Study of Seasonal Variation in Mood and Behaviour in Northwestern Ontario

by
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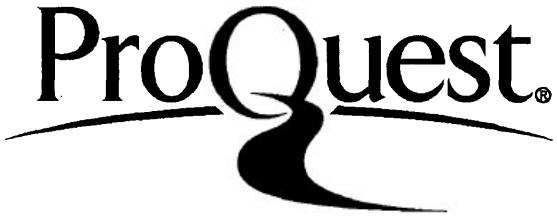
Running head: SEASONAL AFFECTIVE DISORDER



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Abstract

A sample of 237 participants from the general and Lakehead University student population were tested in January 1992 using the Seasonal Pattern Assessment Questionnaire, the Beck Depression Inventory, two subscales (Demoralization and Mania) from the Psychiatric Epidemiology Research Interview and the Food/Drink Frequency Questionnaire. Climate, age and occupation seem to have an influence on the prevalence of seasonality in this sample. Three seasonality groups (No-SAD, subsyndromal-SAD and SAD) were compared in terms of mood and food intake. Evidence that the depressive symptoms of Seasonal Affective Disorder are a by-product of core seasonality dimensions (increased appetite, fatigue and decreased energy) was found. A subsample of individuals was tested monthly over a 12 month period to record changes in mood, behaviour and food intake (using the same scales as in the initial testing along with the NEO personality inventory). Overall, these yearlong participants reported seasonal changes in mood-- feeling worse in the fall and winter. This pattern was more pronounced among the SAD group participants. The Food/Drink Frequency Questionnaire did not provide clear results over the year.

The purpose of this study was to investigate the seasonal variations in mood, behaviour and food intake within the context of the northerly climate of Thunder Bay, Canada. An overall sample of 237 participants was tested once in January 1992 and a subsample of 18 individuals was tested on a monthly basis over the course of the same year. The ultimate goal was to better describe and define seasonal affective disorder.

Literature Review

Seasonal Affective Disorder

The influence of climatic variables on one's mood and behaviour has been a popular topic since classical times. Blehar and Rosenthal (1989) concluded that "...for over 2000 years seasonal and environmental influences were enduring themes in writings on depression and mania...". In fact, terms such as "cabin" and "spring" fever are still a part of our everyday language. However, it is only in the past decade that scientific interest in the field of seasonality has resurfaced.

Today, the term generally used to describe a seasonal problem with mood or behaviour is seasonal affective disorder or SAD. Rosenthal et al. (1984) first introduced this term to describe a disorder in which a person consistently experiences a period of depression in the fall and winter that spontaneously remits by the spring or summer. It is currently accepted within the classification system of the Diagnostic and Statistical Manual of Mental Disorders III-Revised (1987) as a seasonal form of mood disorder.

The characteristic features of SAD

The primary defining characteristic of this disorder is its periodicity, the fact that changes in mood and behaviour occur roughly at the same time each year (Thase, 1986). To be diagnosed as suffering from SAD, therefore, a person must experience recurring episodes of mood disturbance over a number of years (see Appendix A).

Although everyone seems to experience some seasonal fluctuation in mood and behaviour, individuals with SAD tend to report a more exaggerated form of this behaviour that interferes with their lives (Garvey, Wesner & Godes, 1988; Thase, 1986; Eastwood, Whitton, Kramer & Peter, 1985). Overall, women are more likely to suffer from seasonality (Garvey et al., 1988; Thompson & Isaacs, 1988; Eastwood et al., 1985; Rosenthal et al., 1984); especially those between the ages of 20 and 40 years of age (Kasper, Wehr, Bartko, Gaist & Rosenthal, 1989).

The characteristic features of this disorder include changes in energy level, activity, appetite, weight, sleep and mood. Specifically, there is the presence of atypical vegetative symptoms: hypersomnia, fatigue, increased appetite and body weight along with a "carbohydrate craving" (Rosenthal et al., 1984).

Although individuals with SAD report feeling depressed and tired, they tend to crave carbohydrate-rich foods and actually tend to eat more and gain weight during their depressive winter episodes-- which is atypical of most individuals suffering from major affective disorders (Wehr & Rosenthal, 1989; Rosenthal et al., 1984). It is as if these people try to self-medicate or energize themselves by taking in

carbohydrate-rich foods (Krauchi, Wirz-Justice & Graw, 1990; Rosenthal et al., 1989; Krauchi & Wirz-Justice, 1988; Rosenthal et al., 1984)-- often in the form of snacks (Wurtman, 1987).

Krauchi et al. (1990) suggest that this attempt at self-healing elevates the individual's glucose levels and that, via the medial hypothalamus, there is a metabolic shift leading to an increase in energy. The consequence of this process is that the atypical symptoms of SAD are attenuated. According to this view of SAD, an inhibited medial hypothalamus is seen as underlying some of the symptoms of seasonality (especially the lack of energy and increased fatigue).

A milder form of SAD (sub-syndromal SAD or sub-SAD) has also been identified in some individuals (Bartko & Kasper, 1989; Kasper et al., 1989; Wirz-Justice et al., 1989). These individuals do not meet the criteria for seasonal affective disorder but nonetheless report experiencing difficulties with seasonality. The symptoms are basically the same as in SAD but simply not as extreme.

Individuals with sub-SAD appear to be an intermediary group between individuals not severely influenced by seasonality and SAD populations. However, this group's existence has only recently been identified (Bartko & Kasper, 1989). As a result, very little research has been carried out in this area.

The effect of light on SAD

Individuals with seasonal affective disorder have shown some positive responses to bright light treatment (Blehar & Rosenthal, 1989; Rosenthal & Blehar, 1989; Terman, Quitkin, Terman, Stewart & McGrath, 1987;

Kasper, Rogers, Yancey, Schulz, Skwerer & Rosenthal, 1985; Rosenthal et al., 1984). However, the pathogenesis of the condition, the exact biological mechanism responsible for the positive responses to phototherapy and the ideal conditions for administration of this treatment, are not yet clearly understood (Rosenthal & Wehr, 1992).

Three hypotheses have been proposed to explain the effectiveness of phototherapy in the treatment of seasonal affective disorder: the melatonin hypothesis, the circadian rhythm phase-shift hypothesis and the circadian amplitude hypothesis. All of these hypotheses involve the hypothalamic region in the process of seasonality.

The melatonin hypothesis is based on findings suggesting that melatonin production is affected by light-- more specifically, that bright artificial light stops nocturnal melatonin production (Thompson, Franey, Arendt & Checkley, 1988; Terman et al., 1987; Lewy, 1983). This hormone acts as a synchronizing mechanism in several physiological processes and serves as a chemical signal of darkness (Lewy, 1983). It is proposed that humans, like animals, may have seasonal rhythms that are cued to melatonin production and therefore also to the natural photoperiod as it changes through the year (Wehr & Rosenthal, 1989).

Individuals suffering from SAD may be more sensitive to seasonal variations in melatonin secretion (the slight increase in melatonin over the fall and winter). Phototherapy at dawn and dusk is thereby prescribed to suppress daily melatonin production. There has been little empirical evidence to support these views (Rosenthal & Wehr, 1992; Wehr & Rosenthal,

1989). It may be the timing rather than the direct production of melatonin that is altered during phototherapy (Murray, 1989).

Related to the idea of a timing of the light/dark cycle is the circadian rhythm phase-shift hypothesis (Lewy, Sack, Singer & White, 1987). Endogenous circadian rhythms occur regardless of environmental cues (they are free-running) and, in humans, cover a period of about 25 hours (Checkley, 1984). In most cases, these rhythms (ie. temperature, activity-rest cycle, melatonin, cortisol) are synchronized by the light/dark cycle.

The circadian rhythm theory proposes that SAD patients have abnormally delayed circadian rhythms relative to their sleep pattern (Wehr & Rosenthal, 1989; Lewy et al. 1987) and that every point in their cycle occurs later (Byerley, Brown & Lebegue, 1987; Lewy et al., 1987; Lewy, 1983). Phototherapy, in this case, focuses on using morning light exposure (before dawn) in order to advance the phase delay and improve the symptoms of depression. While this hypothesis has received some support (Rosenthal et al., 1988), it has yet to be effectively proven (Rosenthal & Wehr, 1992; Wehr & Rosenthal, 1989).

The third hypothesis does not stress the timing of phototherapy but rather, its intensity and duration-- the number of photons that reach the retina (Wehr & Rosenthal, 1989). The circadian rhythm amplitude hypothesis is based on the notion that winter depression in seasonal affective disorder is caused by a reduction in the amplitude of circadian rhythms-- a decrease in overall light that reaches the retina (Thompson et al, 1988).

According to this model, treatment must try to increase the amplitude of the circadian rhythm. The intensity of the light and the duration of phototherapy are seen as important to treatment (Oren et al., 1991), independent of the time of day (Wehr & Rosenthal, 1989; Lewy & Rosenthal, 1987; Hellekson, Kline, Rosenthal, 1986). Because this hypothesis is relatively new, very little experimental evidence has been brought forth to support the idea (Wehr & Rosenthal, 1989). It still remains a controversial hypothesis (Rosenthal & Wehr, 1992).

Most recently, there has been some consideration given to the role of neurotransmitters in the pathogenesis of seasonal affective disorder. In particular, serotonin, dopamine and norephinephrine have all been implicated in theories of SAD (Rosenthal & Wehr, 1992). Research in this area is ongoing and offers new insight into the process of seasonality.

The effect of latitude on SAD

Since Rosenthal et al.'s (1984) first study on SAD, there have been several studies carried out to better understand the effects of seasonality. However, much of the research has been centered in the Mideastern United States. As a result, very little information about this disorder has come from studies based in more northerly settings.

