	0.36 (0.57)	0.38 (0.60)	0.35 (0.59)
Neutral	0.94 (0.85)	0.72 (0.65)	0.76 (0.60)	0.94 (0.85)	0.94 (0.84)

Note. Proportion of words accurately recalled = number of words recalled / total number of words in Word Type list.

Table 10

Mean (and Standard Deviation)Peak Amplitude of EMG Activity on Image Viewing Task

Muscle Group/ Image Type	SAD (n = 16)	DE (n = 11)	Control (n = 25)	Pooled Sample Across Group (N = 52)	Total Sample (N = 83)
Corrugator supercilli					
Binge food	37.52 (39.12)	28.69 (24.50)	32.11 (46.36)	32.96 (39.89)	27.65 (33.27)
Non-binge food	37.97 (41.06)	26.45 (21.02)	25.31 (24.30)	29.28 (29.60)	25.68 (28.79)
Winter	34.92 (36.40)	28.17 (19.44)	22.62 (20.09)	27.43 (25.86)	23.80 (22.54)
Summer	35.01 (31.16)	24.35 (12.57)	26.15 (28.65)	28.37 (26.77)	26.25 (24.57)
Zygomaticus major					
Binge food	48.00 (41.34)	25.22 (13.74)	25.25 (20.83)	32.24 (29.26)	28.23 (25.14)
Non-binge food	68.60 (97.19)	22.27 (11.20)	26.79 (26.32)	38.70 (59.47)	32.09 (48.52)
Winter	45.80 (51.76)	19.06 (9.54)	26.07 (19.73)	30.66 (33.17)	26.34 (27.79)
Summer	53.26 (80.50)	22.55 (16.02)	27.21 (22.95)	34.24 (48.70)	29.38 (39.67)

Table 11

Mean (and Standard Deviation) of EMG Mean Amplitude on Image Viewing Task

Muscle Group/ Image Type	SAD (n = 16)	DE (n = 11)	Control (n = 25)	Pooled Sample Across Group (N = 52)	Total Sample (N = 83)
Corrugator supercilli					
Binge food	69.60 (46.95)	60.96 (35.35)	50.43 (35.01)	58.34 (39.07)	53.80 (39.22)
Non-binge food	68.48 (45.81)	60.53 (36.63)	50.48 (34.98)	57.94 (38.81)	54.07 (39.60)
Winter	60.86 (37.40)	58.80 (32.50)	58.03 (40.70)	59.03 (37.41)	53.17 (36.64)
Summer	59.93 (36.09)	59.57 (31.27)	57.96 (41.74)	58.89 (37.38)	53.13 (36.50)
Zygomaticus major					
Binge food	29.95 (32.52)	24.83 (12.20)	20.60 (23.38)	24.37 (24.78)	23.84 (24.68)
Non-binge food	31.91 (38.39)	23.20 (12.19)	18.06 (15.30)	23.41 (22.45)	22.89 (23.33)
Winter	26.66 (20.09)	24.63 (13.23)	16.54 (11.16)	21.36 (15.29)	21.76 (18.03)
Summer	26.39 (18.69)	24.17 (13.30)	19.74 (19.49)	22.72 (18.03)	22.82 (19.63)

Table 12

Mean (and Standard Deviation) Valence Ratings of Images

Image Type	SAD (n = 16)	DE (n = 11)	Control (n = 25)	Pooled Sample Across Group (N = 52)	Total Sample (N = 83)
Binge food	3.60 (0.68)	3.38 (1.00)	3.46 (0.56)	3.49 (0.70)	3.43 (0.74)
Non-binge food	2.91 (0.76)	2.73 (0.65)	2.97 (0.77)	2.90 (0.74)	2.89 (0.71)
Winter	2.92 (0.77)	2.95 (1.02)	3.03 (0.96)	2.98 (0.90)	3.02 (0.89)
Summer	3.18 (0.48)	3.39 (0.63)	3.35 (0.11)	3.31 (0.56)	3.33 (0.51)

Note: Food images were rated on a scale ranging from 1 (*extremely unappetizing*) to 5 (*extremely appetizing*). Season images were rated on a scale ranging from 1 (*extremely unappealing*) to 5 (*extremely appealing*).

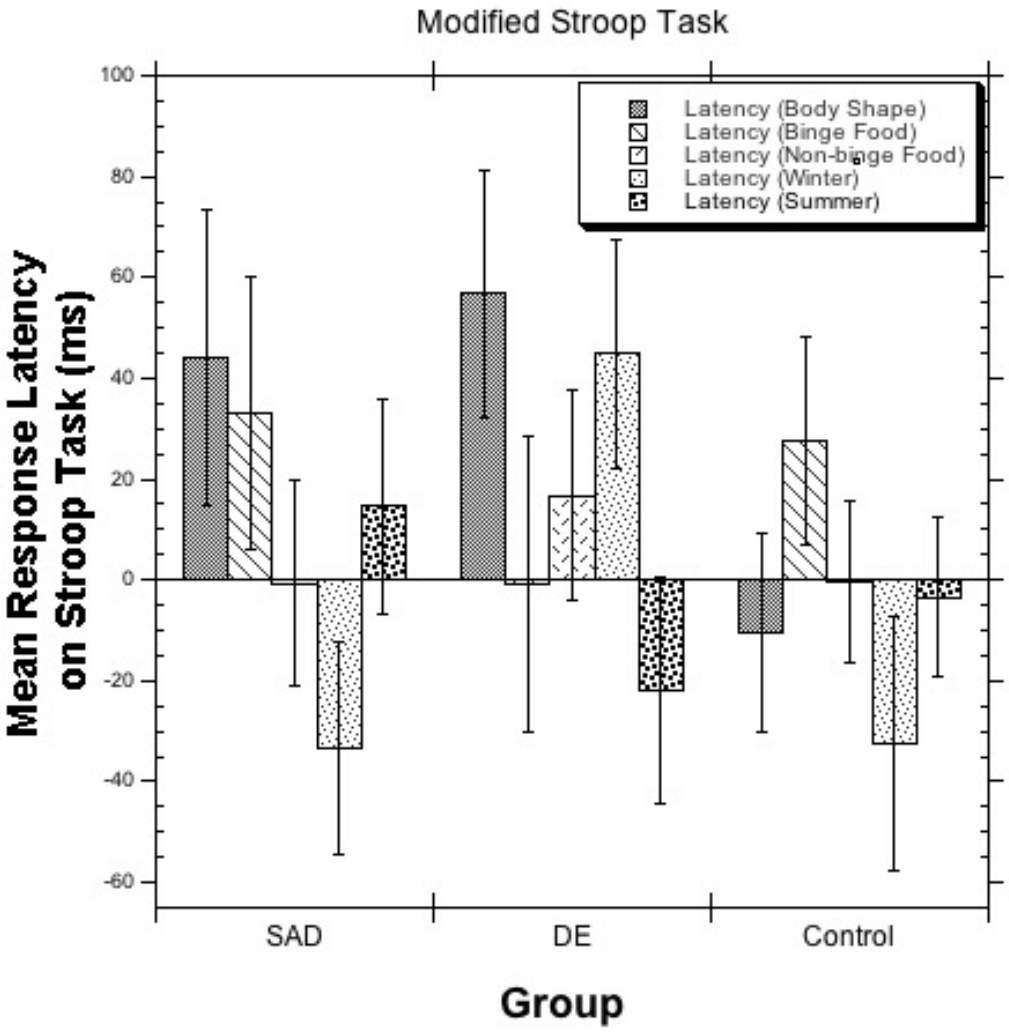

Figure 1. Mean response latency for each word type on the Stroop Task by group. Response latency was calculated as the difference between a response time for a stimulus word and its yoked neutral word. Positive values denote longer latency compared to the yoked neutral words while negative values denote shorter latency. Standard errors are represented in the figure by the error bars attached to each column.

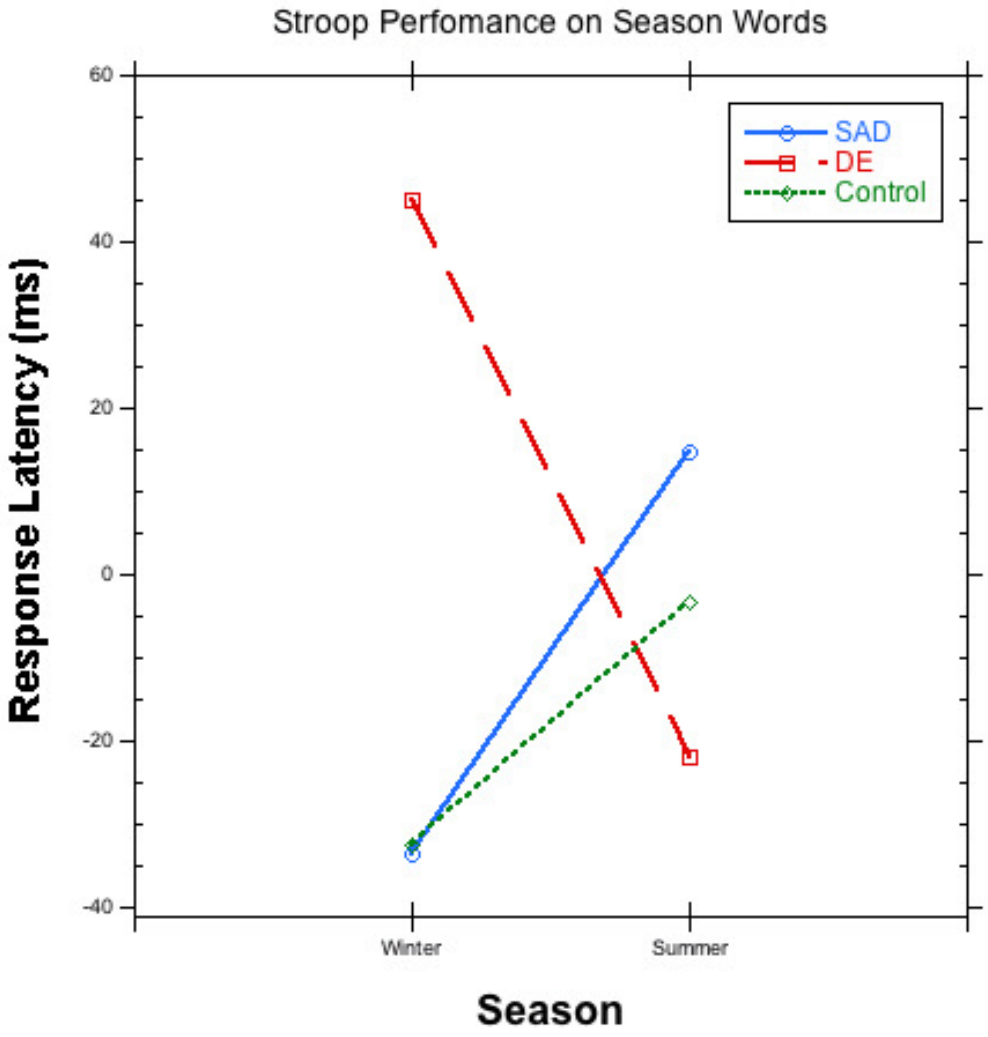

Figure 2. Mean response latency for winter and summer words on the Stroop task by group. Response latency was calculated as the difference between a response time for a stimulus word and its yoked neutral word. Positive values denote longer latency compared to the yoked neutral words while negative values denote shorter latency.

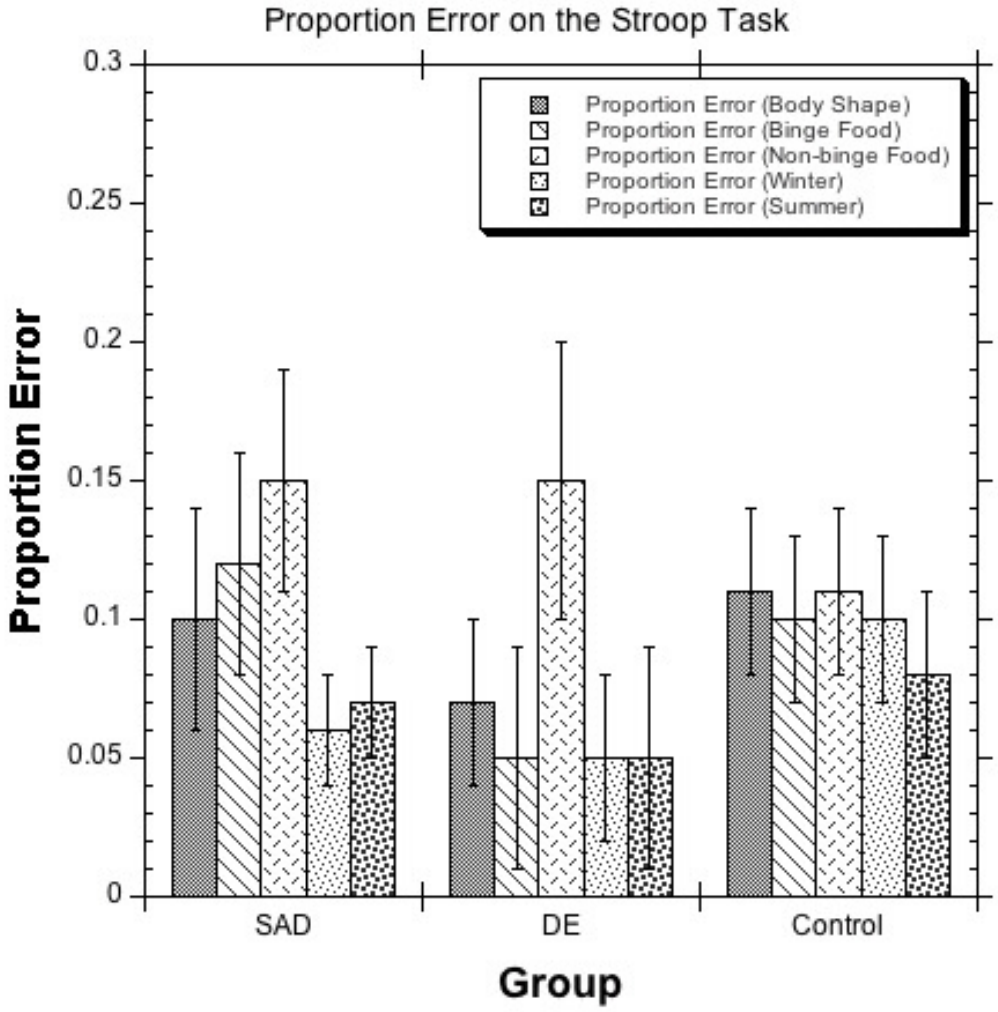

Figure 3. Mean proportion error on each word type on the Stroop Task by group. Proportion error was calculated as the number of erroneous responses divided by the total number of stimulus words in a particular word list. Erroneous responses include incorrect responses as well as failure to respond. Standard errors are represented in the figure by the error bars attached to each column.

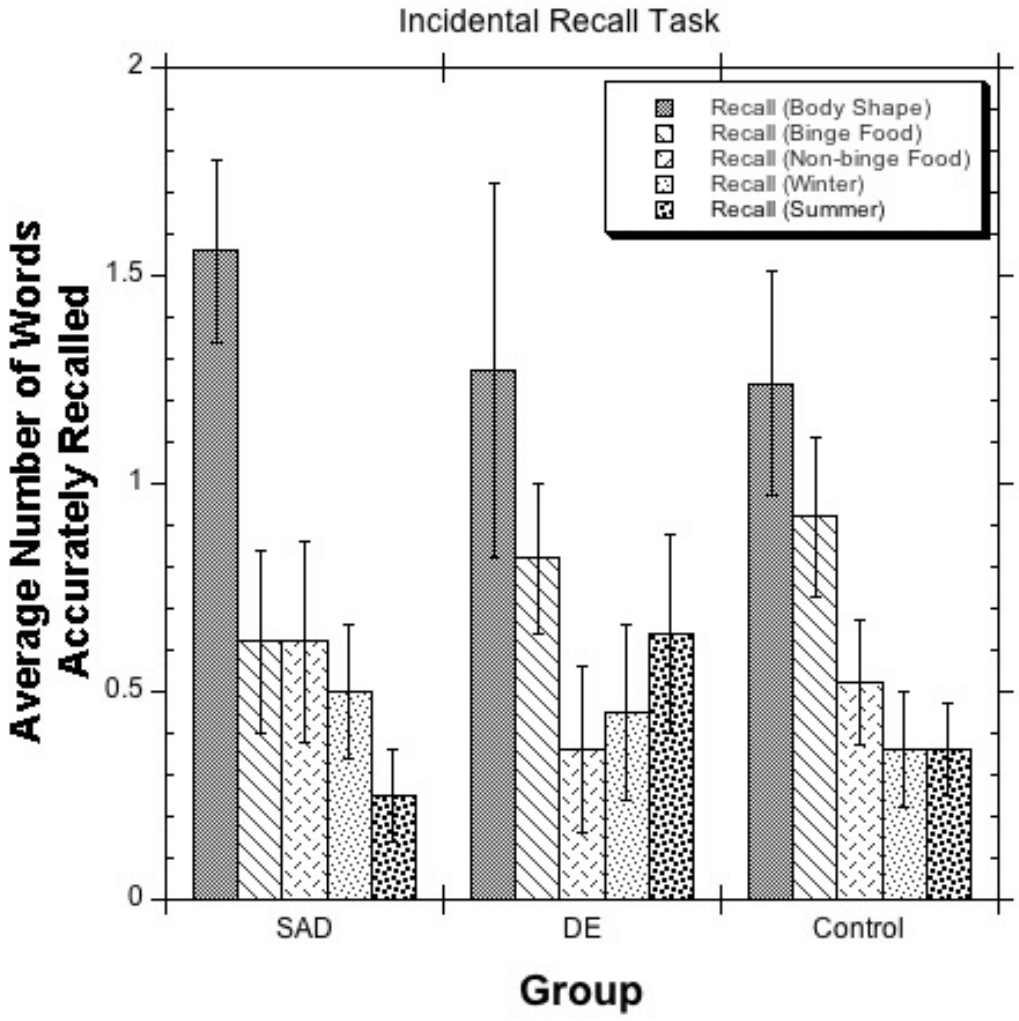

Figure 4. Mean proportion recall accuracy for each word type by group. Proportion recall accuracy was defined as the number of words accurately recalled from each word list divided by the total number of words in that particular word list. Standard errors are represented in the figure by the error bars attached to each column.

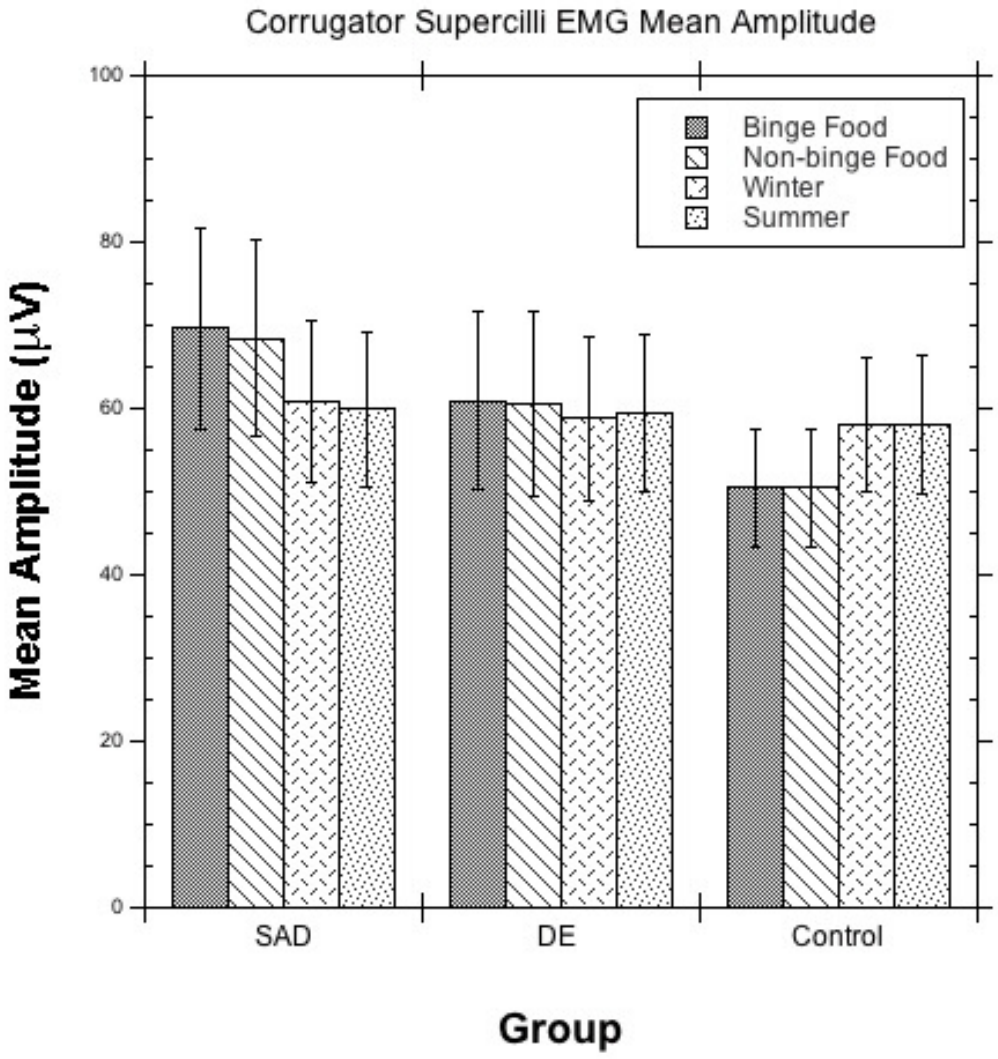

Figure 5. Averaged *corrugator supercilli* (CS) mean amplitude for each image type by group. CS mean amplitude was defined as the amount of activity in microvolts (μV) during the stimulus presentation period minus the baseline period activity. Standard errors are represented in the figure by the error bars attached to each column.

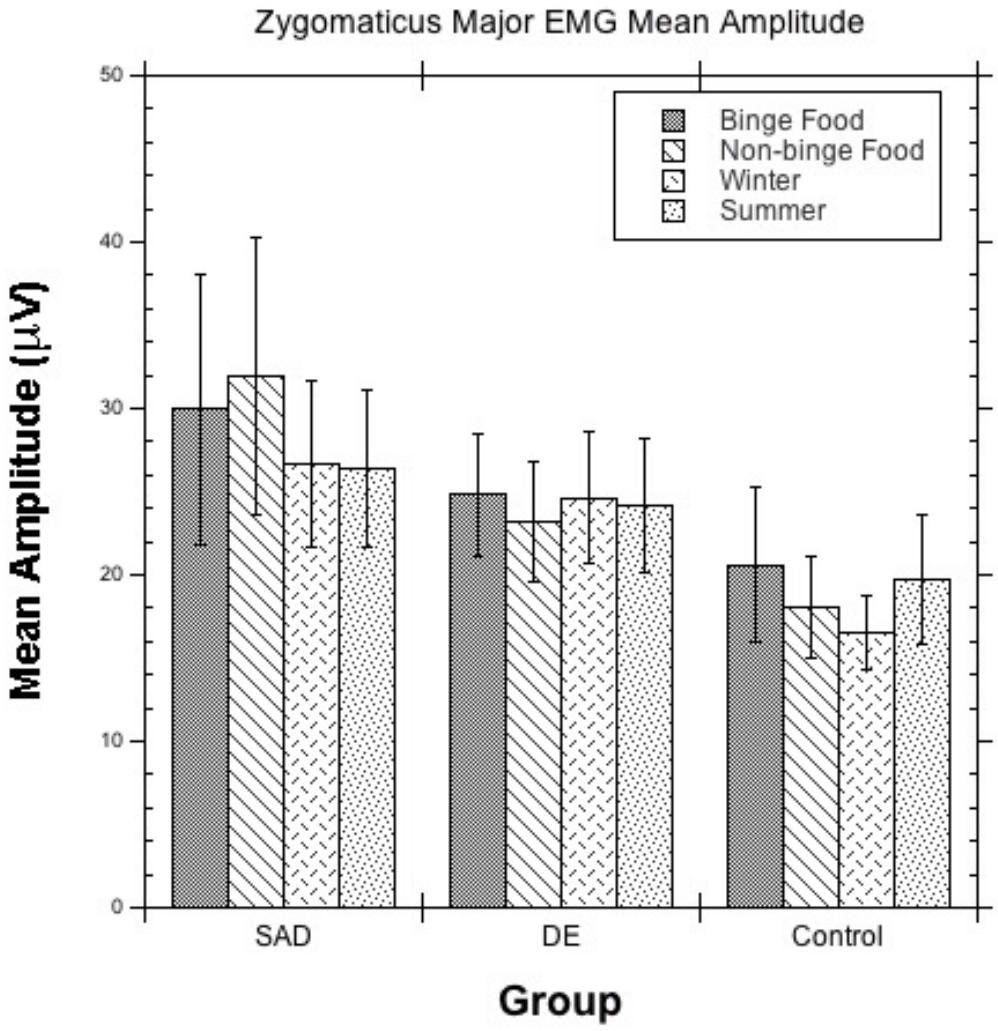

Figure 6. Averaged *zygomaticus major* (ZM) mean amplitude for each image type by group. ZM mean amplitude was defined as the amount of activity in microvolts (μV) during the stimulus presentation period minus the baseline period activity. Standard errors are represented in the figure by the error bars attached to each column.