There is some evidence to suggest that the severity and prevalence of this disorder may increase as the latitude of the setting becomes more northerly (Lingjaerde, Bratlid, Hansen & Gotestam, 1986; Potkin, Zetin, Stamenkovic, Kripke & Bunney, 1986). The issue of whether the effect of latitude is caused by

temperature, the amount of sunshine or other environmental factors is yet unclear (Albert, Rosen, Alexander, & Rosenthal, 1991; Wehr & Rosenthal, 1989; Rosenthal et al., 1984).

With this in mind, a preliminary investigation was carried out in Thunder Bay, Canada to see if the prevalence of SAD was more pronounced in this climatic region (Alarie & Satinder, 1991). Thunder Bay is situated along the upper coast of Lake Superior, in the northwestern region of the province of Ontario (north of the 48 parallel). It was proposed that the sharp contrast between winter and summer in this region would provide an interesting environment in which to observe the process of seasonality.

According to Environment Canada (1992), the average temperatures in Thunder Bay for the months of December, January and February are -11.1, -15.4 and -13.0 degrees Celsius respectively. Furthermore, during these months, the average hours of sunlight (per month) are 93.4 in December, 118.4 in January and 146.7 in February. In contrast, the temperatures in the city during the months of June, July and August are 14.0, 17.6 and 16.4 degrees Celsius respectively. The average hours of sunlight (per month) in Thunder Bay during the summer months are 262.0 in June, 303.7 in July and 255.9 in August. There is more than a 28 degree (Celsius) difference in average temperature and a 210 hour discrepancy in average hours of sunlight (per month) from December to July.

Temperate zone population estimates of the prevalence of seasonality (sub-SAD and SAD) have been reported at between 10% and 15% (Blehar & Rosenthal, 1989; Terman et al., 1989). Alarie and Satinder (1991)

estimated that in the context of a Northern Ontario sample the prevalence of seasonality was 58%. Although the sample in this study was biased (the majority of the participants were selected from introductory psychology courses), it does suggest that seasonality may be more prevalent in the north than in more temperate settings.

The bipolar nature of SAD

A number of studies suggest that SAD may be bipolar in nature (Blehar & Rosenthal, 1989; Garvey et al., 1988; Thompson & Isaacs, 1988; Rosenthal et al., 1984). In other words, as well as experiencing depression during one part of the year, individuals suffering from SAD may also experience a reverse form of the depressed state during an opposite part of the year. Therefore, SAD may consist of a seasonal cycle of highs and lows; going from depression to hypomania at different times of the year.

Two cycles of seasonal affective disorder have been identified: winter depression with summer hypomania; and winter hypomania with summer depression (Blehar & Rosenthal, 1989). This highlights a couple of issues. First, if the cycle of SAD can be reversed (with depression occurring in either the winter or the summer), the hypothesis that light is the seasonal variable solely responsible for seasonality may be inappropriate. The seasonal changes may not simply be entrained by changes in light (Thompson & Silverstone, 1989).

Secondly, the concept of the cyclical process of SAD raises the issue of whether or not a patient must experience hypomania in order to be diagnosed with the

disorder. Related to this issue is the definition of the hypomanic state. Because very little research has been carried out in this area not much is known about whether or not hypomania constitutes one part of the seasonality cycle.

Indeed, there is some evidence to suggest that mania may be more prevalent during the summer months among pscyhiatric populations (Carney, Fitzgerald & Morgan, 1989; Frangos & Athanassenas, 1980; Myers & Davies, 1978; Symonds & Williams, 1976; Walter, 1977). However, there is little evidence to suggest that mania or a milder form of this state (hypomania) does occur over the course of the year in people experiencing SAD (White, Lewy, Sack, Blood & Wesche, 1990). This may stem from the fact that researchers have had difficulty assessing the various symptoms of this state (Blehar & Rosenthal, 1989).

Many studies have evaluated SAD patients according to the criteria for hypomania. It may be that these individuals do not experience a full hypomanic episode. Blehar and Rosenthal (1989) suggest that individuals with SAD may exhibit a milder form of hypomania, especially in terms of their level of impairment. Instead, they propose the term hyperthymia, defined as "... states of increased energy and mood that do not impair functioning..." (p.470)

Rationale of the present study

The overall purpose of this study was to gain better insight into the characteristic features and seasonal pattern of seasonal affective disorder. Is seasonality influenced by latitude? Are people suffering from SAD necessarily depressed? Do they eat

more and if so, what types of foods are more likely to be consumed in greater quantities? What happens to SAD-sufferers in the summer? Do they experience an increase in energy and activity during the summer?

If latitude does have an effect on the prevalence of the disorder, how does this finding impact on the theory suggesting that light plays a pivotal role in the cycle of seasonality. The results of Alarie and Satinder's study (1991) indicate that seasonality may indeed be more prevalent in a northerly setting. However, it was thought appropriate to replicate these findings in a more broad-based investigation carried out on another sample of the general and university student population of Thunder Bay.

A second aim of this research was to examine the changes in behaviour and mood in a random sample over the course of a year, beginning in the winter and ending in the fall. By using less stringent criteria for the opposite state in SAD (hyperthymia), it was thought possible that an increase in activity or energy at some point in the seasonality cycle could be identified.

Related to this objective was the goal of recording the changes in diet that occur across the seasons to determine if there is a difference in carbohydrate intake between normal individuals and people experiencing SAD. This would decrease some of the dependence on retrospective data-- which has been one of the criticisms of the research done in this area (Mrovosky, 1988).

Therefore, in a setting such as Northwestern Ontario, it was proposed that the prevalence and severity of seasonal affective disorder would be higher

than the estimates established by research based in the Eastern United States. Furthermore, the higher prevalence of seasonality in Northwestern Ontario would provide an ideal context within which to describe and better define the characteristic features of SAD (especially with respect to depression).

Secondly, by using a long-term approach to studying seasonality it was expected that there would be a reversal of behavioural and affective patterns in individuals with SAD that would be evident from winter to summer. Specifically, SAD-sufferers would feel worse in the winter (ie. depressed) and, in contrast, report an increase in energy and behaviour akin to the hyperthymic state described by Blehar and Rosenthal (1989) in the summer.

Finally, it was hypothesized that individuals suffering from SAD would report changes in eating habits across seasons-- with the highest intake of carbohydrates occurring in the winter and fall. This would support the view that individuals suffering from SAD attempt to cope with seasonality by consuming larger amount of carbohydrates during the winter. In light of these considerations, the present study was conducted.

Method

Participants

The participants in this study were recruited from three different areas of the community: the Lakehead University student population, a retirement home for older adults and a city mall. These people were initially given a brief outline of the study and then asked if they wished to participate. All participants were informed of the confidential nature of their involvement in the project.

In the case of the university setting, students were given a description of the goals and implications of the study at the end of introductory psychology classes. The older adults were approached in much the same way as the university students, the only difference being that the setting was the retirement homes. People recruited through the shopping mall were randomly chosen and asked to participate in a study examining seasonal changes in behaviour. If interested, they were contacted at a later date to schedule a testing time.

In addition to these participants, six people previously tested for seasonal affective disorder by Alarie and Satinder (1991) were included in the study. These individuals had previously been recruited through the media in February 1991.

Tests and Materials

A version of the Seasonal Pattern Assessment Questionnaire or SPAQ (Rosenthal, 1989) was used to measure and describe the levels of seasonality among the participants. For scoring purposes, the SPAQ was

organized into several sections. The area of primary interest was item 11 which provides a seasonality score ranging from 0 to 24 (Rosenthal, 1989; Kasper et al., 1985-- see appendix B for SPAQ).

The seasonality score was calculated by summing each of the six items in this section (which ranged from 0 to 4). The results were used to divide the sample into three groups: low-scoring (0-7); mid-scoring (8-11); and high-scoring (12-24). These groupings were based on Rosenthal's (1989) assessment of seasonality.

According to Rosenthal's (1989) classification, a person scoring between 0 and 7 is likely to report few seasonal changes in behaviour (non-SAD). People scoring between 8 and 11 tend to experience a mild form of seasonality-- subsyndromal seasonal affective disorder or sub-SAD. Finally, individuals in the 12 to 24 range are most likely to suffer from SAD.

The SPAQ was administered once in January 1992 to the overall sample (the six individuals tested in Alarie and Satinder's 1991 study were tested again). The participants involved in the study over twelve months were tested a second time on this instrument in September 1992.

The Beck Depression Inventory (Beck, 1978) was used to assess the participants' level of depression. This inventory consists of 21 questions on which the participant has four possible answers to choose from (0 to 3). Total scores range from 0 to 63. The classification of depression in this inventory involves a progression from normal reactions (scores of 0 to 10) to severely depressed reactions (scores over 40) to the 21 items (see appendix C for BDI).

The instructions given for this inventory stressed that participants should answer the items based on their prevailing mood for the last month (including the day of the testing). By doing this, it was hoped that the results of this inventory would reveal something more than the participants' current state.

Along with the aforementioned instruments, participants were also given versions of two subtests in the Psychiatric Epidemiology Research Interview or PERI (Dohrenwend, Shrout, Egri & Mendelsohn, 1980): the Demoralization and Mania subtests. Overall, this questionnaire consisted of 20 questions-- the first eleven questions were from the Demoralization scale and the last five questions were from the Mania scale. Four questions (located between the Demoralization and Mania items) surveyed a person's sleeping habits but were not included in the scoring of the two PERI scales. (see appendix D for PERI questions-- both the Demoralization and Mania scales).