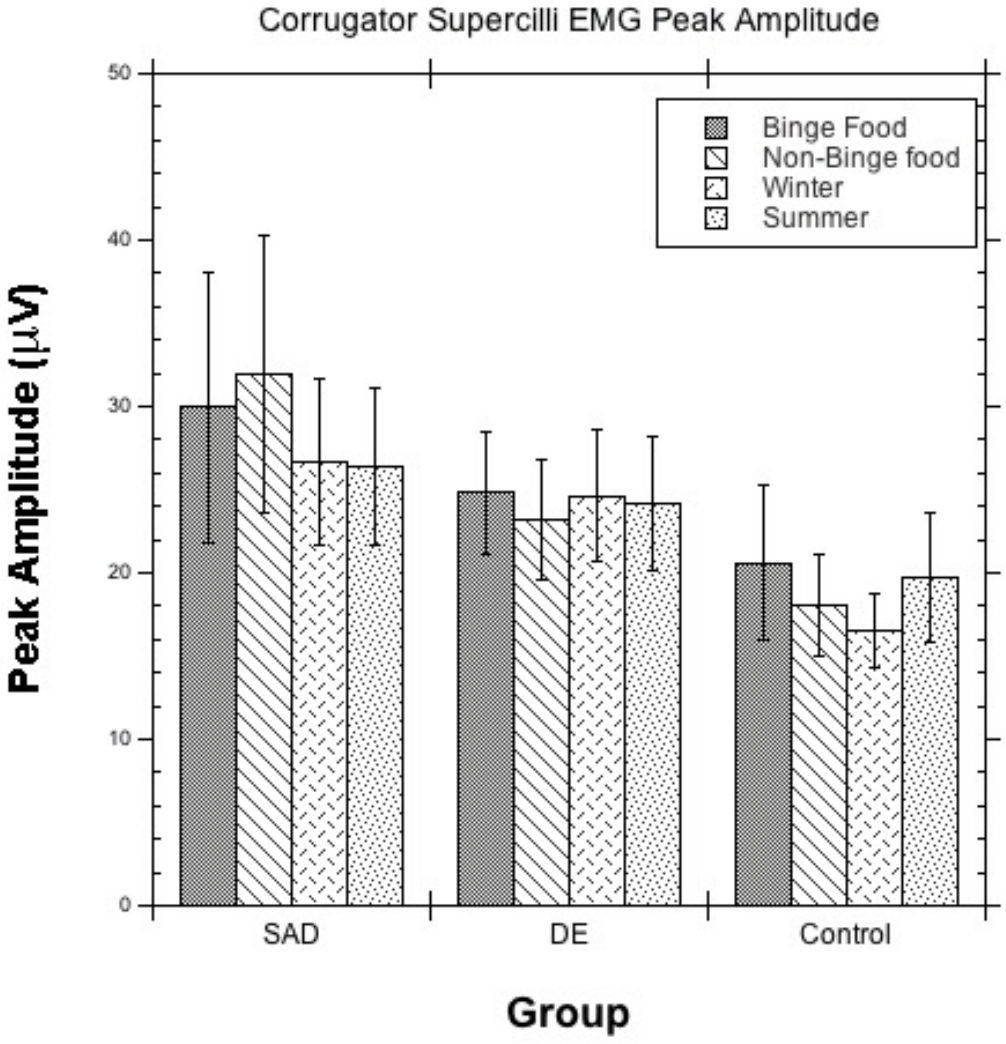

Figure 7. Averaged *corrugator supercilli* (CS) peak amplitude for each image type by group. CS peak amplitude was defined as the highest amount of activity in microvolts (μV) at a given time during the stimulus presentation period minus the peak baseline period activity. Standard errors are represented in the figure by the error bars attached to each column.

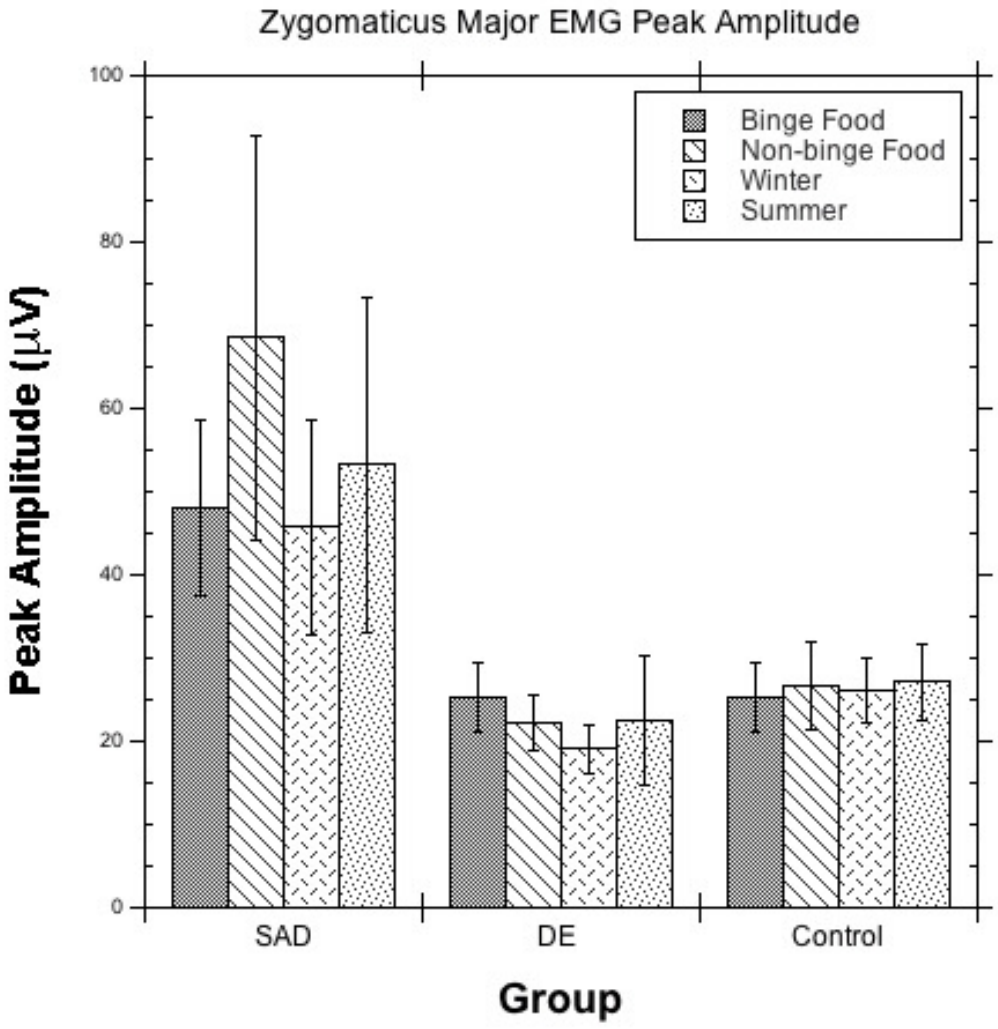

Figure 8. Averaged *zygomaticus major* (ZM) peak amplitude for each image type by group. ZM peak amplitude was defined as the highest amount of activity in microvolts (μV) at a given time during the stimulus presentation period minus the peak baseline period activity. Standard errors are represented in the figure by the error bars attached to each column.

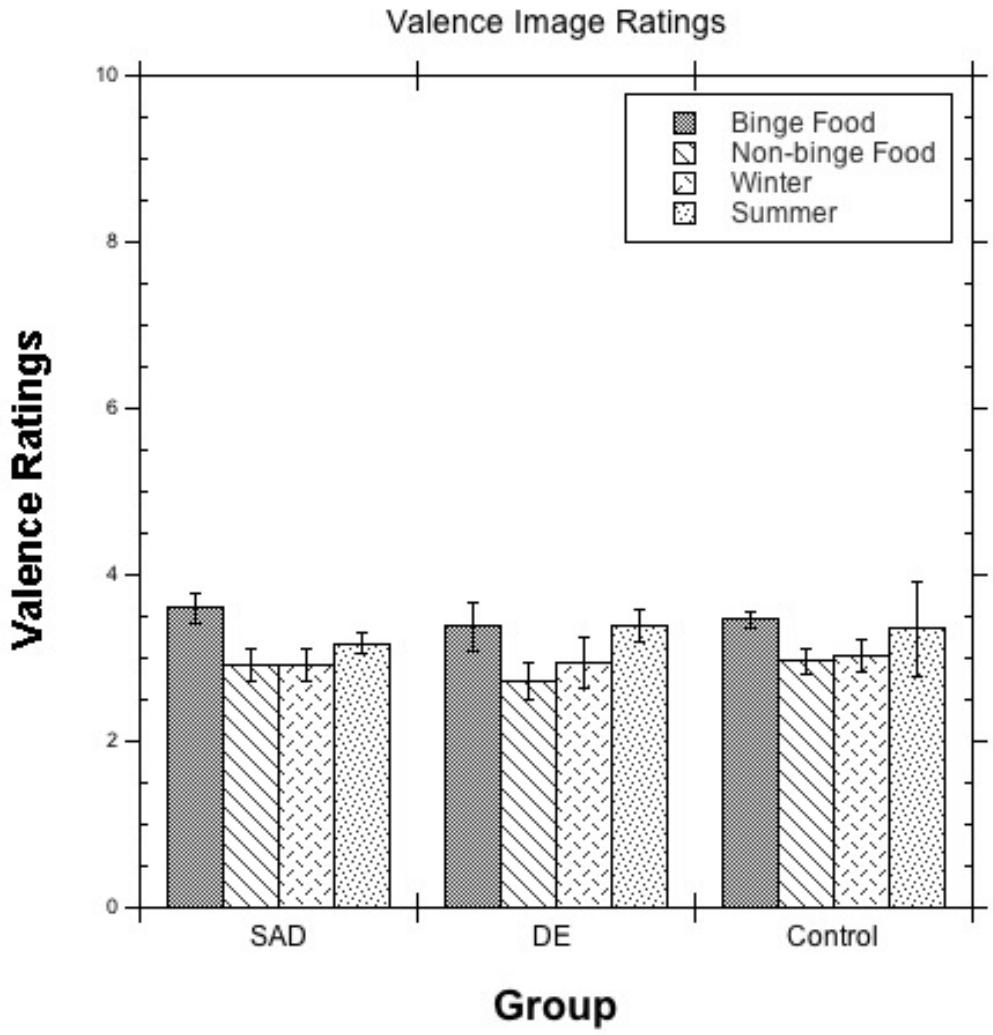

Figure 9. Mean valence ratings for images by group. Valence ratings were defined as the mean of the rating assigned to a particular group of images in the image viewing task. Higher scores indicate greater appetizing ratings for food images and greater appeal ratings for season images. Standard errors are represented in the figure by the error bars attached to each column.

Appendix A

Stage One of Stimulus Word Development For the Modified Stroop Task:

Generating Words Related to Different Concepts

List as many words as you can that remind you of/make you think of the following concepts:

1. Winter
2. Summer
3. Body Shape
4. Foods people are likely to binge eat
5. Non-binge/healthy foods

Appendix B

Stimulus Word Development For the Modified Stroop Task: Cover Page

PILOT STUDY QUESTIONNAIRE (2009)

Project Title: Rating Words on How Accurately They Describe a Given Concept

Researchers: Kylie Prystanski (MA candidate)
Dana Dupuis (MA candidate)
Dr. Josephine Tan (project supervisor)

Nature of study: This pilot study looks at the different words that people use to describe a variety of concepts. The purpose of this study is to gain an understanding regarding which words people tend to rate as most accurately describing a specific concept. The data from this pilot study will be used to develop the materials to be used in future research carried out by Dr. Tan and her students. Two projects that are planned for the immediate future involve examining how different people react to a variety of stimuli, and are being undertaken as MA theses by Kylie and Dana. Your participation in this pilot study is completely voluntary and you are free to withdraw without penalty at any time. All of your responses will be kept confidential and anonymous. Your responses will be kept in Dr. Tan's lab under secure storage for a period of 7 years. There are no psychological or physical risks or benefits to you for participating in this pilot study. This questionnaire will take approximately one hour to complete.

Completing the questionnaire: You may choose to complete the questionnaire in either one of two ways. Online copies can be filled out at <http://cbtc.utoronto.ca/opinio/s?s=302> or paper copies can be obtained from any of the researchers. Please slide the completed paper questionnaire under the door of room SN 1003. Please drop it off as soon as you have completed the questionnaire. We ask that all questionnaires be returned no later than June 15, 2009.

Questions? Any of the researchers would be pleased to answer your questions. Miss Prystanski can be reached at kmprysta@lakeheadu.ca, Miss Dupuis at ddupuis@lakeheadu.ca, and Dr. Tan can be reached at jtan@lakeheadu.ca or 346-7751.

If in agreement with all of the terms covered on this page, please proceed to the next page ..

Appendix C

Stimulus Word Development For the Modified Stroop Task: Word Rating Research Questionnaire

Body Shape

Section A: Think of the concept of **BODY SHAPE**. On a scale of 1 to 9, where 1 = *is not related to the concept at all* and 9 = *is extremely representative of the concept*, to what degree would you rate each of the following words as reflecting the concept **BODY SHAPE**. If you do not recognize or understand the word, write DK for *Don't Know*. Please consider each word carefully before making your choice.

1 2 3 4 5 6 7 8 9	DK
Does not relate to the concept at all … *Neutral* … *Is extremely representative of the concept*	*Don't Know*

Fat	_____	Tall	_____
Thin	_____	Voluptuous	_____
Skinny	_____	Growth spurt	_____
Obese	_____	Curvy	_____
Anorexic	_____	Short	_____
Malnourished	_____	Weak	_____
Rubinesque	_____	Big	_____
Mature	_____	Perfect	_____
Shape	_____	Strong	_____
Waist	_____	Pudgy	_____
Overweight	_____	Plus size	_____
Round	_____	Stomach	_____
Bloated	_____	Small	_____
Plump	_____	Bulky	_____
Underweight	_____	Height	_____
Flabby	_____	Flawed	_____
Hips	_____	Belly	_____
Childlike	_____	Intimidating	_____
Roly-poly	_____	Beautiful	_____
Monstrous	_____	Scrawny	_____
Thick	_____	Pear-shaped	_____
Prepubescent	_____	Lean	_____
Full-figured	_____	Big boned	_____

Body Shape (Continued)

1	2	3	4	5	6	7	8	9	DK
Does not relate to the concept at all				*Neutral*				*Is extremely representative of the concept*	*Don't Know*

Average	_____	Hourglass figure	_____
Young	_____	Stocky	_____
Thighs	_____	Deformed	_____
Ugly	_____	Healthy	_____
Massive	_____	Athletic	_____
Weight	_____	Pregnant	_____
Jiggly	_____	Chubby	_____
Toned	_____	Petite	_____
Old	_____	Curvaceous	_____
Lumpy	_____	In shape	_____
Sexy	_____	Large	_____

Binge Foods

Section B: Think of **BINGE FOODS** that people are likely to binge eat. A **BINGE** is defined as experiencing a loss of control and eating an unusually large amount of food in one sitting. On a scale of 1 to 9, where 1 = *is not related to the concept at all* and 9 = *is extremely representative of the concept*, to what degree would you rate each of the following words as reflecting **FOODS** people are likely to **BINGE** on. If you do not recognize or understand the word, write DK for *Don't Know*. Please consider each word carefully before making your choice.

1	2	3	4	5	6	7	8	9	DK
Does not relate to the concept at all				*Neutral*				*Is extremely representative of the concept*	*Don't Know*

Fatty foods	_____	Cupcakes	_____
Potato chips	_____	Popcorn	_____
Ice cream	_____	Specialty coffees	_____
Cake	_____	Greasy food	_____
Chocolate	_____	Pizza	_____
Soft drinks	_____	Peanut butter	_____
Candy	_____	Thick sauces	_____
Pasta	_____	Cookies	_____
Sandwich	_____	Cream	_____
Pudding	_____	Waffles	_____
Chicken fingers	_____	Potatoes	_____
Salty foods	_____	Butter	_____
Whipping cream	_____	Caramel	_____
Cheezies	_____	Pie	_____
Taco chips	_____	Nachos	_____
Deli meats	_____	Starchy foods	_____
Sugar	_____	Muffins	_____
Fast food	_____	Onion rings	_____
French fries	_____	Pastries	_____
Sweet foods	_____	Alcohol	_____
Bacon	_____	Beef jerky	_____
Nuts	_____	Marshmallows	_____
Icing	_____	Donuts	_____

Binge Foods (Continued)

1	2	3	4	5	6	7	8	9	DK
Does not relate to the concept at all				*Neutral*				*Is extremely representative of the concept*	*Don't Know*

Cheesecake	_____	Honey	_____
Crackers	_____	Spaghetti	_____
Hamburgers	_____	Toast	_____
Fudge	_____	Fried foods	_____
Cereal	_____	Bread	_____
Carbs	_____	Sweets	_____
Cheese	_____	Milkshake	_____
Brownies	_____	Toffee	_____

Non-binge Foods

Section C: Think of **FOODS** that people are **NOT** likely to **BINGE** on. On a scale of 1 to 9, where 1 = *is not related to the concept at all* and 9 = *is extremely representative of the concept*, to what degree would you rate each of the following words as reflecting **FOODS** that people are **NOT** likely to **BINGE** eat. If you do not recognize or understand the word, write DK for *Don't Know*. Please consider each word carefully before making your choice.

1	2	3	4	5	6	7	8	9	DK
Does not relate to the concept at all				*Neutral*				*Is extremely representative of the concept*	*Don't Know*

Broccoli	_____	Kiwi	_____
Nectarine	_____	Fish	_____
Chicken	_____	Chickpeas	_____
Fruits	_____	Nuts	_____
Bran	_____	Raspberries	_____
Vegetables	_____	Raisins	_____
Cherries	_____	Red pepper	_____
Plums	_____	Spinach	_____
Beans	_____	Oatmeal	_____
Yogourt	_____	Squash	_____
Dried fruit	_____	Oranges	_____
Cantaloupe	_____	Whole grains	_____
Potatoes	_____	Grapes	_____
Water	_____	Asparagus	_____
Salad	_____	Peaches	_____
Peas	_____	Banana	_____
Onions	_____	Carrots	_____
Granola	_____	Blueberries	_____
Cabbage	_____	Apricot	_____
Fruit	_____	Cucumber	_____
Apples	_____	Green pepper	_____
Lettuce	_____	Grapefruit	_____
Rice	_____	Mushrooms	_____
Tomato	_____	Strawberries	_____
Sprouts	_____	Celery	_____

Summer

Section D: Think of the concept of **SUMMER.** On a scale of 1 to 9, where 1 = *is not related to the concept at all* and 9 = *is extremely representative of the concept*, to what degree would you rate each of the following words as reflecting the concept **SUMMER**. If you do not recognize or understand the word, write DK for *Don't Know*. Please consider each word carefully before making your choice.

1 2 3 4 5 6 7 8 9	DK
Does not relate to the concept at all … *Neutral* … *Is extremely representative of the concept*	*Don't Know*

Warmth	_____	Thirst	_____
Relaxing	_____	Shorts	_____
Adventure	_____	Water	_____
Vacation	_____	T-shirt	_____
Swimming	_____	Golf	_____
Biking	_____	Bathing suit	_____
Camping	_____	Humid	_____
Long days	_____	Dry	_____
Sunlight	_____	Sunglasses	_____
Beach	_____	Cold drinks	_____
Sunburn	_____	Sand	_____
Sweat	_____	Mosquitoes	_____
Bright	_____	Volleyball	_____
Suntan	_____	Olympics	_____
Heat	_____	Sports	_____
Scorching	_____	Surfing	_____
Heat wave	_____	Popsicle	_____
Sweltering	_____	Sandals	_____
Fishing	_____	June	_____
Boating	_____	Active	_____
Waterskiing	_____	Barbeque	_____
Muggy	_____	July	_____
Sunny	_____	Lazy	_____
Breezy	_____	Grass	_____

Summer (Continued)

1	2	3	4	5	6	7	8	9	DK
Does not relate to the concept at all				*Neutral*				*Is extremely representative of the concept*	*Don't Know*

Balmy	_____	Flowers	_____
August	_____	Fireworks	_____
Sunshower	_____	Ice cream	_____
Gardening	_____	Tropical	_____
Blooming	_____		

Winter

Section E: Think of the concept **WINTER.** On a scale of 1 to 9, where 1 = *is not related to the concept at all* and 9 = *is extremely representative of the concept*, to what degree would you rate each of the following words as reflecting the concept **WINTER**. If you do not recognize or understand the word, write DK for *Don't Know*. Please consider each word carefully before making your choice.

1	2	3	4	5	6	7	8	9	DK
Does not relate to the concept at all				*Neutral*				*Is extremely representative of the concept*	*Don't Know*

Cold	_____	Winter sports	_____
Snow	_____	Windy	_____
Ice	_____	Dreary	_____
Short days	_____	Shiver	_____
Snow boots	_____	Fireplace	_____
Frost	_____	Toque	_____
Skiing	_____	Mittens	_____
Frostbite	_____	Dull	_____
Christmas	_____	Woodstove	_____
Blizzard	_____	Frigid	_____
Darkness	_____	Sleet	_____
Toboggan	_____	Iceberg	_____
Snowball	_____	Skating	_____
Storm	_____	Hot chocolate	_____
Snowhill	_____	Blustery	_____
Flurries	_____	Sweater	_____
Avalanche	_____	Snowboarding	_____
Snowfall	_____	Scarf	_____
Shoveling	_____	Bobsled	_____
Snowplow	_____	Olympics	_____
White	_____	Snow day	_____
Frozen	_____	November	_____
Snowmobile	_____	Snowman	_____
Hockey	_____	December	_____

Winter (continued)

1	2	3	4	5	6	7	8	9	DK
Does not relate to the concept at all				*Neutral*				*Is extremely representative of the concept*	*Don't Know*

Freezing	_____	Glacier	_____
Rosy cheeks	_____	Snowflake	_____
Winter tires	_____	February	_____
Snowshoe	_____	Chill	_____
Hypothermia	_____	Hibernation	_____
Snowsuit	_____	Bitter	_____
January	_____	Arctic	_____
Igloo	_____	Slush	_____
Polar bear	_____	Penguin	_____
Ice fishing	_____	Slippery	_____
March	_____	Sleigh ride	_____
Snowdrift	_____	Snow bank	_____
Brisk	_____	Goosebumps	_____
Cool	_____	Nippy	_____
Glacial	_____	Polar	_____

Thank you for completing this questionnaire. Your participation is greatly appreciated. If you have any further questions do not hesitate to contact any of the researchers.

Appendix D

Stimulus Word Development For the Modified Stroop Task: Demographics Section

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

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

Are you a student? Yes / No

- if yes, what year of your program are you in? _____

Please check the highest level of education that you have completed:

___ Eighth grade or less
___ High school graduate
___ College graduate
___ University graduate
___ Graduate school
___ Other, please specify_____

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_____

Appendix E

Development of Stimulus Images For the EMG Task: Cover Page

PILOT STUDY QUESTIONNAIRE (2009)

Project Title: Rating Images on How Accurately They Represent a Given Concept

Researchers: Kylie Prystanski (MA candidate)

Dana Dupuis (MA candidate)

Dr. Josephine Tan (project supervisor)

Nature of study: This pilot study looks at how people react toward a variety of images. The purpose of this pilot study is to gain an understanding regarding which images people tend to rate as most accurately describing a specific concept. The data from this pilot study will be used to develop the materials to be used in future research carried out by Dr. Tan and her students. Two projects that are planned for the immediate future involve examining how different people react to a variety of stimuli, and are being undertaken as MA theses by Kylie and Dana. Your participation in this pilot study is completely voluntary and you are free to withdraw without penalty at any time. All of your responses will be kept confidential and anonymous. Your responses will be kept in Dr. Tan's lab under secure storage for a period of 7 years. There are no psychological or physical risks or benefits to you for participating in this pilot study. This questionnaire will take approximately 30 minutes to complete.

Completing the questionnaire: Online copies can be filled out at http://cbtc.utoronto.ca/opinio/s?s=303. We ask that all questionnaires be completed no later than August 25, 2009.

Questions? Any of the researchers would be pleased to answer your questions. Miss Prystanski can be reached at kmprysta@lakeheadu.ca, Miss Dupuis at ddupuis@lakeheadu.ca, and Dr. Tan can be reached at jtan@lakeheadu.ca or346-7751.

If in agreement with all of the terms covered on this page, please proceed to the next page ..

Appendix F

Development of Stimulus Images For the EMG Task: Demographics Section

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

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

Are you a student? Yes / No
- if yes, what year of your program are you in? _____

Are you a graduate student? Yes / No
- if yes, what program are you in? _____

Please check the highest level of education that you have completed:

___ Eighth grade or less
___ High school graduate
___ College graduate
___ University graduate
___ Graduate school
___ Other, please specify_____

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: _____

Please continue on to the next page ..

Appendix G

EMG Task Images

Binge Food Images Used in the EMG Task

Non-Binge Food Images Used in the EMG Task

Summer Images Used in the EMG Task


Image #52


Image #54


Image #60


Image #62


Image #63


Image #80

Winter Images Used in the EMG Task

Image # 86

Image # 92

Image # 98

Image # 102

Image # 105

Image # 112

Appendix H

Screening Questionnaire:

Demographic and General Information

SCREENING RESEARCH QUESTIONNAIRE

Please enter your personal code: _____

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 Are you a student? Yes / No 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? _____

Do you have a problem with colour-blindness? Yes / No

- If yes, what is the nature of the colour-blindness? _____

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 prescribed medication, over-the-counter drugs, and *supplements (e.g., St. John's Wort)* that you have had in <u>the last 8 weeks</u>:

Tick off the diagnoses below that currently apply to you (the diagnoses have to be provided by a health professional, not by your own self).

Depression ___ Seasonal depression ___ Eating disorders ___ Anxiety ___

Appendix I

Screening Questionnaire:

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 <u>your</u> experience, <u>not others</u> 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 <u>had the same pattern</u> as above:
__ Sept. 2009/Aug. 2008 __ Sept. 2008/Aug. 2007 __ Sept. 2007/Aug. 2006
__ Sept. 2006/Aug. 2005 __ Sept. 2005/Aug. 2004 __ Sept. 2004/Aug. 2003

3. 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

4. If your experiences in question 3 change with the seasons, do you feel that they are a <u>problem</u> for you? Yes / No
- If yes, is this problem:
__ mild __ moderate __ marked __ severe __ disabling

5. 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:

6. (For students) Is starting school a seasonal stressor for you? Yes / No
If yes, when does it become a stressor for you? (specify the months):

7. 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

8. Approximately how many hours of each 24-hour day <u>do you sleep</u> 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+

9. 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:

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

12. <u>If you answered "yes" to question 11,</u> 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 J

Screening Questionnaire:

Structured Interview for the Hamilton Rating Scale of Depression –

Seasonal Affective Disorder Version – Self Report (SIGH-SAD-SR)

SELF-REPORT SUMMARY

Date __ __ / __ __ / __ __

Have you been physically ill in the past week? Circle one: ***yes / no.*** If yes, please explain:

_____

Have you taken any medications in the past week? Circle one: ***yes / no.*** If yes, what medications?

_____

Have you had treatment(s) of any other kind in the past week? Circle one: ***yes / no.*** If yes, please describe:

_____

Females (pre-menopausal): About when did your last period begin? __ __ / __ __ / __ __

In the questions that follow, please circle the number of <u>one</u> alternative in each set that best describes how you have been during the <u>past week.</u> If you have changed during the last few days, circle the alternative that best describes how you are today. Before you select an alternative in each set, read all of the choices to make sure you pick the most accurate one. Each new set of alternatives that you should consider begins with a pointer sign, ☞

DURING THE PAST WEEK . . .

☞ (H1/ 4 x)
(max H↑ A↑)

0 - I have ***not*** been feeling down or depressed at all.
1 - I have been feeling somewhat down or depressed.
2 - I have been feeling quite down or depressed.
3 - I have been feeling and looking very depressed (or others have said so).
4 - I haven't been able to think about anything except how bad or depressed I feel.