The first 15 questions of the test measured an individual's level of "demoralization". In more specific terms, the participants were asked questions related to self-esteem, self-confidence, feelings of sadness, sleeping problems, motivation, etc (see Appendix D). Participants were asked to report to what degree they had been troubled in these particular areas in the last month. The higher the score, the more the person tended to experience difficulties. This questionnaire was used to supplement the results of the Beck Depression Inventory.

The last five questions of the PERI came from the Mania subtest. These questions attempted to determine the degree to which a person had felt "high" or very

energetic during the past month (see Appendix D). Once again, the higher the score, the more the individual had felt "manic" lately.

Participants were also given a version (adapted by Kurt Krauchi-- personal communication, Jan. 1992) of the Food/Drink Frequency Questionnaire (Burke, 1948). This questionnaire provided quantitative data on the eating habits of each individual. Each person was asked to retrospectively report their eating habits for the past month. In terms of the yearlong aspect of this study, this questionnaire provided a monthly record of each participant's eating patterns (see appendix E for the Food/Drink Inventory).

Finally, the NEO Personality Inventory/ Five Factor Inventory (Costa & McCrae, 1989; Costa & McCrae, 1985) was administered to the yearlong sample. The participants completed this inventory in December, 1992. Five overall scores characterize this personality measure: Neuroticism, Extraversion, Openness, Conscientiousness and Agreeableness. Six subscales make up the Neuroticism, Extraversion and Openness scales (see appendix F for NEO inventory). It was hoped that this inventory would give some insight into the personality differences between seasonality groups.

Procedure

Participants recruited via the university and the shopping mall were asked to come to the university campus to fill out the questionnaires in an initial session. This was done in a classroom reserved for such a purpose. The people that were unable to be present at this general administration of the

questionnaires were tested on an individual basis at a time that was convenient to both the tester and the participant.

The older adults were tested in a similar fashion on a date that was convenient for the majority of the participants. This was done within the retirement home in question.

This initial stage of the study took place in late January/early February 1992. This session will be referred to as the initial testing and the sample involved will be called the overall sample. Two hundred and thirty-seven subjects were tested during this first session.

A common battery of instruments was administered to all participants: the SPAQ, Beck Depression Inventory, PERI and Food/Drink Inventory. Prior to testing, all participants were apprised of the goal of the study and asked to fill out a consent form. The entire process lasted about 40 to 45 minutes.

Following this first session, participants interested in continuing their involvement in the study were asked to leave their name and telephone number with one of the researchers. The people interested in participating in this part of the study made up a sample tested at monthly intervals over the year (1992). This sample will be referred to as the yearlong sample.

At the end of each month these "yearlong" participants were asked to fill out the BDI, PERI and Food/Drink Frequency Questionnaire. This procedure continued for twelve months--until December 1992. At the end of December, the members of the yearlong sample were asked to fill out the NEO Personality Inventory.

As mentioned above, the yearlong sample was also tested a second time on the Seasonal Pattern Assessment Questionnaire at the end of the month of September, 1992. It was assumed that a person's self-rating of seasonality should be reasonably stable over a few months. A person's seasonality score should not change depending on the season if seasonal affective disorder is to be seen as a reasonably consistent phenomena.

The SPAQ score attempts to measure a person's self-reported change in mood, appetite, sleep and behavior over the year. Theoretically, a person's estimates of these changes should not be influenced by the season (as mood or food intake might be). The second testing was used as a check on this assumption.

Statistical Procedure

The participants in this study were generally classified into groups based on occupation (student, worker, retired, homemaker), marital status (single, divorced, married, widowed) and age (under 25, 26-49, 50 and over). These groups, along with gender, provided an initial classification system within which to compare the participants.

The rationale for the age groupings was one based on the importance of examining generational differences among the sample. Given the largely student sample, it was of some interest to see if either age, related to a "student bias", influenced the results. In our previous research (Alarie & Satinder, 1991), a large proportion of the sample was students and this may have explained the prevalence of seasonality in that study. Thus the under 25 specification was created to capture the single, university student subgroup. The 26-49

group was created to capture the effect of a married, working, more "mature" group while the over 50 group was devised to monitor the influence of the oldest segment of the sample.

The Seasonal Pattern Assessment Questionnaire provided an overall view of each participant's level of seasonality. As mentioned above, item 11 on the questionnaire yielded a score which allowed classification of the participants into one of three groups: No-SAD, Sub-SAD and SAD. This classification of the participants into one of the three seasonality groups provided the focus for many of the analyses in this study.

The three seasonality groups were matched in terms of gender, age and, as much as possible, by occupation and marital status. These three matched groups consisted of fifty-seven subjects each (based on the smallest seasonality group-- the Sub-SAD group). Statistical analysis revealed very little deviance from the results uncovered using seasonality groups from the overall sample (see Table 7). As a result, it was decided to report the findings based on the larger overall sample.

Another categorization of the participants was based on the degree to which they reported changes in their weight over the year. Based on personal communications with a clinical dietitian at the Lakehead Psychiatric Hospital (P. Teixeira, July 1992), the 0-7 lbs. range was considered an average amount of yearly fluctuation in weight. One group consisted of people experiencing this amount of weight change. A second group consisted of individuals reporting over 8 lbs. of weight change in a year.

The seasonality questionnaire also provided descriptive information regarding the participants' behaviour over the course of a year. Individuals were asked to report in what months they are most likely to feel best or worst, eat most or least, etc. They were also asked other questions related to changes in sleeping habits, weight gain and the effect of various types of weather on their mood. This information complemented the seasonality scores and provided a more complete analysis of the seasonal patterns of the participants.

The Beck Depression Inventory measured the participants' level of depression. The results of this inventory were studied in comparison with the overall scores obtained on the seasonality questionnaire. A person reporting SAD tends to feel down and has little energy (Rosenthal et al., 1984). Consequently, a high score on the seasonality scale during the winter should correspond with a moderately high depression score. Conversely, lower ratings of depression should be evident in the summer in individuals with high seasonality scores. The seasonality and depression scores were compared in the hopes of finding relevant differences and/or similarities.

The abbreviated version of the Psychiatric Epidemiology Research Interview was administered each month to assess the participants' monthly patterns of behaviour. Over the course of the year, this instrument served as a baseline measure of the participants' changes in behaviour and mood.

In particular, participants' scores on the Demoralization and Mania scales were compared to their results on the seasonality questionnaire. Individuals

with higher seasonality scores should score higher in terms of the Demoralization scale during the winter and higher in terms of Mania scale during the summer (with respect to the yearlong sample). The higher Mania scores in the summer would support the theory that SAD is bipolar in nature.

It should be noted that the two PERI subtests have not been thoroughly validated and tested as separate instruments by themselves. Consequently, the results from these instruments were considered cautiously. These subscales were used more as exploratory items in this study. However, the Mania subscale in particular may provide an interesting impetus for further research into the "summer" or bipolar aspect of SAD. Unfortunately, there are very few inventories measuring mania, let alone hyperthymia.

The Food/Drink Frequency Questionnaire (Burke, 1948) was also used on a monthly basis with the yearlong participants in this study. It provided quantitative data regarding the participants' dietary habits.

The items of this inventory were grouped together to make up various food groups (P. Teixeira, personal communication, July 1992). These groups were based on: a) Canada's Food Guide system of classification (1992) involving the major food groups (cereals, meats, dairy products, fruits and vegetables); and b) a system of classification based on the basic constituents in foods (proteins, fats, carbohydrates). The analysis involving food was more on a descriptive level.

It was of interest to examine the variation in food intake between non-SAD and SAD individuals. Furthermore, the dietary analysis was useful to uncover

the seasonal variation in carbohydrate and calorie intake over the course of the year.

By testing some of the participants over the course of a year, a more in-depth analysis of the seasonal patterns reported by these individuals was possible. The first seasonality score provided a focus for future analysis; it served as a context within which to evaluate the results obtained on the other questionnaires and inventories.

Repeated measures analysis of variance was used as opposed to multivariate analysis of variance to measure yearlong changes in scores. Given the small size of the yearlong sample, this statistical procedure offered a conservative yet more reliable approach to studying the differences among this sample.

It should also be noted that in most cases, a significance level of $p<.01$ was used to detect relevant differences between groups. This approach was used in order to minimize the risk of type I error (of finding a relationship that is in fact not there). However, in cases where results enhanced the theoretical understanding or added to the explanation of seasonal affective disorder, a more liberal significance level of $p<.05$ was used.

Results

Demographics

Two hundred and thirty-seven people tested during the initial session in January 1992 consisted mostly of single students under the age of 25 (see Table 1). This large segment of the sample (62%) undoubtedly influenced the results of this study and one must keep this fact in mind when interpreting the results.

As mentioned above, one of the goals of this study was to garner a sample that was more representative of the average population. While the overall sample was largely characterized by a young student population, serious attempts were made to recruit a more diverse sample representative of the general population. Roughly one quarter of the overall sample consisted of married, middle-aged individuals actively involved in the work force. Fifteen percent of the overall sample was over the age of 50. The average age in the overall sample was 30.6 years.

The majority of the participants in this study were females (69%). This fact must also be considered when interpreting the results of this study; especially given the higher rate of SAD in women between the ages of 20 and 40 years (Rosenthal et al., 1984; Garvey, Wesner & Godes, 1988; Thompson & Isaacs, 1988; Kasper et al., 1989; Capulak, S. & Satinder, 1993).