☞ (H2/ 4 x)

0 - I have been keeping busy and have been interested in the things I've been doing.
1 - I haven't been quite as interested in doing things as I used to be.
2 - I have definitely not been as interested in things as I used to be, and I have had to push myself to do them.
3 - I have not been doing much because I feel so bad.
4 - I have stopped doing nearly everything — I just sit or sleep most of the day.

Note: When an item refers to how you "normally" are, it means when you are feeling OK, or as close to OK as you get.

☞ (A1/ x 4)

0 - I have been interested in socializing with others as much as normal.
1 - I have still been interacting with others but am less interested in doing so.
2 - I have been interacting less with other people in social situations.
3 - I have been interacting less with others at home or at work.
4 - I have become quite withdrawn at home or at work.

☞(This question is about your interest in sex, not your actual sexual activity.) (H3/ 2 x)

0 - My interest in sex has been about the same as it was before I became depressed, or greater than normal.
1 - I have not been quite as interested in sex as I was before I became depressed.
2 - I have been much less interested in sex than I was before I became depressed.

DURING THE PAST WEEK . . .

Remember, "normal" means how you're feeling when you're OK.

☞ (H4/ 2 x)

0 - My appetite has been normal or greater than normal.
1 - I have had less appetite than normal, but I eat without anyone having to urge me.
2 - I have had so little appetite that I have not been eating regularly unless someone urges me to.

☞(Circle "0" for this question if you have lost weight due to dieting, (H5/ 3 x)
or have lost weight that you had previously gained when you were depressed.)

0 - I don't think I have lost any weight since I became depressed, or if I have lost weight, I have started to gain it back.
1 - I have probably lost some weight (that I haven't gained back at all) because I haven't felt like eating.
2 - I have definitely lost weight (that I haven't gained back at all) because I haven't felt like eating.

☞ (A2/ x 2)

0 - I have ***not*** gained weight above my normal level in the past week.
1 - I have probably gained weight (two or more pounds) in the past week, and my current weight is above normal for me.
2 - I have definitely gained weight (two or more pounds) in the past week, and my current weight is above normal for me.

☞(This question is about your appetite, not what you have actually been eating.) (A3/ x 3)

0 - My appetite has been normal or less than normal.
1 - I have wanted to eat just a little more than normal.
2 - I have wanted to eat somewhat more than normal.
3 - I have wanted to each much more than normal.

☞(This question is about what you have actually been eating.) (A4/ x 3)

0 - I have ***not*** been eating more than normal.
1 - I have been eating a little more than normal.
2 - I have been eating somewhat more than normal.
3 - I have been eating much more than normal.

☞ (A5/ x 3)

0 - I have ***not*** been craving or eating sweets or starches any more than when I feel normal.
1 - I have been craving or eating sweets or starches somewhat more than when I feel normal.
2 - I have been craving or eating sweets or starches much more than when I feel normal.
3 - I have had an irresistible craving for sweets or starches.

If you circled "1", "2" or "3" for the question above, please also answer the following:

The craving or eating has focused mainly on:
1 - sweets
2 - starches
3 - both sweets and starches

List any specific foods you have been craving: _____

Which of the following describes you best?
1 - I have been craving sweets or starches, but have been able to control eating them.
2 - I have actually been eating sweets or starches excessively.

DURING THE PAST WEEK . . .

At what time of day has the craving or eating usually occurred?

0 - It can occur at any time – it comes and goes.
1 - It usually occurs in the morning.
2 - It usually occurs in the afternoon or evening.
3 - It has been nearly all the time.

☞ (H6/ __2_x_)

0 - I have ***not*** had any difficulty falling asleep at night.
1 - Some nights it has taken me longer than half an hour to fall asleep.
2 - I have had trouble falling asleep every night.

☞ (H7/ __2_x_)

0 - I have ***not*** been waking up in the middle of the night, or if I have gotten up to go to the bathroom, I have fallen right back asleep.
1 - My sleep has been disturbed and restless during the night.
2 - I have been waking during the night without being able to get right back to sleep, or I've been getting out of bed in the middle of the night (not just to go to the bathroom.)

☞ (H8/ __2_x_)

0 - I have been oversleeping ***or*** waking up at a reasonable hour in the morning.
1 - I have been waking up very early in the morning, but I have been able to go back to sleep.
2 - I have been waking up very early in the morning without being able to go back to sleep, especially if I've gotten out of bed.

Remember, "normal" means how you're feeling when you're OK.

☞

When I am feeling normal, I usually sleep about ___ hours each day, including naps.

0 - I have been sleeping no more than I usually do when I feel normal. (A6/ _x_ __4)
1 - I have been sleeping at least one hour more than I usually do when I feel normal.
2 - I have been sleeping at least two hours more than I usually do when I feel normal.
3 - I have been sleeping at least three hours more than I usually do when I feel normal.
4 - I have been sleeping at least four hours more than I usually do when I feel normal.

The following question asks about how difficult it has been waking up in the morning:

0 - Usually I have been waking up on time and quickly feeling wide awake.
1 - Although I've had to depend on an alarm clock to wake up on time, I've usually felt wide awake within 30 minutes.
2 - I've been feeling sleepy for 30 minutes or longer after I wake up.
3 - It's been a major effort to get out of bed, and I've continued to feel sleepy for at least three hours after I wake up.
4 - I've been falling back asleep after the alarm, or feeling sleepy for at least five hours after I first wake up.

If you have been using an alarm, what time is it set for? ____:____ AM / PM (circle)

☞ (H9a) ↓

0 - I have ***not*** had a heavy feeling in my limbs, back, or head.
1 - I have had a heavy feeling in my limbs, back, or head, some of the time.
2 - I have had a heavy feeling in my limbs, back, or head, a lot of the time.

☞ (H9b) ↓

0 - I have ***not*** been bothered by backaches, headache, or muscle aches.
1 - I have been bothered some of the time by backaches, headache, or muscle aches.
2 - I have been bothered a lot of the time by backaches, headache, or muscle aches.

DURING THE PAST WEEK . . .

Remember, "normal" means how you're feeling when you're OK.

☞ (H9c, A7/ _2+__4)
(lrgst ↑ H9a-c after recoding 2 to 1, and 3 and 4 to 2, on item H9c)

0 - I have ***not*** been feeling more tired than normal.
1 - I have felt slightly more tired than normal.
2 - I have been more tired than normal for at least a few hours per day.
3 - I have felt tired much of the time most days.
4 - I have felt an overwhelming fatigue all of the time.

☞ (H10/ __4 _x_)

0 - I have ***not*** been putting myself down, or feeling like a failure or that I have let other people down, or feeling guilty about things I have done.
1 - I have been feeling like a failure or that I have let other people down.
2 - I have been feeling very guilty or thinking a lot about bad things I have done, or bad mistakes I have made.
3 - I believe that my being depressed is a punishment for something bad that I've done.
4 - I have been hearing voices accusing me of bad things, or seeing things that are scary, that others said were not really there.

☞ (H11/ __4 _x_)

0 - I have ***not*** had any thoughts about dying or about hurting or killing myself, or that life is not worth living.
1 - I have had thoughts that life is not worth living, or that I'd be better off dead.
2 - I have thought about dying, or wish I were dead.
3 - I have thought about killing myself, or I have done something to hurt myself.
4 - I have tried to kill myself.

☞ (H12/ __4 _x_)

0 - I have ***not*** been feeling especially tense or irritable, or worrying a lot.
1 - I have been feeling somewhat tense or irritable.
2 - I have been worrying about little unimportant things — that I wouldn't ordinarily worry about — or I have been excessively tense or irritable.
3 - Other people notice that I look or sound tense, anxious, or fearful.
4 - I feel tense, anxious, or fearful all of the time.

Check off all the following physical symptoms that have <u>bothered</u> you in the past week:

_dry mouth	*_cramps*	*_hyperventilating*
_gas	*_belching*	*_sighing*
_indigestion	*_heart palpitations*	*_having to urinate frequently*
_diarrhea	*_headaches*	*_sweating*

If you checked off any of the symptoms listed above, please also answer the following: (H13/ __4 _x_)
(0 if none)

1 - Altogether, the symptom(s) have only been bothering me a little bit.
2 - Altogether, the symptom(s) have been bothering me somewhat.
3 - Altogether, the symptom(s) have been bothering me a lot.
4 - Altogether, the symptom(s) have been making it difficult for me to function.

Circle one of the following:

0a - These symptoms bother me only when I am depressed.
0b - These symptoms bother me from time to time, but they get worse when I'm depressed.
2 - In my experience, these symptoms occur whether or not I am depressed.
3 - I think these symptoms are due to physical illness or a medication that I am taking.

If you circled "3" above, what illness or medication? _____

DURING THE PAST WEEK . . .

☞ (H14/__4 _x_)

0 - I have ***not*** been thinking much about my physical health.
1 - I have been worrying about being or becoming physically ill.
2 - I have been spending most of my time worrying about my physical health.
3 - I have been complaining frequently about how I feel physically, or asking for help a lot.
4 - I am sure that I have a physical disease, even though the doctors tell me that I don't.

Have you had a specific medical problem this week? If yes, please describe:

_____

☞ (H15/__2 _x_)
(recode 2 to 0?)

0a - Although previously I was depressed, this past week I have felt distinctly better.
0b - I have become depressed, or have continued feeling depressed, in the past week.

If neither 0a nor 0b is true, circle 1 or 2 below:

1 - I haven't been feeling very good, but it's not because of depression – rather, I ate something bad, or overworked, or had a virus, or just have been needing a rest.
2 - Depression has not been a problem of mine, now or before.

Remember, "normal" means how you're feeling when you're OK. (H16/__4 _x_)

☞

0 - My rate of speech and thought are normal.
1 - My speech and physical movements are slightly slowed down, or my thoughts are slightly slower, which has made it difficult for me to concentrate.
2 - My physical movements, speech or thoughts are somewhat slow compared to normal, and other people have noticed this.
3 - My physical movements are markedly slower, or my speech or thoughts are so slow that it has been hard to have a conversation with me.
4 - My physical movements are greatly slowed down, or my speech and thoughts are so slow that it has been difficult for me to think or talk at all.

☞ (H17/__4 _x_)

0 - I have ***not*** been restless or fidgety.
1 - I have been somewhat restless, or sometimes have been playing with my hands, hair, or other things.
2 - I have been very restless, or often have been playing with my hands, hair, or other things.
3 - I have trouble sitting still, and need to keep moving about a lot of the time.
4 - I am unable to sit still, or have been wringing my hands, biting my nails, pulling my hair, or biting my lips, nearly all the time.

(Total H1-H17 = ___)
(HAM-D 17-item subscore)

☞ (H18a)
↓

0 - Overall, the problems I have been asked about in this questionnaire have bothered me equally in the morning and in the late evening.
1 - Overall, these problems have bothered me more in the morning.
2 - Overall, these problems have bothered me more in the late evening.

☞ (H18b/__2 _x_)
(0 if none)

0 - Overall, the problems I have been asked about in this questionnaire have bothered me equally in the morning and in the late evening.
1 - Overall, these problems have bothered me more in the morning.
2 - Overall, these problems have bothered me more in the late evening.

If you circled "1" or "2" for the question above, please also circle one of the following:

1 - I have been feeling only a little worse in the mornings (***or*** evenings).
2 - I have been feeling much worse in the mornings (***or*** evenings).

DURING THE PAST WEEK . . .

☞In the following question, a "slump" means a temporary reduction in mood or energy from which you recover, at least partially, later in the day.

0 - I have ***not*** regularly had a slump in my mood or energy in the afternoon or evening.
1 - I have regularly had a slump in my mood or energy in the afternoon or evening.

If you circled "1" for the question above, please also answer the following:

The slumps usually begin about ___p.m. and end about ___p.m.

Please specify:

0 - Once these slumps occur, they usually last till bedtime.
1 - I usually come out of these slumps at least an hour before bedtime.

If you usually come out of these slumps at least an hour before bedtime, please also circle one of the following: (A8/ x ___3) (0 if none)

0 - Usually, the slumps have only been mild in intensity.
1 - Usually, the slumps have been moderate in intensity.
2 - Usually, the slumps have been severe in intensity.

How would you characterize the slumps?

0 - They are mostly in my mood.
1 - They are mostly in my energy.
2 - They are in both mood and energy.

☞ (H19/ __4 x)

0 - I have ***not*** been having any sensation that things around me are unreal, or that I'm in a dream.
1 - I have been having only very mild sensations of unreality.
2 - I have been having some definite sensations of unreality or of being in a dream.
3 - I have been having sensations of unreality a lot of the time.
4 - I have been so bothered by sensations of unreality that it has been hard for me to function.

☞ (H20/ __3 x)

0 - I have ***not*** thought that anyone was trying to give me a hard time or hurt me.
1 - I have been suspicious of people.
2 - I have noticed certain things that probably mean that someone is trying to harm me.
3 - I am sure someone is trying to get me or hurt me.

☞ (H21a) ↓

0 - I have ***not*** had things that I've had to do over and over again, like checking the locks on the doors several times, or repeatedly washing my hands.
1 - I have been compelled to check certain things repeatedly — more than should be necessary.
2 - I have been spending excessive amounts of time checking certain things repeatedly.

☞ (H21b) ↓

0 - I have not been bothered by thoughts that run over and over in my mind but don't make any sense to me.
1 - I have been a little bit bothered by thoughts that keep running through my mind but don't make any sense to me. (H21b/ __2 x) (lrgst ↑ 21 a-b)
2 - I have been very bothered by thoughts that keep running through my mind but don't make any sense to me.

(___ T_{29} = ___ H_{21} + ___ A_8)
(SIGH-SAD 29-item total)

[(A_8 / T_{29}) x 100 = ___ %]
(Atypical balance score)

Appendix K

Screening Questionnaire:

Eating Disorder Diagnostic Scale (EDDS)

Section D: Please carefully complete all questions.

Over the past 3 months…	Not at all		Slightly		Moderately		Extremely
1. Have you felt fat?	0	1	2	3	4	5	6
2. Have you had a definite fear that you might gain weight or become fat?	0	1	2	3	4	5	6
3. Has your weight influenced how you think about (judge) yourself as a person?	0	1	2	3	4	5	6
4. Has your shape influenced how you think about (judge) yourself as a person?	0	1	2	3	4	5	6

5. During the past 6 months have there been times when you felt you have eaten what other people would regard as an unusually large amount of food (e.g., a quart of ice cream) given the circumstances? YES NO
6. During the time when you ate an unusually large amount of food, did you experience a loss of control (feel you couldn't stop eating or control what or how much you were eating)? YES NO
7. How many DAYS per week on average over the past 6 MONTHS have you eaten an unusually large amount of food and experienced a loss of control? 0 1 2 3 4 5 6 7
8. How many TIMES per week on average over the past 3 MONTHS have you eaten an unusually large amount of food and experienced a loss of control? 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14

During these episodes of overeating and loss of control did you…

9. Eat much more rapidly than normal? YES NO
10. Eat until you felt uncomfortably full? YES NO
11. Eat large amounts of food when you didn't feel physically hungry? YES NO
12. Eat alone because you were embarrassed by how much you were eating? YES NO
13. Feel disgusted with yourself, depressed, or very guilty after overeating? YES NO
14. Feel very upset about your uncontrollable overeating resulting in weight gain? YES NO

15. How many times per week on average over the past 3 months have you made yourself vomit to prevent weight gain or counteract the effects of eating? 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14
16. How many times per week on average over the past 3 months have you used laxatives or diuretics to prevent weight gain or counteract the effects of eating? 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14
17. How many times per week on average over the past 3 months have you fasted (skipped at least 2 meals in row) to prevent weight gain or counteract the effects of eating? 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14
18. How many times per week on average over the past 3 months have you engaged in excessive exercise specifically to counteract the effects of overeating episodes? 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14

19. How much do you weigh? If uncertain, please give your best estimate. _____lb
20. How tall are you? _____ ft. _____ in.
21. Over the past 3 months, how many menstrual periods have you missed? 0 1 2 3 4 n/a
22. Have you been taking birth control pills during the past 3 months? YES NO

Appendix L

Screening Questionnaire:

Diagnostic Inventory for Depression (DID)

Section E: This questionnaire is about how you have been feeling **during the past 2 weeks.** After each question there are 5 statements (numbered 0–4). Read all 5 statements carefully. Then decide which one best describes how you have been feeling. Choose only one statement per group. If more than one statement in a group applies to you, choose the one with the higher number.

(1) **During the past 2 weeks, have you been feeling sad or depressed?**
- 0 No, not at all.
- 1 Yes, a little bit.
- 2 Yes, I have felt sad or depressed most of the time.
- 3 Yes, I have been very sad or depressed nearly all the time.
- 4 Yes, I have been extremely depressed nearly all the time.

(2) **How many days in the past 2 weeks have you been feeling sad or depressed?**
- 0 No days
- 1 A few days
- 2 About half the days
- 3 Nearly every day
- 4 Every day

(3) **Which of the following best describes your level of interest in your usual activities during the past 2 weeks?**
- 0 I have not lost interest in my usual activities.
- 1 I have been less interested in 1 or 2 of my usual activities.
- 2 I have been less interested in several of my usual activities.
- 3 I have lost most of my interest in almost all of my usual activities.
- 4 I have lost all interest in all of my usual activities.

(4) **How many days in the past 2 weeks have you been less interested in your usual activities?**
- 0 No days
- 1 A few days
- 2 About half the days
- 3 Nearly every day
- 4 Every day

(5) **Which of the following best describes the amount of pleasure you have gotten from your usual activities during the past 2 weeks?**
- 0 I have gotten as much pleasure as usual.
- 1 I have gotten a little less pleasure from 1 or 2 of my usual activities.
- 2 I have gotten less pleasure from several of my usual activities.
- 3 I have gotten almost no pleasure from most of the activities that I usually enjoy.
- 4 I have gotten no pleasure from any of the activities that I usually enjoy.

(6) **How many days in the past 2 weeks have you gotten less pleasure from your usual activities?**
- 0 No days
- 1 A few days
- 2 About half the days
- 3 Nearly every day
- 4 Every day

(7) **During the past 2 weeks, has your energy level been low?**
- 0 No, not at all.
- 1 Yes, my energy level has occasionally been a little lower than it normally is.
- 2 Yes, I have clearly had less energy than I normally do.
- 3 Yes, I have had much less energy than I normally have.
- 4 Yes, I have felt exhausted almost all of the time.

(8) **Which of the following best describes your level of physical restlessness during the past 2 weeks?**
- 0 I have not been more restless and fidgety than usual.
- 1 I have been a little more restless and fidgety than usual.
- 2 I have been very fidgety, and it has been somewhat difficult to sit still.
- 3 I have been extremely fidgety, and I have been pacing a little bit almost every day.
- 4 I have been pacing more than an hour a day, and I have been unable to sit still.

(9) **Which of the following best describes your physical activity level during the past 2 weeks?**
0 I have not been moving more slowly than usual.
1 I have been moving a little more slowly than usual.
2 I have been moving more slowly than usual, and it takes me longer than usual to do most activities.
3 Normal activities are difficult because it has been tough to start moving.
4 I have been feeling extremely slowed down physically, like I am stuck in mud.

(10) **During the past 2 weeks, have you been bothered by feelings of guilt?**
0 No, not at all.
1 Yes, I have occasionally felt a little guilty.
2 Yes, I have often been bothered by feelings of guilt.
3 Yes, I have often been bothered by strong feelings of guilt.
4 Yes, I have been feeling extremely guilty.

(11) **During the past 2 weeks, what has your self-esteem been like?**
0 My self-esteem has not been low.
1 Once in a while, my opinion of myself has been a little low.
2 I often think I am a failure.
3 I almost always think I am a failure.
4 I have been thinking I am a totally useless and worthless person.

(12) **During the past 2 weeks, have you been thinking about death or dying?**
0 No, not at all.
1 Yes, I have occasionally thought that life is not worth living.
2 Yes, I have frequently thought about dying in passive ways (such as going to sleep and not waking up).
3 Yes, I have frequently thought about death, and that others would be better off if I were dead.
4 Yes, I have been wishing I were dead.

(13) **During the past 2 weeks, have you been thinking about killing yourself?**
0 No, not at all.
1 Yes, I had a fleeting thought about killing myself.
2 Yes, several times I thought about killing myself, but I would not act on these thoughts.
3 Yes, I have been seriously thinking about killing myself.
4 Yes, I have thought of a specific plan for killing myself.

(14) **Which of the following best describes your ability to concentrate during the past 2 weeks?**
0 I have been able to concentrate as well as usual.
1 My ability to concentrate has been slightly worse than usual.
2 My attention span has not been as good as usual and I have had difficulty collecting my thoughts, but this hasn't caused any serious problems.
3 I have frequently had trouble concentrating, and it has interfered with my usual activities.
4 It has been so hard to concentrate that even simple things are hard to do.

(15) **During the past 2 weeks, have you had trouble making decisions?**
0 No, not at all.
1 Yes, making decisions has been slightly more difficult than usual.
2 Yes, it has been harder and has taken longer to make decisions, but I have been making them.
3 Yes, I have been unable to make some decisions that I would usually have been able to make.
4 Yes, important things are not getting done because I have had trouble making decisions.

(16) **During the past 2 weeks, has your appetite been decreased?**
0 No, not at all.
1 Yes, my appetite has been slightly decreased compared to how it normally is.
2 Yes, my appetite has been clearly decreased, but I have been eating about as much as I normally do.
3 Yes, my appetite has been clearly decreased, and I have been eating less than I normally do.
4 Yes, my appetite has been very bad, and I have had to force myself to eat even a little.

(17) **How much weight have you lost during the past 2 weeks (not due to dieting)?**
0 None (or the only weight I lost was due to dieting)
1 1–2 pounds
2 3–5 pounds
3 6–10 pounds
4 More than 10 pounds

(18) **During the past 2 weeks, has your appetite been increased?**
0 No, not at all.
1 Yes, my appetite has been slightly increased compared to how it normally is.
2 Yes, my appetite has clearly been increased compared to how it normally is.
3 Yes, my appetite has been greatly increased compared to how it normally is.
4 Yes, I have been feeling hungry all the time.

(19) **How much weight have you gained during the past 2 weeks?**
0 None
1 1–2 pounds
2 3–5 pounds
3 6–10 pounds
4 More than 10 pounds

(20) **During the past 2 weeks, have you been sleeping less than you normally do?**
0 No, not at all.
1 Yes, I have occasionally had slight difficulty sleeping.
2 Yes, I have clearly been sleeping less than I normally do.
3 Yes, I have been sleeping about half my normal amount of time.
4 Yes, I have been sleeping less than 2 hours a night.

(21) **During the past 2 weeks, have you been sleeping more than you normally do?**
0 No, not at all.
1 Yes, I have occasionally slept more than I normally do.
2 Yes, I have frequently slept at least 1 hour more than I normally do.
3 Yes, I have frequently slept at least 2 hours more than I normally do.
4 Yes, I have frequently slept at least 3 hours more than I normally do.

(22) **During the past 2 weeks, have you been feeling pessimistic or hopeless about the future?**
0 No, not at all.
1 Yes, I have occasionally felt a little pessimistic about the future.
2 Yes, I have often felt pessimistic about the future.
3 Yes, I have been feeling very pessimistic about the future most of the time.
4 Yes, I have been feeling that there is no hope for the future.

---

0 = no difficulty 1 = mild difficulty 2 = moderate difficulty 3 = marked difficulty 4 = extreme difficulty

INSTRUCTIONS
Indicate below how much symptoms of depression have interfered with, or caused difficulties in, the following areas of your life during the past 2 weeks (Circle DNA [Does Not Apply] if you are not married or do not have a boyfriend/girlfriend.)

During the PAST 2 WEEKS, how much difficulty have symptoms of depression caused in your. . .

23. usual daily responsibilities (at a paid job, at home, or at school)..... 0 1 2 3 4
24. relationship with your husband, wife, boyfriend, girlfriend, or lover .....DNA 0 1 2 3 4
25. relationships with close family members..... 0 1 2 3 4
26. relationships with your friends 0 1 2 3 4
27. participation and enjoyment in leisure and recreation activities 0 1 2 3 4

28. **Overall, how much have symptoms of depression interfered with or caused difficulties in your life?**
0 not at all
1 a little bit
2 a moderate amount
3 quite a bit
4 extremely

29. **How many days during the past 2 weeks were you <u>completely unable</u> to perform your usual daily responsibilities (at a paid job, at home, or at school) because you were feeling depressed? (circle one)**
0 days 1 day 2 days 3 days 4 days 5 days 6 days 7 days
8 days 9 days 10 days 11 days 12 days 13 days 14 days

0 = very satisfied 1 = mostly satisfied 2 = equally satisfied/dissatisfied 3 = mostly dissatisfied 4 = very dissatisfied

INSTRUCTIONS
Indicate below your level of satisfaction with the following areas of your life (Circle DNA [Does Not Apply] if you are not married or do not have a boyfriend or girlfriend.)

During the PAST 2 WEEKS how satisfied have you been with your. . .

30. usual daily responsibilities (at a paid job, at home, or at school).....	0	1	2	3	4
31. relationship with your husband, wife, boyfriend, girlfriend, or lover .....DNA	0	1	2	3	4
32. relationship with close family members	0	1	2	3	4
33. relationships with your friends	0	1	2	3	4
34. participation and enjoyment in leisure and recreation activities	0	1	2	3	4
35. mental health.....	0	1	2	3	4
36. physical health	0	1	2	3	4

37. **In general, how satisfied have you been with your life during the past 2 weeks?**
   0 very satisfied
   1 mostly satisfied
   2 equally satisfied & dissatisfied
   3 mostly dissatisfied
   4 very dissatisfied

38. **In general, how would you rate your overall quality of life during the past 2 weeks?**
   0 very good, my life could hardly be better
   1 pretty good, most things are going well
   2 the good and bad parts are about equal
   3 pretty bad, most things are going poorly
   4 very bad, my life could hardly be worse

Addendum items:

When you consider how you have been feeling the past 2 weeks, do you think it is related to
39. the death of a person or animal close to you? NO / YES
40. a medical condition you presently have? NO / YES
41. your use of medication, drugs or alcohol? NO / YES

Appendix M

Brief Recruitment Notice for Screening

Seeking Research Volunteers **--** The Department of Psychology at Lakehead University is currently recruiting individuals ***18 years or older*** to participate in a project (*Attention and Reaction Time 2009-2010*) that looks at individual's responses to a set of computerized stimuli. A short screening to select participants for the project consists of answering a questionnaire that can be found at **http://cbtc.utoronto.ca/opinio/s?s=321**. Separate random draws for gift certificates are offered to those who participate in the screening and in the project. For more information, please contact Kylie Prystanski (kmprysta@lakeheadu.ca or 343-8168).