Table 1

Distribution of Participants in the Overall and Yearlong Samples According to Various Demographic Characteristics

	Comparison samples			
	Overall		Yearlong	
	n	%	n	%
Gender				
female	164	69	16	89
male	73	31	2	11
Age				
under 25 years	142	62	12	67
26-49 years	52	23	4	22
over 50 years	36	16	2	11
Occupation				
homemaker	15	7	1	6
student	145	64	13	72
worker	56	25	4	22
retired	11	5	-	-
Marital Status				
single	156	66	12	67
divorced	14	6	-	-
married	57	24	6	33
widowed	8	3	-	-

Table 2

Means of SPAQ Score According to Marital Status and Occupation

	Marital Status Groupings			
	Single	**Divorced**	**Married**	**Widowed**
SPAQ score	9.44	10.50	8.53	3.13**

	Occupational Groupings			
	Homemaker	**Student**	**Worker**	**Retired**
SPAQ score	5.00	9.61	9.79	5.82***

** - significant ANOVA at the $p<.01$ level
*** - significant ANOVA at the $p<.001$ level

Overall Sample

Demographic differences

Statistical analyses were carried out on the occupational and marital status groups across the variety of measures used in this study. Table 2 highlights the significant differences across these categories in terms of the SPAQ score. While analysis of variance revealed differences among the occupational and marital groups, a common denominator--age--became apparent when analysis of covariance was used.

It would appear that age underlain most of the

differences found amongst occupational and marital status groups. Only a difference in sunny weather's influence across the occupational groups remained significant after age was controlled for [F (3,225)=3.59, p<.01]-- homemakers (M=1.40) tended to rate the effect of sunny weather less positively than did students (M=2.14) and workers (M=2.45).

It seems, therefore, that age was the critical factor distinguishing the overall sample at a demographic level. As a result, age groups were most relevant in defining the demographic make-up of the overall sample. Table 3 provides a breakdown of the three age groups in terms of gender, occupation and marital status.

The three age groups differed in terms of occupational [chi-square (6, N=222)=227.84, p<.001] and marital [chi-square (6, N=229)=184.02, p<.001] status. The under 25 years group was primarily made up of single (97%) students (92%). This age group represented 60% of the overall sample and, as a result, constituted the core segment of the sample. The 26 to 49 group was characterized by married (60%) workers (71%) but there still was a sizable portion of students (25%) and divorced (23%) individuals.

The smallest age group was over 50 years (15% of the overall sample). This group had a sizable segment of married (51%) individuals. Occupational status in this group was divided between homemakers, workers and retirees (roughly one third each). All the retired participants as well as all of the widowed individuals were found in this group.

Table 3

Distribution of Participants Across Age Groups According to Various Demographic Characteristics

	Age groups		
	Under 25	**26-49**	**Over 50**
Gender			
male	40	17	14
female	102	35	22
Occupation			
homemakers	1	2	11
students	130	13	1
workers	9	37	8
retired	-	-	11
Marital Status			
single	137	9	9
divorced	1	12	1
married	4	31	18
widowed	-	-	8

Table 4 provides the significant mean differences found among the age groups in relation to SPAQ and PERI scores as well as some of the respective items. Newman-Keuls post-hoc comparisons revealed significant ($p<.05$) differences across the groups in terms of SPAQ score. The under 25 and 26-49 age groups scored higher than the over 50 group. Furthermore, these two groups (under 25 and 26-49 years) tended to report greater changes in sleep length, social activity, mood,

Table 4

Significant Differences Among Age Groups

	Age Groups			
	Under 25	26-49	Over 50	
SPAQ Questionnaire				
SPAQ score	9.64	10.29	5.72	***
Changes in:				
Sleep length	1.67	1.61	0.94	**
Social activity	1.94	2.10	1.14	***
Mood	1.59	1.90	1.14	**
Appetite	1.43	1.35	0.53	***
Energy	1.81	2.12	1.11	***
PERI Questionnaire				
Demoralization score	16.69	14.96	10.44	***
Item 2 (sadness)	1.84	1.71	1.06	***
Item 3 (crying)	1.44	1.29	0.77	**
Item 5 (restlessness)	2.08	1.94	1.20	***
Item 6 (concentration)	2.27	1.89	1.26	***
Item 7 (motivation)	2.29	2.02	1.53	***
Item 9 (poor appetite)	1.24	0.84	0.53	***
Food intake				
Coffee	1.98	3.74	3.62	***
Jam	1.04	1.27	1.97	***
Cooked Vegetables	2.47	2.94	3.23	***
Beer	1.42	0.76	0.45	***

Note- only significant effects are presented
** - significant ANOVA at the $p<.01$ level
*** - significant ANOVA at the $p<.001$ level

appetite and energy level over the course of a year than did the older age group.

In terms of social activity, a larger number of participants aged 26 to 49 (74%) reported socializing least in the winter than in the under 25 age group (41%) [chi-square (1, N=145)=13.38, p<.001] and the over 50 age group (26%) [chi-square (1, N=71)=8.76, p<.001]. Furthermore, a significantly larger percentage of the 26-49 group (77%) reported socializing most in the summer as compared to the over 50 age group (36%) [chi-square (1, N=75)=12.37, p<.001].

The over 50 age group tended to score lowest on the Demoralization subtest (see Table 4). Newman-Keuls post-hoc comparisons revealed that the over 50 age group tended to report significantly (.05) less sadness, crying, restlessness and more motivation to do things than did the other two age groups. Consequently, these older individuals seemed to report having less difficulties in these areas over the month of January 1992.

Other differences on the Demoralization subscale items revealed that the ability to concentrate significantly differed across the three groups, with the under 25 group having the greatest difficulty focusing attention at times during the month of January, 1992. The under 25 group was also most likely to report a disturbance in appetite during this time.

Food intake differed amongst the three age groups. Specifically, the under 25 group drank less coffee and wine and consumed smaller quantities of cooked vegetables on a weekly basis than did the other two age groups. The youngest age group drank more beer than the other two subsamples.

Gender differences

Sixty-nine percent of the overall sample (Table 1) consisted of women. As can be seen in Table 3, this ratio was fairly consistent across the different age groups. Somewhat surprisingly, no overall gender differences were found in terms of the SPAQ score (8.31 for males as compared to 9.40 for females). Consequently, no proportional differences were apparent among the seasonality groups in terms of gender (see Table 6).

In a related study based on this same sample, Capulak and Satinder (1993) found that females between the ages of 18 to 40 scored significantly higher (M=10.14) than males (M=8.41) [$F(1,177)=4.34$, $p<.05$] on the SPAQ scale. Furthermore, women who were still menstruating reported higher seasonality scores (M=10.33) than those women who were no longer menstruating (M=6.00) [$F(1,150)=16.95$, $p<.01$] (however, this finding was no longer significant when age was used as a covariate).

Women did score higher (M=16.07) on the Demoralization subscale compared to the men (M=13.23) [$t(231)=2.84$, $p<.01$]. In particular, they reported higher rates of crying (M=1.60 for females compared to M=0.61 for males) [$t(229)=7.07$, $p<.001$] and lower levels of self-confidence (M=1.41 for females compared to M=1.10 for males) [$t(230)=2.79$, $p<.01$]. Women also tended to report feeling worse (M=-1.19) on cloudy days than the men did (M= -0.69) [$t(226)=3.12$, $p<.002$].

A significant interaction was identified between the seasonality groups (based on the SPAQ score) and gender on the Demoralization score [$F(2,232)=2.88$, $p<.02$]. Figure 1 illustrates this relationship. There

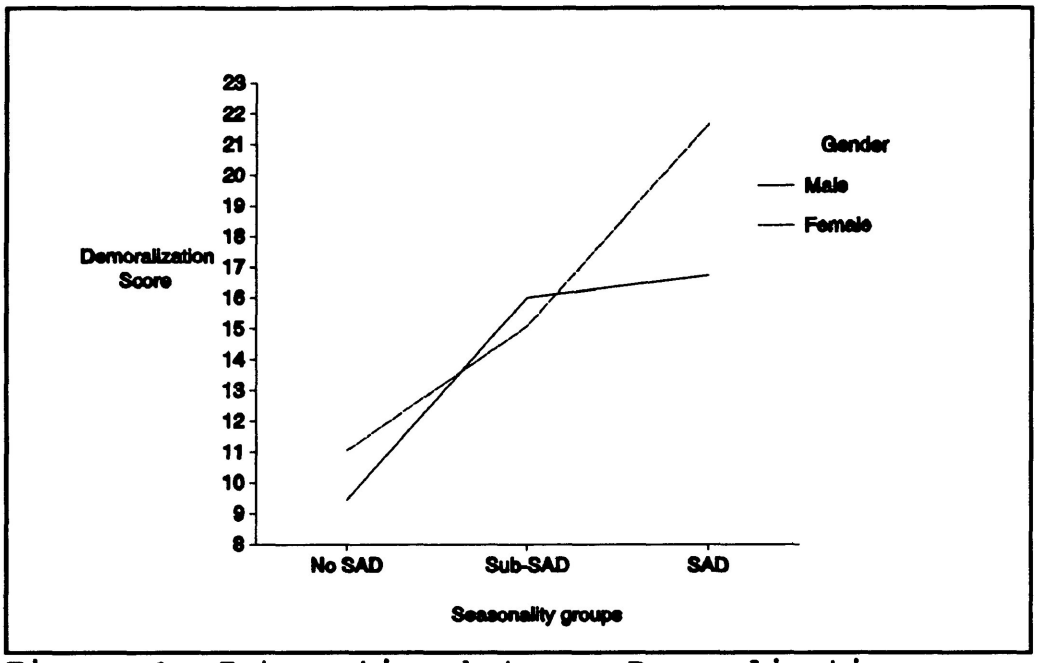

Figure 1. Interaction between Demoralization score and seasonality groups.

was a gradual increase in Demoralization scores across seasonality groups for females, whereas with males, the score tended to level off for the Sub-SAD and SAD groupings.

No gender differences were apparent in terms of the BDI score. The fact that demoralization differentiated between men and women independently from the SPAQ and BDI scores raises the possibility that this PERI subscale was measuring something a little different from the other two scales.