Appendix N

Recruitment Advertisement for Screening

SEEKING RESEARCH VOLUNTEERS

The Department of Psychology at Lakehead University is currently recruiting individuals ***18 years or older*** to participate in a short screening study. The data from this screening will be used to select potential participants for a main project that looks at individual's attention and reaction time to a set of computerized psychological stimuli.

For more information on the screening and main study, please visit this weblink **http://cbtc.utoronto.ca/opinio/s?s=321** which will also lead you to the screening questionnaire. Otherwise, please contact Kylie Prystanski (**kmprysta@lakeheadu.ca**), or leave a message at **343-8168**.

Individuals who complete the Screening Research Questionnaire will be entered into a random prize draw for a **$50 Wal-Mart gift certificate**.

Individuals who participate in the main study will be entered into a random prize draw for **1 of 2 $50 Wal-Mart gift certificates**. Introductory Psychology students will also receive **1 bonus point** toward their final mark.

kmprysta@lakeheadu.ca / 343-8168
http://cbtc.utoronto.ca/opinio/s?s=321

kmprysta@lakeheadu.ca / 343-8168
http://cbtc.utoronto.ca/opinio/s?s=321

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http://cbtc.utoronto.ca/opinio/s?s=321

kmprysta@lakeheadu.ca / 343-8168
http://cbtc.utoronto.ca/opinio/s?s=321

Appendix O

Cover Page for the Hard Copy Screening Research Questionnaire

PAPER COPY SCREENING RESEARCH QUESTIONNAIRE
(ATTENTION & REACTION TIME 2009-2010)

Dear Potential Participant,

Thank you for your interest in our screening study. The screening is designed to identify potential research participants, who are 18 years or older, for a main study on attention and reaction time. Before you begin, we would like to provide you with information so that you can participate on an informed basis.

Who are the researchers? They are Kylie Prystanski, a MA Clinical Psychology student at Lakehead University, and the research supervisor, Dr. Josephine Tan. Their contact information is below.

What do I have to do for the screening? You must be at least 18 years old to participate in the screening which takes only about 30 minutes. The screening consists of you answering questions about your emotions, cognitions, and behaviours so that we can invite individuals who cover a range of characteristics to participate in the main study.

What is the main study like? In the main study, participants will be asked to view computerized images and given clear instructions on how to respond to those images. During those tasks, we will measure your reaction time and your physiological response. The main study takes 1 hour.

What about confidentiality and voluntary participation? Your participation in both the screening and main study is completely voluntary and you can withdraw from both at any time without penalty. You are free to not answer any item you do not want to. Your responses will be kept confidential and only the researchers will have access to them. Please note there is a limit to this confidentiality if you indicate in the screening questionnaire that you are at risk for self-harm. In this case, we are required to break confidentiality in order to ensure your safety. All responses are tracked with a number code to ensure the anonymity of each participant. Responses from all screening participants will be downloaded and stored securely in Dr. Tan's lab for a period of 5 years, after which they will be destroyed.

Risks and benefits? There are no foreseeable benefits to your participation in the screening or main study. However, please note that we will be asking some questions relating to psychological health. There is a small possibility that you may find some of the questions uncomfortable and you do have the right to refuse to answer them. As a small token of our gratitude, all participants in the screening will be entered into a random prize draw for a $50 Wal-Mart gift certificate. All participants in the main study will be entered into one of two random prize draws of $50 Wal-Mart gift certificates. Main study participants who are Introductory Psychology students at Lakehead University will also receive 1 bonus point towards their course mark. All main study participants can also request for a summary of the results to be sent to them after the study has been completed.

How do I know whether I am selected for the main study? We will contact you within 5 days to let you know whether or not you have been selected for the main study.

I prefer to fill out an online version of the screening questionnaire. That's not a problem. Please visit this weblink <**http://cbtc.utoronto.ca/opinio/s?s=321**> .

I prefer to fill out the screening questionnaire on paper. That's not a problem at all. Just fill out the attached questionnaire and return it to us by mail (see address below) or slide it under the door of SN 1003 in the School of Nursing Building, Lakehead University.

THANK YOU from the research team (please contact us if you have questions):

Kylie Prystanski <*kmprysta@lakeheadu.ca*> Dept. of Psychology
Dr. Tan<*jtan@lakeheadu.ca*> Lakehead University
Research team tel: 343-8168 Thunder Bay, ON, P7B 5E1

If you have any concerns regarding your rights as a research participant, or wish to speak to someone other than a research team member about this research project, you are welcome to contact the:

Office of Research
Lakehead University
955 Oliver Road
Susan Wright (Research Ethics Officer)
Phone: 807-343-8283

Chair, Research Ethics Board
St. Joseph's Care Group
580 N. Algoma St., Thunder Bay, Ontario P7B 5G4
Phone: 807-343-4300 ext. 4723
Email contact for Chair: REB_Chair@tbh.net

Appendix P

Informed Consent for the Hard Copy Screening Research Questionnaire

INFORMED CONSENT FORM (2009-2010)
Paper Copy Screening

Title of research: ATTENTION AND REACTION TIME 2009-2010

Researchers: Kylie Prystanski (MA student)
Dr. Josephine Tan (supervisor)

Aim of Screening: The aim of this screening is to identify individuals of age 18 or older who might be eligible to participate in a main study on attention and reaction time. In the main study individuals will be asked to view computerized sets of images and given instructions on how to respond to them while their attention and reaction time are being measured by the computer and by a machine that measures physiological reactions. In the screening, the researchers are looking for participants across a range of scores on psychological measures that assess their emotions, cognitions, and functioning.

Procedure of Screening: This screening will require you to complete a questionnaire on your emotions, cognitions, and behaviors. Please respond as honestly and accurately as possible. Your responses will be kept confidential and will only be accessed by the researchers. The entire questionnaire should take you no more than 30 minutes to complete. The researchers will contact you within 5 days to let you know if you are selected for the main study.

Confidentiality: All your responses will be kept confidential and identifiable only with a personal code. However, there is a limit to this confidentiality if you indicate in the screening questionnaire that you are at risk for self-harm. In this case, a professional will be informed and will take steps to ensure your safety, as your personal health and safety is our first concern. All data will remain in secure storage in Dr. Tan's lab for a period of 5 years after which time they will be destroyed. In the event of any publications or research presentations based on this research, your participation will remain entirely anonymous and confidential.

Voluntary Nature: Your participation is strictly voluntary. You are free to withdraw from the screening any time you want without explanation or penalty. You are under no obligation to participate in the main study even if you complete this screening questionnaire. You are free to not answer any questions you wish although we hope that you will not skip any item so that your responses will be comprehensive and valid when completed.

Risks / Benefits: There are no foreseeable benefits to your participation in the screening or main study. However, please note that we will be asking some questions relating to psychological health. There is a small possibility that you may find some of the questions uncomfortable and you do have the right to refuse to answer them. All screening participants will be entered into a random prize draw for a $50 Wal-Mart gift certificate. All participants in the main study will be entered into1 of 2 random prize draws for a $50 Wal-Mart gift certificate, and will be able to request for a copy of the summary of the results when the main study has been completed. Lakehead University Introductory Psychology students will receive 1 bonus point towards their course marks for participating in the main study.

For my own protection, I understand that there is a limit to the level of confidentiality held by the researchers if I show to be at risk for self-harm or harm to others.

If you have read and understood the above and wish to participate in this recruitment study, please sign below to indicate your full informed consent.

_____	_____	_____
Print name here	Sign name here	Date here

We need your name and contact information so that we can reach you if you are selected for the main study, and if you win a gift certificate in the screening random prize draw:

Name: _____

Mailing address: _____

_____

_____

Postal code: _____

Tel number we can reach you at: _____

Email address we can reach you at: _____

Personal Code:
In order to maintain anonymity in your research questionnaire and yet still enable us to contact you for the main study should meet the research criteria, please create a **personal code** that is no longer than 7 characters. Please write in your personal code here: _____

Please proceed to the Screening Questionnaire.

Appendix Q

Debriefing Form for the Screening Questionnaire

DEBRIEFING FORM FOR THE SCREENING QUESTIONNAIRE

(ATTENTION AND REACTION TIME 2009-2010)

Firstly, we would like to thank you for completing this study. Without participants like you who are willing to volunteer your time and share information with us, it would not be possible for psychological research to advance.

The questionnaire that you just filled out is a screening questionnaire. The objective of this screening is to identify participants across a wide range of scores who are eligible to participate in the main study. Completing this screening questionnaire does not mean that you are obligated to participate in the main study. You will be contacted by a researcher within five days of submitting this screening questionnaire to inform you of whether or not you are eligible to participate in the main study.

You will also be contacted in the event that you win the random prize draw for a $50 gift certificate that you can redeem at Wal-Mart which will be held in the spring.

People experiencing difficulties in life may benefit from professional assistance to help them through a troubling time. In this screening we asked questions of a personal nature pertaining to the experience of depression as well as disordered eating symptoms. If you experience depression or disordered eating that interferes with your functioning or is a source of concern to you, there are therapeutic resources available to you. If you have any questions, please feel free to contact Dr. Tan, who is a clinical psychologist, at 346-7751 or jtan@lakeheadu.ca.

Resources for Counseling and Therapy

Sometimes when experiencing life problems, seeking professional assistance becomes necessary in order to bring one's life to a better balance. This is particularly important if one's life has become affected by stress or mood changes (e.g. withdrawal from friends or family, work and/or academic performance becomes impaired, self-grooming deteriorates, personal relationships become strained, there are thoughts/ intentions of harming one's self, etc.).

The city of Thunder Bay has therapy and counseling services that are accessible. If you or someone you know could use some assistance, please consider the following options:

- Lakehead University Health and Counseling Services – free to all LU students: (807) 343-8361
- Lakehead University Native Student Support Services: (807) 343-8085
- Family Services Thunder Bay: (807) 626-1880
- Catholic Family Development Centre: (807) 345-7323
- Thunder Bay Counseling Centre: (807) 684-1880
- St. Joseph's Health Centre: (807) 624-3400
- Emergency services are available from the Thunder Bay Regional Health Sciences Centre
- See your family physician or walk-in clinic for a referral or refer yourself to any mental health professional in private practice (look up in the Yellow Pages under *Psychologists and Psychological Associates; Psychotherapy; or Marriage, Family & Individual Counselors*).
- Get more information from the Thunder Bay Canadian Mental Health Association: (807) 345-5564

Appendix R

Cover Page for the Online Screening Research Questionnaire

ONLINE SCREENING RESEARCH QUESTIONNAIRE
(ATTENTION & REACTION TIME 2009-2010)

Dear Potential Participant,

Thank you for your interest in our screening study. The screening is designed to identify potential research participants, who are 18 years or older, for a main study on attention and reaction time. Before you begin, we would like to provide you with information so that you can participate on an informed basis.

Who are the researchers? They are Kylie Prystanski, a MA Clinical Psychology student at Lakehead University, and the research supervisor, Dr. Josephine Tan. Their contact information is below.

What do I have to do for the screening? You must be at least 18 years old to participate in the screening which takes only about 30 minutes. The screening consists of you answering questions about your emotions, cognitions, and behaviours so that we can invite individuals who cover a range of characteristics to participate in the main study.

What is the main study like? In the main study, participants will be asked to view computerized images and given clear instructions on how to respond to those images. During those tasks, we will measure your reaction time and your physiological response. The main study takes 1 hour.

What about confidentiality and voluntary participation? Your participation in both the screening and main study is completely voluntary and you can withdraw from both at any time without penalty. You are free to not answer any item you do not want to. Your responses will be kept confidential and only the researchers will have access to them. Please note there is a limit to this confidentiality if you indicate in the screening questionnaire that you are at risk for self-harm. In this case, we are required to break confidentiality in order to ensure your safety. All responses are tracked with a number code to ensure the anonymity of each participant. Responses from all screening participants will be downloaded and stored securely in Dr. Tan's lab for a period of 5 years, after which they will be destroyed.

Risks and benefits? There are no foreseeable benefits to your participation in the screening or main study. However, please note that we will be asking some questions relating to psychological health. There is a small possibility that you may find some of the questions uncomfortable and you do have the right to refuse to answer them. As a small token of our gratitude, all participants in the screening will be entered into a random prize draw for a $50 Wal-Mart gift certificate. All participants in the main study will be entered into one of two random prize draws of $50 Wal-Mart gift certificates. Main study participants who are Introductory Psychology students at Lakehead University will also receive 1 bonus point towards their course mark. All main study participants can also request for a summary of the results to be sent to them after the study has been completed.

How do I know whether I am selected for the main study? We will contact you within 5 days to let you know whether or not you have been selected for the main study.

I prefer to fill out the screening questionnaire on paper. That's not a problem at all. Just let us know and we can mail out a copy of the screening questionnaire to you. If you are on campus at Lakehead University, you can pick up a copy from a box that will placed outside the door of SN 1003 in the School of Nursing Building. You can return the questionnaire by mail to us (see below) or slide it under the door of SN 1003.

I prefer to fill out an online version of the screening questionnaire. That's perfect. Just click on the PROCEED button below and it will take you there.

THANK YOU from the research team (please contact us if you have questions):

Kylie Prystanski <kmprysta@lakeheadu.ca>
Dr. Tan <jtan@lakeheadu.ca>
Research team tel: 343-8168
Dept. of Psychology
Lakehead University
Thunder Bay, ON
P7B 5E1

If you have any concerns regarding your rights as a research participant, or wish to speak to someone other than a research team member about this research project, you are welcome to contact the:

Office of Research
Lakehead University
955 Oliver Road
Susan Wright (Research Ethics Officer)
Phone: 807-343-8283

Chair, Research Ethics Board
St. Joseph's Care Group
580 N. Algoma St., Thunder Bay, Ontario P7B 5G4
Phone: 807-343-4300 ext. 4723
Email contact for Chair: REB_Chair@tbh.net

Appendix S

Informed Consent for the Online Screening Research Questionnaire

INFORMED CONSENT FORM (2009-2010)
Online Screening

Title of research: ATTENTION AND REACTION TIME 2009-2010

Researchers: Kylie Prystanski (MA student)
Dr. Josephine Tan (supervisor)

Aim of Screening: The aim of this screening is to identify individuals of age 18 or older who might be eligible to participate in a main study on attention and reaction time. In the main study individuals will be asked to view computerized sets of images and given instructions on how to respond to them while their attention and reaction time are being measured by the computer and by a machine that measures physiological reactions. In the screening, the researchers are looking for participants across a range of scores on psychological measures that assess their emotions, cognitions, and functioning.

Procedure of Screening: This screening will require you to complete a questionnaire on your emotions, cognitions, and behaviors. Please respond as honestly and accurately as possible. Your responses will be kept confidential and will only be accessed by the researchers. The entire questionnaire should take you no more than 30 minutes to complete. The researchers will contact you within 5 days to let you know if you are selected for the main study.

Confidentiality: All your responses will be kept confidential and identifiable only with a personal code. However, there is a limit to this confidentiality if you indicate in the screening questionnaire that you are at risk for self-harm. In this case, a professional will be informed and will take steps to ensure your safety, as your personal health and safety is our first concern. All data will remain in secure storage in Dr. Tan's lab for a period of 5 years after which time they will be destroyed. In the event of any publications or research presentations based on this research, your participation will remain entirely anonymous and confidential.

Voluntary Nature: Your participation is strictly voluntary. You are free to withdraw from the screening any time you want without explanation or penalty. You are under no obligation to participate in the main study even if you complete this screening questionnaire. You are free to not answer any questions you wish although we hope that you will not skip any item so that your responses will be comprehensive and valid when completed.

Risks / Benefits: There are no foreseeable benefits to your participation in the screening or main study. However, please note that we will be asking some questions relating to psychological health. There is a small possibility that you may find some of the questions uncomfortable and you do have the right to refuse to answer them. All screening participants will be entered into a random prize draw for a $50 Wal-Mart gift certificate. All participants in the main study will be entered into 1 of 2 random prize draws for a $50 Wal-Mart gift certificate, and will be able to request for a copy of the summary of the results when the main study has been completed. Lakehead University Introductory Psychology students will receive 1 bonus point towards their course marks for participating in the main study.

For my own protection, I understand that there is a limit to the level of confidentiality held by the researchers if I show to be at risk for self-harm or harm to others.

Please note that by completing the online screening questionnaire and submitting it, you are indicating that you have read and understood the above information and that you participate in the screening on a voluntary basis.

We need your name and contact information so that we can reach you if you are selected for the main study, and if you win a gift certificate in the screening random prize draw:

Name:

Mailing address:

Postal code:

Tel number we can reach you at:

Email address we can reach you at:

Personal Code:
In order to maintain anonymity in your research questionnaire and yet still enable us to contact you for the main study should meet the research criteria, please create a **personal code** that is no longer than 7 characters. Please type in your personal code here: _____

Now, ***please note your personal code*** and remember it. You will be asked to provide it if you participate in the main study.

If you have noted down your personal code and are ready to proceed to the research questionnaire, please click on the PROCEED button below:

PROCEED

Appendix T

Main Study Cover Page

ATTENTION AND REACTION TIME 2009-2010

Dear Potential Participant,

Thank you for your interest in our study, ATTENTION AND REACTION TIME 2009-2010. This main study is being conducted by Kylie Prystanski (kmprysta@lakeheadu.ca), a MA Clinical Psychology student at Lakehead University and by the MA thesis advisor, Dr. Josephine Tan (jtan@lakeheadu.ca, 346-7751).

The objective of the main study is to compare people's evaluative judgment and reaction time to images and words on verbal and physiological levels. Participants will be invited to come into the lab to fill out a brief questionnaire and then engage in a computerized task that will measure reaction times. Following this part of the testing session, non-invasive electrodes will be placed on the face of the participant to measure their physiological reactions towards images presented on a computer screen.

This testing session will take approximately 1 hour to complete. Your participation in this main study is strictly voluntary. You are free to withhold your participation in any part of the study. You are also free to skip any item you do not wish to answer and to withdraw from the study any time without explanation or penalty. Your responses will be kept confidential and anonymous and will only be accessed by the researchers. There are no foreseeable physical or psychological risks or benefits to you for participating in this study. All of the data collected will remain in secure storage in Dr. Tan's lab for a period of 5 years after which time they will be destroyed. In the event of any publications or research presentations based on this research, the data will be presented in aggregate form and your participation will remain entirely anonymous and confidential.

All participants who completed the screening questionnaire will have their name entered into a prize draw with the chance to win a $50 gift certificates for Wal-Mart. To thank you for participating in our main study, we will be carrying out two additional random prize draws for $50 gift certificates for Wal-Mart. Also, Introductory Psychology students who complete the main study will receive 1 bonus point toward their final mark. These prize draws will be done in the spring and you will be contacted in the event that you win. If you are interested in the outcome of the study you can choose to receive a summary of the results in the summer of 2010.

Once again, we would like to thank you for your time and interest in this study. It is greatly appreciated.

Kylie Prystanski <kmprysta@lakeheadu.ca>
Dr. Tan <jtan@lakeheadu.ca>
Research team tel: 343-8168

Dept. of Psychology
Lakehead University
Thunder Bay, ON
P7B 5E1

If you have any concerns regarding your rights as a research participant, or wish to speak to someone other than a research team member about this research project, you are welcome to contact the:

Office of Research
Lakehead University
955 Oliver Road
Susan Wright (Research Ethics Officer)
Phone: 807-343-8283

Chair, Research Ethics Board
St. Joseph's Care Group
580 N. Algoma St., Thunder Bay, Ontario P7B 5G4
Phone: 807-343-4300 ext. 4723
Email contact for Chair: REB_Chair@tbh.net

Appendix U

Main Study Informed Consent

INFORMED CONSENT FORM (2009-2010)
Main Study

Title of research: ATTENTION AND REACTION TIME 2009-2010

Researchers: Kylie Prystanski (MA student)
Dr. Josephine Tan (supervisor)

Aim of Study: The aim of this study is to measure participants on their attention and reaction time while viewing computerized sets of images. This will help us to understand what types of stimulus are more meaningful to different people.

Procedure: In this study, you will be viewing words presented in different colours on a computer screen and naming the colour of the words as quickly and accurately as you can. You will also be viewing and rating different images while your physiological responses are measured by a machine.

Risks / Benefits: There are no foreseeable physical or psychological harm to you as a result of participating in the study. The physiological recordings that will be undertaken are not invasive and are all surface recordings that are painless. All participants in the main study will be entered into 1 of 2 random prize draws for a $50 Wal-Mart gift certificate, and will be able to request for a copy of the summary of the results when the main study has been completed. Lakehead University Introductory Psychology students will receive 1 bonus point towards their course marks for participating in the main study.

Confidentiality: All your responses will be kept confidential and identifiable only with the personal code that was developed during the screening. All data will remain in secure storage in Dr. Tan's lab for a period of 5 years after which time they will be destroyed. Only the researchers will have access to the data. In the event of any publications or research presentations based on this research, your participation will remain entirely anonymous and confidential.

Voluntary Nature: Your participation is strictly voluntary. You are free to withdraw from the screening any time you want without explanation or penalty. You are also free to skip any item you do not wish to answer.

If you have read and understood the above and wish to participate in this study, please sign below to indicate your full informed consent.

_____	_____	_____
Print name here	Sign name here	Date here

We need your name and contact information so that we can reach you in the summer of 2010 if you win a gift certificate in the random prize draw:

Name: _____

*Mailing address:*_____

_____

_____

*Postal code:*_____

*Tel number we can reach you at:*_____

*Email address we can reach you at:*_____

If you are an Introductory Psychology student at Lakehead University, you are entitled to 1 bonus mark towards your course. Please provide us with the information below so that we can make sure that you receive your credit:

What is the name of your Introductory Psychology professor? _____

or

On what day and time is your Introductory Psychology class? _____

Appendix V

Debriefing and List of Counseling/Therapy Resources

DEBRIEFING FORM FOR THE MAIN STUDY

(ATTENTION AND REACTION TIME 2009-2010)

Firstly, we would like to thank you for completing this study. Without participants like you who are willing to volunteer your time and share information with us, it would not be possible for psychological research to advance. We would like to offer you additional information about the study now that you are done so that you can understand further what we are doing in this project. We were not able to offer you a lot of detailed information before because we did not wish to influence your responses in anticipation of what you believed we expected to find.

The objective of our research is to measure people's reaction time and psychophysiological responses to sets of psychological stimuli. We selected people who experienced winter depression, those who had disordered eating or irregularities in their eating patterns that could include overeating, feeling loss of control when eating, engaging in bulimic behaviours such as purging after a bingeing episode, and finally, a group of people who did not experience any depression or any health problems (control). This research involves comparing those with winter depression, disordered eating, and control.

The symptoms of winter depression is similar to those in regular depression except that in winter depression, there is a seasonal pattern to it and the symptoms are more vegetative-somatic in nature such as carbohydrate craving, increased appetite and eating, weight gain, fatigue, and oversleeping. As it turns out, the vegetative-somatic symptoms in winter depression are also similar to those found in disordered eating, especially bulimia. Given that there is overlap between winter depression and disordered eating, we were interested to see if we could find differences between the groups.

Research suggests that people with different types of problems tend to have different cognitive profiles and are more sensitive to picking up cues that relate to their problems. For example, in regular depression, people tend to be more sensitive to negative and pessimistic cues. We hypothesized that in winter depression, people might be sensitive to winter cues and disordered eating people would be more sensitive to food cues.

In the project, we gave our research participants computerized tasks that expose them to different types of cues in the form of a word or an image. Those cues would be season-related (summer, winter) or food related (binge food, non-binge food).

To see how they react to those cues, we measured the participants' reaction time to colour-naming cue words. Research shows that when a word has more meaning to a person, he is slower to colour name the word. By measuring people's reaction time in the colour-naming task, we could measure which words the different groups were sensitive to. For example, people with winter depression words would be slower to colour-name winter words, people with disordered eating would be slower to colour-name food words.

We also asked people to recall the words that they saw in the colour-naming task. We believe that people will be more likely to recall words that have more meaning to them. Hence people with winter depression would recall more winter words, people with disordered eating would recall more food words.

Finally, we showed images to people while hooking them up to a machine that measured their psychophysiological responses in the form of their facial activity level which can give us information about the strength of a person's emotional reaction to what he or she saw. To prevent people from becoming self-conscious about their facial activity, we said that we were measuring their galvanic skin response. We apologize for this little deception but it was necessary so that people would not be uncomfortable and control their facial reactions during the task. We think that people with winter depression might be more reactive to winter images whereas those with disordered eating will be more reactive to images of binge foods. We also

had the participants rate how appealing/appetizing they found each image. That way, we could correlate the strength of their facial responses with the valence (positive/negative) of their rating.

We do not yet know how the results of this study will turn out. If you are interested in the outcome of this study and have requested a summary of the findings, we will send it to you by late summer 2010. You will also be contacted in the event that you win the one of the random prize draws for a $50 gift certificate that you can redeem at Wal-Mart which will be held in the spring. If you are an Introductory Psychology student, you will be given 1 bonus point toward your final course mark.

People who have winter depression and/or disordered eating may benefit from professional assistance to help them through the difficult time. If you experience depression or disordered eating that interferes with your functioning or is a source of concern to you, there are therapeutic resources available to you. We have provided a list of resources below. If you have any questions, please feel free to contact Dr. Tan at 346-7751 or jtan@lakeheadu.ca.

Please do not mention this study to anyone. Many people have not yet participated in this study and we do not wish to contaminate their answers with prior information. Our results will not be accurate in such a case, and the data will not be usable. We hope that you will cooperate with us in this regard. Do you have any questions? Thank you.

Resources for Counseling and Therapy

Sometimes when experiencing life problems, seeking professional assistance becomes necessary in order to bring one's life to a better balance. This is particularly important if one's life has become affected by stress or mood changes (e.g. withdrawal from friends or family, work and/or academic performance becomes impaired, self-grooming deteriorates, personal relationships become strained, there are thoughts/ intentions of harming one's self, etc.).

The city of Thunder Bay has therapy and counseling services that are accessible. If you or someone you know could use some assistance, please consider the following options:

- Lakehead University Health and Counseling Services – free to all LU students: (807) 343-8361
- Lakehead University Native Student Support Services: (807) 343-8085
- Family Services Thunder Bay: (807) 626-1880
- Catholic Family Development Centre: (807) 345-7323
- Thunder Bay Counseling Centre: (807) 684-1880
- St. Joseph's Health Centre: (807) 624-3400
- Emergency services are available from the Thunder Bay Regional Health Sciences Centre
- See your family physician or walk-in clinic for a referral or refer yourself to any mental health professional in private practice (look up the Yellow Pages under *Psychologists and Psychological Associates; Psychotherapy; or Marriage, Family & Individual Counselors*).
- Get more information from the Thunder Bay Canadian Mental Health Association: (807) 345-5564