In terms of food intake, men (M=1.11) tended to report ingesting larger amounts of alcohol [$t(228)=2.69$, $p<.008$] on a weekly basis than did women (M=0.76)-- in particular beer (M=1.60 for males compared to M=0.91 for females) [$t(226)=3.64$, $p<.001$]. Men (M=2.19) also reported a higher weekly intake of beef [$t(231)=3.35$, $p<.001$] than did women (M=1.64).

SPAQ seasonality score

The average SPAQ seasonality score was 9.07 in the entire sample. This score was undoubtedly influenced by a number of other factors measured in this study (see Table 5). It would appear that a relationship did indeed exist between the SPAQ, Demoralization and BDI scores as well as age. However, upon further inspection, these relationships became quite complex.

Significant positive relationships were apparent between SPAQ, BDI and Demoralization scores. Interestingly, significant negative relationships existed between all the scores and age (except in the case of the BDI score). This tends to confirm the trend discussed above that people over 50 scored lower on the SPAQ and Demoralization scales (see Table 4).

To better understand the relationships between the various scores, partial correlations were calculated (see Table 5). The strong relationship between the BDI and Demoralization score was fairly constant despite partialling out other variables. As a result, it would appear that these two scales were measuring a similar dimension-- depression or "demoralization". Even when the SPAQ score was partialled out, the correlation between BDI and Demoralization scores remained significant at the .01 level.

The relationship between SPAQ and BDI remained significant when other variables were partialled out. However, when specific F-test comparisons of overall and partial correlations were calculated, the Demoralization score was found to have a significant impact on the correlation between the SPAQ and BDI scores [$F(1,221)= 29.85$, $p<.001$], as did the BDI score on the relationship between SPAQ and Demoralization

Table 5

Partial correlations involving SPAQ, BDI, PERI scores and Age

	Overall	When partialled out														
		SPQ Dem	SPQ BDI	SPQ Man	SPQ Age	Dem BDI	Dem Man	Dem Age	BDI Man	BDI Age	Man Age					
SPQ/ Dem	**.62**	*	*	**.34**	**.61**	**.58**	*	*	*	*	*	*	*	**.33**	**.26**	**.58**
SPQ/ BDI	**.57**	*	**.23**	*	**.57**	**.58**	*	*	*	*	*	**.23**	**.26**	*	*	**.58**
SPQ/ Man	.10	*	.00	.10	*	.02	*	*	*	*	.04	*	-.03	*	.02	*
SPQ/ Age	**-.24**	*	-.08	**-.27**	**-.23**	*	*	*	*	*	**-.16**	-.09	*	**-.25**	*	*
Dem/ BDI	**.75**	**.60**	*	*	**.75**	**.76**	*	*	**.61**	**.65**	*	*	*	*	*	**.76**
Dem/ Man	.17	.13	*	.18	*	.08	*	*	.15	*	.08	*	*	*	.07	*
Dem/ Age	**-.30**	-.19	*	**-.38**	**-.27**	*	*	*	**-.32**	-.16	*	*	*	*	**-.35**	*	*
BDI/ Man	.08	.00	-.09	*	*	.05	-.09	*	*	.03	*	*	-.03	*	*	*
BDI/ Age	-.07	.09	**.25**	*	-.05	*	**.28**	*	.11	*	*	**.24**	*	*	*	*
Man/ Age	**-.30**	**-.29**	**-.27**	**-.29**	*	*	**-.27**	**-.28**	*	*	**-.25**	*	*	*	*	*

Note- **SPQ**=SPAQ score; **BDI**=BDI score; **Demo**=Demoralization score; **Man**=Mania score
Underlined- significant at the .01 level **Bold**- significant at the .001 level

scores [$F(1,221) = 12.41$, $p < .001$].

Therefore, although seasonality and depression were related, the strength of this relationship did not imply that there was a strong interdependence between these measures. Instead, it would seem that depression explained only a portion of the seasonality score (or vice versa). Consequently, depression may reflect only one dimension or aspect of seasonal affective disorder as it was defined in this study.

As indicated in Table 5, the weakest correlation between age and a score used in this study was in the case of the BDI scale (-.07). Partial correlation analysis revealed that the relationship between these two variables became significant when the Demoralization score was partialled out.

Even more interesting is the positive nature of the BDI score's relationship with age when the Demoralization score was partialled out. This type of relationship with age goes against the trend apparent with the other scores used in this study (negative relationship). However, it is likely that this finding is due to the extent of the covariance between the BDI and Demoralization scores (Darlington, 1987). As mentioned above, the Demoralization and BDI scores were highly correlated.

Seasonality group characteristics

Based upon the seasonality score, three seasonality groups were created. Table 6 outlines the demographic distribution of these seasonality groups. The large number of young (or under 25), single students noticeably influenced the composition of these groups. Yet, there were some significant proportional

Table 6

Distribution of Participants Across Seasonality Groups According to Various Demographic Characteristics

	Seasonality groups		
SPAQ score range:	No SAD (n=95) 1-7	Sub-SAD (n=57) 8-11	SAD (n=84) 12-24
Gender			
male	34	16	22
female	61	41	62
Age Groups			
under 25	50	39	53
26-49	15	15	22
over 50	25	3	8
Occupation			
homemakers	11	-	4
students	51	39	55
workers	19	15	22
retired	8	1	2
Marital Status			
single	57	42	57
divorced	2	4	8
married	28	10	19
widowed	8	-	-

differences concerning age groups and marital status.

When the No-SAD and Sub-SAD groups were compared, there was a higher percentage of people over the age of 50 in the No-SAD group (69%) as compared to the under 25 age group (35%) [chi-square (1, N=117)=10.15, p<.01] as well as the 26-49 age group (29%) [chi-square (1, N=58)=10.44, p<.001]. In contrast, when the Sub-SAD and SAD groups were compared, there were larger percentages of people in the SAD group under 25 [chi-square (1, N=136)=7.48, p<.001] and between the ages 26-49 [chi-square (1, N=70)=8.83, p<.01] than over 50 years of age.

The higher prevalence of the over 50 age group in the No-SAD group highlights the fact that this group tended to score lower on the SPAQ score (see Table 4). Consequently, there was a significant difference among the seasonality groups in terms of age [F(2, 229)=5.39, p<.01]. Specifically, Newman-Keuls post-hoc comparison revealed that the No-SAD group (M=35.07) significantly (.05) differed from both the Sub-SAD (M=27.68) and SAD (M=27.75) groups with respect to age.

In terms of the relationship between seasonality group membership and occupation, the results were a little less clear. Overall, there was a difference in the proportion of occupations found across seasonality groups [chi-square (8, N=235)=19.423, p<.01]. Specifically, this difference seemed to involve the divorced and widowed individuals.

Over half (57%) of divorced participants were found in the SAD group with only 14% in the No-SAD group (see Table 6). This highlights the fact that the highest score among marital status categories was found in the divorced group (although it was not

significantly higher than either the single or married individuals-- see Table 2).

All of widowed individuals were found in the No-SAD group. This finding corresponds to the fact that the widowed group scored lowest among all marital status groups on the SPAQ score (Newman-Keuls post-hoc comparison at the .05 level-- see Table 2). Therefore, the picture we get is of a large segment of the divorced population scoring high on the SPAQ score (and being categorized as suffering from SAD) and the entire group of widowed individuals scoring low on the SPAQ score (and being categorized as not suffering from SAD).

Seasonality group differences

As mentioned above, given the fact that matching the seasonality groups did not significantly add to the description or differentiation of seasonality, the overall sample was used to examine seasonality group differences (see Table 7).

The three seasonality groups differed with respect to the number of years they reported experiencing problems with seasonality [$F(2,221)=15.473$, $p<.001$]. Newman-Keuls post-hoc comparisons revealed that all three groups differed significantly ($p<.05$) in this respect ($M=1.14$ for the No-SAD group; $M=3.98$ for the Sub-SAD group; $M=6.78$ for the SAD group).

As would be expected, seasonality group differences existed on the SPAQ score (see Table 7). This difference is expected given the fact that the groups were based on the seasonality score itself. Interestingly, the BDI and Demoralization scores also differed across seasonality groups. Newman-Keuls post-

Table 7

Seasonality Group Means on SPAQ, BDI, Demoralization and Mania Scales (Overall and Matched Samples)

	Seasonality groups		
Scores	No-SAD	Sub-SAD	SAD
Overall sample			
SPAQ	3.76	9.43	14.81***
BDI	4.52	7.09	12.42**
Demoralization	10.50	15.36	20.36***
Mania	6.40	6.33	5.37
Matched sample			
SPAQ	4.06	9.43	14.95***
BDI	4.39	7.09	12.56***
Demoralization	11.45	15.36	20.83***
Mania	6.93	6.33	5.53

** - significant ANOVA at the $p<.01$ level
*** - significant ANOVA at the $p<.001$ level

Table 8

Correlations between BDI, Demoralization and SPAQ Scores Across Seasonality Groups (for Overall and Male/Female Subsamples)

		Seasonality groups		
	Overall	No-SAD	Sub-SAD	SAD
Entire Sample				
Demosc/BDI	.75***	.54**	.62**	.68**
Demosc/SPAQ	.62***	.35**	-.03	.16
BDI/SPAQ	.57***	.26*	.17	.20
Males				
Demosc/BDI	.72**	.53**	.74**	.65**
Demosc/SPAQ	.49**	.20	-.28	-.02
BDI/SPAQ	.49**	.43*	-.13	.24
Females				
Demosc/BDI	.76**	.58**	.55**	.69**
Demosc/SPAQ	.66**	.42**	.05	.17
BDI/SPAQ	.62**	.16	.32*	.15

Note-Demosc= Demoralization score
* -significant correlation at the p<.05 level
** -significant correlation at the p<.01 level
*** -significant correlation at the p<.001 level

hoc comparisons revealed that all three groups differed significantly (.05) across the SPAQ, BDI and Demoralization measures, with the SAD group scoring highest on all three scales.

As indicated in Table 8, in the overall sample both the Demoralization and BDI scores were correlated with the SPAQ score in the No-SAD group. However, this positive relationship did not continue to manifest itself in the other two seasonality groups. Clearly, self-reported depression did not necessarily continue to increase as a function of increased seasonality in the Sub-SAD and SAD groups.

It would appear that among the non SAD-sufferers, the level of depression or "demoralization" increased as a function of the SPAQ score (or seasonality). However, once seasonality reached a certain level (sub-syndromal), it may be that the depressive aspect of seasonal affective disorder became more or less "stabilized". This corresponds to results in our study suggesting that the average BDI score among the SAD group were indicating only mild depression. Had the BDI scores continued to increase as a function of the SPAQ score, one would have expected to find more severe self-reported depression.

Table 8 also highlights the relationship between BDI, Demoralization and SPAQ scores across seasonality groups for both men and women. The relationship between the Demoralization and BDI scores remained significant across all seasonality groupings for both sexes. However, the pattern apparent among the overall sample was not necessarily present with the correlations involving the SPAQ score and the Demoralization or BDI scores.

The relationship between Demoralization and SPAQ scores was not significant for the men in any seasonality grouping, while the women exhibited a trend similar to the one witnessed among the overall sample (positive relationship among the No-SAD group only). Only the women in the Sub-SAD group exhibited a positive correlation between BDI and SPAQ scores while the men displayed a pattern similar to what was found in the overall sample (significant relationship among the No-SAD group only).

By including an overall correlations followed by a breakdown of correlations across seasonality groups in Table 8, there is the risk of presenting significant findings that are due to cumulative rather than specific effects (Simpson's Paradox). An attempt was made to clarify this point.

Covariate analyses of variance were run controlling for the Demoralization and BDI scores (seperately) while examining the distribution of the SPAQ score across the seasonality groups. The Demoralization and BDI scores accounted for approximately half of the explained variance (51% and 45% respectively) among the women as compared to 29% and 28% (respectively) among the men. It would appear, therefore, that the relationship between depression and the seasonality groups was slightly different for men and women (as evidenced in Table 8).

Another interesting trend in Table 8 is the fact that although there are strong correlations overall between the SPAQ score and the depression scores, these relationships do not show up across the seasonality groups. However, when either of the depression scores were controlled for in these relationships, the

Table 9

Seasonality Group Differences Across SPAQ Score Items

	Seasonality groups		
SPAQ score items	No SAD	Sub-SAD	SAD
Changes in:			
Sleep length	0.60	1.54	2.49***
Social activity	0.88	2.11	2.69***
Mood	0.66	1.58	2.61***
Weight	0.46	1.12	1.98***
Appetite	0.40	1.35	2.15***
Energy	0.76	1.77	2.87***

*** - significant ANOVA at the $p<.001$ level

correlation fell dramatically (see Table 5 for effect among the entire sample).

In terms of the gender subsamples the same trend mentioned above is apparent. For males, the correlations between SPAQ/Demoralization and SPAQ/BDI fell to .34 and .23 respectively when the other depression measure was partialled out. For females, the SPAQ/Demoralization and SPAQ/BDI correlations fell to .34 and .26 respectively when controlling for either of the depression scores.

Therefore, the influence of Simpson's Paradox must be considered in examining Table 8, but overall there does appear to be an interaction between the seasonality groups and gender. Specifically, depression appears to be more of a defining characteristic in the seasonality of females. Furthermore, this difference between men and women may manifest itself across the seasonality groups.

Given the differences on the SPAQ, BDI and Demoralization scales across groups, further analyses were carried out to examine which items differentiated the seasonality groups. Table 9 summarizes the differences across SPAQ score items. Newman-Keuls post-hoc comparisons revealed that not only was there an increase across the three groups in terms of reported changes in sleep length, social activity, mood, weight, appetite and energy, but that each group significantly differed ($p<.05$) from the other in these areas.

As indicated in Table 10, nearly all the BDI items showed significant group differences. The picture one gets from the significant Newman-Keuls post-hoc comparisons ($p<.05$) is that across the three seasonality groups there was an increasing sense of failure, self-dislike, dissatisfaction, sadness and reported insomnia. All three groups were differentiated on these BDI items.

Participants in the SAD group also tended to score highest on the BDI pessimism, guilt, self-accusation, crying, irritability, social withdrawal, indecisiveness, reported body image change, work difficulty, fatigability and loss of appetite items (Newman-Keuls post-hoc comparison, $p<.05$-- see Table

Table 10

Seasonality Groups Differences Across BDI Items

	Seasonality groups		
BDI items	No SAD	Sub-SAD	SAD
Overall BDI score	4.52	7.09	12.42**
Item 1 (sadness)	0.11	0.29	0.51***
Item 2 (pessimism)	0.14	0.16	0.47***
Item 3 (failure)	0.12	0.29	0.47***
Item 4 (dissatisfied)	0.16	0.45	0.77***
Item 5 (guilt)	0.10	0.18	0.39***
Item 6 (punishment)	0.10	0.24	0.28
Item 7 (self-dislike)	0.11	0.27	0.63***
Item 8 (self-blame)	0.47	0.48	0.85***
Item 9 (suicide)	0.02	0.13	0.16**
Item 10 (crying)	0.15	0.28	0.49**
Item 11 (irritability)	0.55	0.46	0.91***
Item 12 (withdrawal)	0.14	0.26	0.53***
Item 13 (indecision)	0.17	0.29	0.63***
Item 14 (body image)	0.15	0.31	0.74***
Item 15 (work problems)	0.43	0.58	0.93***
Item 16 (insomnia)	0.33	0.55	0.88***
Item 17 (fatigability)	0.49	0.66	1.13***
Item 18 (appetite)	0.11	0.26	0.46***
Item 19 (weight loss)	0.11	0.23	0.30
Item 20 (somatization)	0.12	0.31	0.51***
Item 21 (libido)	0.35	0.31	0.41

** - significant ANOVA at the $p<.01$ level
*** - significant ANOVA at the $p<.001$ level

Table 11

Significant Seasonality Groups Differences Across PERI Items

	Seasonality groups		
Demoralization items	No SAD	Sub-SAD	SAD
Item 1 (satisfaction)	1.27	1.51	2.00***
Item 2 (sadness)	1.21	1.53	2.33***
Item 3 (crying)	0.85	1.23	1.86***
Item 4 (confidence)	0.95	1.25	1.77***
Item 5 (restlessness)	1.36	1.86	2.33***
Item 6 (concentration)	1.38	2.21	2.55***
Item 7 (motivation)	1.45	2.32	2.64***
Item 8 (helplessness)	0.63	0.86	1.36***
Item 9 (poor appetite)	0.60	1.20	1.42***
Item 11 (nervousness)	0.95	1.39	2.12***

Note - only significant effects are presented
*** - significant ANOVA at the $p<.001$ level

10). These items did not, however, distinguish between the No-SAD and Sub-SAD groups.

Analysis of the Demoralization subscale items revealed a somewhat similar pattern as with the BDI (see Table 11). Newman-Keuls post-hoc comparisons identified sadness, crying, a lack of self-confidence, restlessness, poor concentration and nervousness as characteristics that significantly ($p<.05$) differentiated the three groups. Consequently, there tended to be an increase in the reporting of these

symptoms as the seasonality score increased.

Table 12 summarizes the other significant analysis of variance findings among the seasonality groups. Participants in the No-SAD group reported being less influenced by hot, sunny and cold days than the people in the other two groups (Newman-Keuls, $p<.05$).

Food intake also varied across seasonality groups. Specifically, post-hoc comparisons revealed that the Sub-SAD group reported the highest weekly intake of pasta compared to the other two groups. Furthermore, the Sub-SAD and SAD groups reported eating significantly ($p<.05$) more chocolate on a weekly basis than did the No-SAD group.

Overall seasonality group differences existed in terms of reported behaviour patterns over the season (see Table 13). The higher a person's seasonality score, the more likely he or she was to feel worst [chi-square (8, $N=232$)=50.01, $p<.001$], socialize least [chi-square (8, $N=229$)=41.31, $p<.001$], sleep most [chi-square (8, $N=230$)=62.77, $p<.001$], gain most weight [chi-square (8, $N=235$)=25.38, $p<.001$] and eat most [chi-square (8, $N=226$)=49.34, $p<.001$] in winter.

As indicated in Table 13, individuals scoring higher on the seasonality scale were also more likely to feel best [chi-square (8, $N=233$)=41.91, $p<.001$), socialize most [chi-square (8, $N=229$)=41.31, $p<.001$), lose most weight [chi-square (8, $N=234$)=51.93, $p<.001$) and eat least [chi-square (8, $N=232$)=50.05, $p<.001$) in the summer.

The trends in seasonal behaviour uncovered in the overall analysis (Table 13) became more revealing when comparing only the No-SAD and SAD groups. Individuals

Table 12

Significant Seasonality Group Differences Across Weather, Food Intake and Hours of Sleep

	Seasonality groups		
	No SAD	**Sub-SAD**	**SAD**
Effect of weather			
Cold weather	-0.68	-1.46	-1.49***
Hot weather	-0.17	0.47	0.96***
Sunny days	1.71	2.53	2.49***
Foggy days	-0.83	-0.93	-1.50***
Food intake			
High calorie foods	1.58	1.79	1.72*
Carbohydrates	2.10	2.32	2.23*
- Pasta	2.68	3.28	2.71***
- Chocolate	1.09	1.95	1.69***
- Potato chips	1.14	1.79	1.48**
Hours of sleep			
Winter	8.02	8.44	8.95***

* - significant ANOVA at the p<.05 level
** - significant ANOVA at the P<.01 level
*** - significant ANOVA at the p<.001 level

Table 13

Seasonality Group Differences in Behaviour When Comparing Winter and Summer

	Seasonality groups					
	No-SAD (n=95)		Sub-SAD (n=57)		SAD (n=84)	
Behaviour	n/N	(%)	n/N	(%)	n/N	(%)
Winter						
Feel worst	25/93	(27)	25/56	(45)	51/83	(61)**
Soc. least	21/91	(23)	20/56	(36)	45/82	(55)**
Sleep most	25/94	(27)	29/55	(53)	55/81	(68)**
Gain most weight	41/94	(44)	35/57	(61)	52/84	(62)**
Eat most	28/91	(35)	34/54	(63)	50/81	(62)**
Summer						
Feel best	43/94	(46)	36/56	(64)	68/83	(82)***
Soc. most	33/95	(35)	32/57	(56)	54/84	(64)**
Lose most weight	23/93	(25)	22/57	(39)	42/84	(50)**
Eat least	14/93	(15)	25/57	(44)	41/82	(50)**

Note - soc. = socialize
** - No-SAD and SAD groups differed significantly at $p<.01$ level or higher
*** - all three seasonality groups differed significantly at $p<.001$ level or higher

in the SAD group were more likely to report seasonal differences in the manifestation of the behaviours listed in Table 13 than did the No-SAD group. The low seasonality scorers were more likely to report no particular seasonal differences in the manifestation of these behaviours.

Weight-change differences

The Seasonal Pattern Assessment Questionnaire was used for a second type of categorization. Two groups were created based on reported fluctuations in body weight over the year. Individuals reporting less than an 8 lbs. change in weight were considered average. This group consisted of 63% of the overall sample. Participants reporting fluctuations of 8 lbs. or more over a year were placed in the second group. The demographic distribution of these groups is presented in Table 14.

A closer inspection of the make-up of these groups revealed that the individuals reporting average fluctuations in weight were more likely to be found in the No-SAD group than in the SAD group [chi-square (1, N=148)=4.58, p<.001]. As seen in Table 14, 47% of the people scoring in the No-SAD group reported changes of less than 8 lbs. over the year. In contrast, nearly half (47%) of the individuals reporting fluctuations of 8 lbs. or more scored in the SAD group.

Given the fact that proportional differences in reported body weight fluctuations existed across seasonality groups, it is no surprise that group differences existed in terms of seasonality score (see Table 15). Individuals reporting a greater change in weight over the year tended to score higher on the SPAQ

Table 14

Distribution of Participants in the Weight-Change Groups According to Various Demographic Characteristics

	Weight-change groups	
	0-7 lbs.	Over 8 lbs.
Gender		
female	106	54
male	43	28
Age groups		
under 25	85	57
26-49	32	19
50 and over	27	6
Occupation		
homemaker	14	-
student	87	58
worker	34	22
retired	9	2
Marital status		
single	95	58
divorced	9	5
married	36	19
widowed	8	-
Seasonality group		
No-SAD	71	21
Sub-SAD	34	22
SAD	44	39

Table 15

Significant Differences Among Weight-Change Groups

	Weight-change groups	
	0-7 lbs.	Over 8 lbs.
SPAQ score	8.12	10.98***
SPAQ score items:		
Changes in:		
Energy	1.60	2.06**
Appetite	0.98	1.76***
Weight	0.89	1.71***
Demoralization Score	14.36	16.78**
BDI score	6.83	9.86***
BDI items		
Item 14 (body image)	0.27	0.67***
Item 19 (weight loss)	0.13	0.35**
Item 20 (somatization)	0.23	0.45***

** - significant ANOVA at the $p<.01$ level
*** - significant ANOVA at the $p<.001$ level

score as well as on the BDI and Demoralization measures. This underlines the relationship between seasonality, body weight change and depression.

People who reported fluctuations in weight of 8 lbs. or more were most likely to report changes in energy, appetite and weight over the year (see Table 15). Specifically, they reported a higher rate of weight loss than individuals in the average weight-change group. These people also tended to be more sensitive to changes in their body image and were generally more preoccupied with somatic concerns. However, it is important to note that there were no differences in terms of seasonal fluctuations in social activity, mood and sleep length.

The body weight change groups were also compared in terms of seasonal behavioural preferences. The over 8 lbs. change group was more likely to report eating the most (1, N=190)=11.70, p<.001] and, accordingly, gaining the most weight (1, N=191)=20.87, p<.001] in winter. This same group of participants was also most likely to report eating least [chi-square (1, N=202) =10.48, p<.001] and losing the most weight [chi-square (1, N=202)=15.06, p<.001] in spring and summer.

In contrast, the less than 8 lbs. change group was most likely to report no particular seasonal pattern or preference in terms of appetite and weight change. Therefore, it would appear that the group reporting the greatest fluctuations in body weight experienced behavioural changes with the seasons pertaining to mood, eating and weight fluctuation.

Yearlong Sample

Yearlong sample vs. once-tested sample

Table 1 highlights the composition of the yearlong sample. The yearlong sample consisted of 18 individuals who chose to continue in the study over a twelve month period. This sample was made up entirely of single or married participants. The average age of this sample was 28.9 years.

A cursory glance at the make-up of this subsample shows that single [chi-square (2, N=18)=6.00, p<.05], students [chi-square (2, N=18)=7.01, p<.03] under the age of 25 [chi-square (4, N=18)=16.50, p<.01] largely characterized the yearlong group. This is undoubtedly an artifact of the overall sample bias implicating a substantial student population. As a result of this, the yearlong and once-tested samples did not differ substantially in terms of demographic make-up.

Simple T-test analysis between the yearlong and once-tested samples revealed no significant differences between the two groups on the SPAQ, BDI or PERI scores. Furthermore, no differences were uncovered in terms of the influence of weather on these two groups. However, there were some differences concerning food intake (see Table 16).

In general, the yearlong sample tended to eat more of all foods. This sample also reported eating more carbohydrates and more high calorie foods. In particular, items such as ice cream, chocolate and candy were reportedly consumed more often by the yearlong sample. These foods tend to be high in energy but low in nutrition-- thus the relationship with the high calorie, high carbohydrate groups. This may limit the subsequent findings among the yearlong sample with

Table 16

Significant Differences Between Yearlong and Once-Tested Samples in Terms of Food Intake

	Comparison samples	
	Yearlong	**Once-tested**
Food items		
chocolate	2.28	1.45**
ice cream	1.72	0.93**
candy	2.17	1.19**
Food groups		
carbohydrates	2.60	2.17**
high calorie foods	2.07	1.65***
all foods	2.29	1.94**

Note - these numbers represent the reported average weekly intake of the participants over the month of January 1992
** - significant t-test at the $p<.01$ level
*** - significant t-test at the $p<.001$ level

respect to seasonal fluctuations in food intake (given the a priori differences between yearlong and overall samples).

Chi-square analyses revealed that the yearlong sample did not differ from the once-tested sample in terms of its seasonality group representation. Twenty-eight percent of the yearlong sample scored in the No-

SAD group (compared to forty-two in the once-tested), thirty-nine percent were in the Sub-SAD group (compared to twenty-three) and thirty-three percent were in the SAD (compared to thirty-six). The demographic make-up of the yearlong sample's seasonality groups was similar to that of the overall sample.

Differences among the yearlong sample

Unlike the overall sample, the seasonality group classification did not generate many differences in the yearlong sample. While the seasonality score did significantly differ across the three groups [$F(2,17)= 85.52$, $p<.001$], the other score-type measures (BDI, Demoralization, Mania scores) did not (see Table 17). All three groups significantly (.05) differed in terms of seasonality score (Newman-Keuls).

As mentioned above, the yearlong group was tested twice on the Seasonal Pattern Assessment Questionnaire: once in January 1992 and again in September of the same year. Of interest here was the fact that the second testing did not yield significant differences across the seasonality groups in terms of SPAQ score (see Table 18). Specifically, participants in the SAD group scored significantly lower [$F(1,4)=11.36$, $p<.03$] in terms of their seasonality score from January to September. This explained the interaction [$F(2,14)=3.88$, $p<.05$] between seasonality groups and SPAQ score over the two testings.

When the specific SPAQ items were examined, it became apparent that participants' ratings of the various aspects of seasonality changed from the first to the second testing (see Table 18). Items tapping

Table 17

Means Differences across the Yearlong Sample Seasonality Groups

	Seasonality groups		
Scores	No SAD	Sub-SAD	SAD
SPAQ	4.00	9.57	16.67***
Demoralization	15.20	16.29	20.00
BDI	7.40	8.29	11.33
Mania	7.20	4.71	4.33

*** - significant ANOVA at the $p<.001$ level

changes in mood, energy, social activity, appetite and weight did not significantly distinguish the seasonality groups in September.

When test-retest correlations were run on the SPAQ score and its specific items, only the change in weight and change in appetite items were significantly ($p<.01$) correlated (.62 and .65 respectively). The SPAQ score itself was only correlated at .42. This suggests that there was very little consistency among the yearlong sample in its response to the SPAQ scale over the two testings.

Table 18

Changes in Seasonality Score and SPAQ Items From January to September Testings (1992)

		Seasonality groups		
	Testing	No SAD	Sub-SAD	SAD
SPAQ score	Jan.	4.00	9.57	16.67***
	Sept.	6.20	11.29	11.80
SPAQ items: Changes in:				
Mood	Jan.	0.80	1.43	3.00**
	Sept.	1.20	2.14	2.30
Energy	Jan.	0.80	2.29	3.00**
	Sept.	1.20	2.43	2.00
Activity	Jan.	0.80	1.71	3.00**
	Sept.	2.40	2.14	2.20
Appetite	Jan.	0.60	1.86	2.60*
	Sept.	0.40	1.71	1.40
Weight	Jan.	0.40	0.86	2.17***
	Sept.	0.40	1.29	1.60
Sleep	Jan.	0.60	1.57	3.00***
	Sept.	0.80	1.57	2.40**

* - significant ANOVA at the $p<.05$ level
** - significant ANOVA at the $p<.01$ level
*** - significant ANOVA at the $p<.001$ level

Table 19

Seasonality Group Means on the NEO Personality Inventory Subscales Neuroticism and Extraversion Subscales

	Seasonality groups		
	No-SAD	**Sub-SAD**	**SAD**
Neuroticism			
N1 (Anxiety)	13.00	16.00	14.83
N2 (Hostility)	11.80	10.71	12.50
N3 (Depression)	12.60	13.86	14.33
N4 (Self\conscious)	14.40	14.43	16.50
N5 (Impulsive)	21.00	15.00	19.33
N6 (Vulnerability)	9.80	12.43	12.83
Extraversion			
E1 (Warmth)	24.40	22.58	23.00
E2 (Gregariousness)	16.60	14.87	12.83
E3 (Assertiveness)	19.00	14.57	16.67
E4 (Activity)	16.00	15.86	15.17
E5 (Excitement seeking)	18.80	14.57	15.67

No significant differences were uncovered across the seasonality groups with respect to the NEO Personality Inventory. All three groups tended to score within the average ranges, showing very little fluctuation. However, certain patterns were apparent when studying the three groups' raw scores on the Neuroticism and Extraversion subscales.

The No-SAD groups appeared to score higher on the excitment-seeking, assertiveness and gregariousness

Table 20

Correlations Between NEO Inventory Neuroticism/ Extraversion Subscales and Measures Used in the Study

	Measures used in study			
	SPAQ	**BDI**	**Demosc**	**Mania**
Neuroticism subscales				
N1 -Anxiety	.17	.62**	.54*	-.66**
N2 -Hostility	.04	.26	.27	.34
N3 -Depression	.07	.71**	.39	-.28
N4 -Conscientious	.22	.75**	.56*	-.39
N5 -Impulsiveness	-.05	.10	-.01	.24
N6 -Vulnerability	.46	.49*	.33	-.20
Extraversion subscales				
E1 -Warmth	-.23	-.72**	-.43	.57*
E2 -Gregarious	-.25	-.80**	-.58*	.48
E3 -Assertiveness	-.20	-.48*	-.31	.63**
E4 -Activity	-.09	-.67**	-.15	.18
E5 -Excitment seeking	-.13	-.66**	-.37	.52*
E6 -Positive emotions	-.03	-.72**	-.62**	.34

Note - **Demosc** = Demoralization score
* - significant correlation at the $p<.05$ level
** - significant correlation at the $p<.01$ level

subscales (see Table 19). The No-SAD groups also scores somewhat higher on the overall Extraversion scale (M=117) than either the Sub-SAD (M=104) or the SAD (M=101) groups. In line with these findings, there appeared to be a negative relationship between the SPAQ score and the Extraversion subscales in general (see Table 20)-- suggesting that individuals suffering from seasonality may be less extraverted by nature. Nonetheless, these differences were not significant.

Interestingly, some of the Neuroticism and Extraversion subscales did correlate with the other measures used in this study (see Table 20). Specifically, the BDI score seemed to correlate with the Neuroticism subscales measuring anxiety, self-consciousness and depression. Furthermore, the Neuroticism score appeared to be measuring the opposite of what the Extraversion scale was measuring (given the negative correlations between its subscales and the BDI score). The Mania score, on the other hand, was negatively related to anxiety. This mania score seemed to be characterized instead by the assertiveness subscale.

Yearlong measures

The yearlong sample was tested on a monthly basis in order to track changes in mood, behaviour and eating patterns. Analysis of Variance with orthogonal contrasts were carried out on the BDI, Demoralization and Mania scores. The a priori assumption was that there would be a quadratic effect occurring over time for all three scores. In particular, it was hypothesized that the BDI and Demoralization scores would be at their lowest level in the spring/summer and

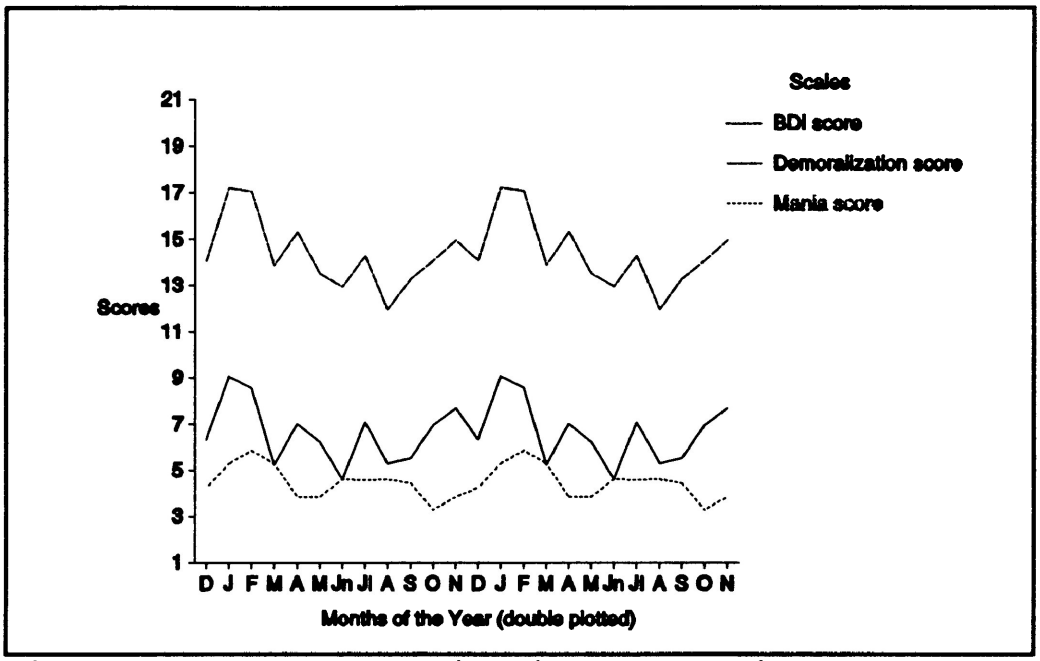

Figure 2. BDI, Demoralization and Mania scores over the year (1992).

at their highest in the fall/winter (when the participants would feel most depressed or "demoralized"). In contrast, we believed that the Mania scores would be highest in the spring/summer (when the participants would have the most energy) and lowest in the fall/winter.

Significant trends were uncovered for all three measures (see Figure 2). Specifically, quadratic trends were uncovered for the BDI [$F(1,17)=7.16$, $p<.02$], and Demoralization scores [$F(1,17)=7.66$, $p<.01$]. A significant linear trend was identified among the Mania score [$F(1,17)=8.64$, $p<.01$].

There was some concern that the order of the testings (the seasonal sequence of the months) may be influencing the results obtained with the polynomial contrasts. As a result, the order of the months was

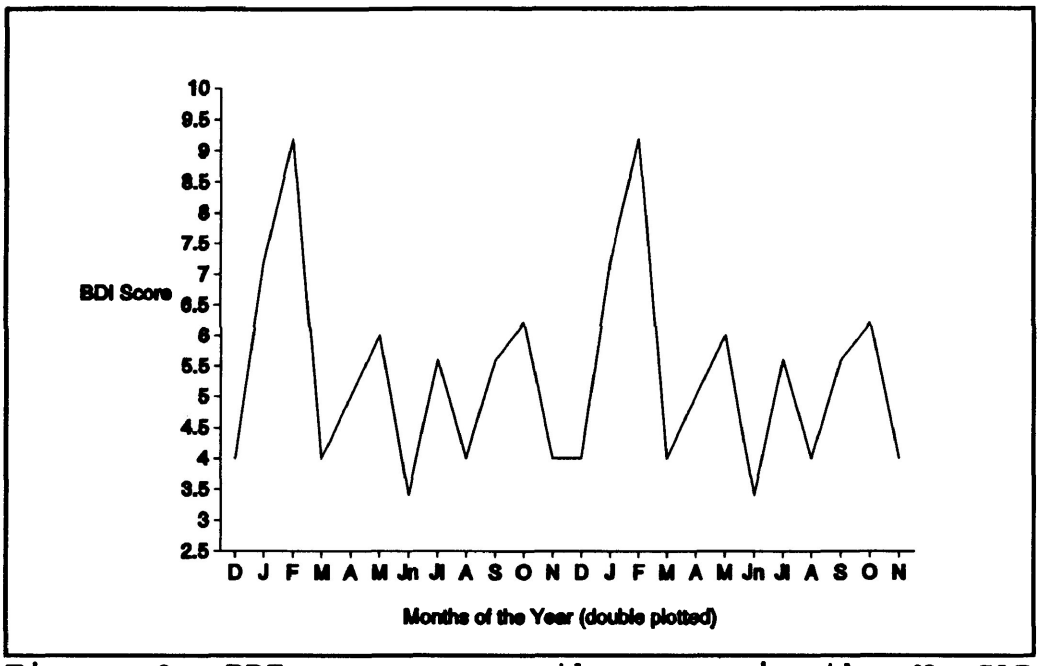

Figure 3. BDI score over the year in the No-SAD group.

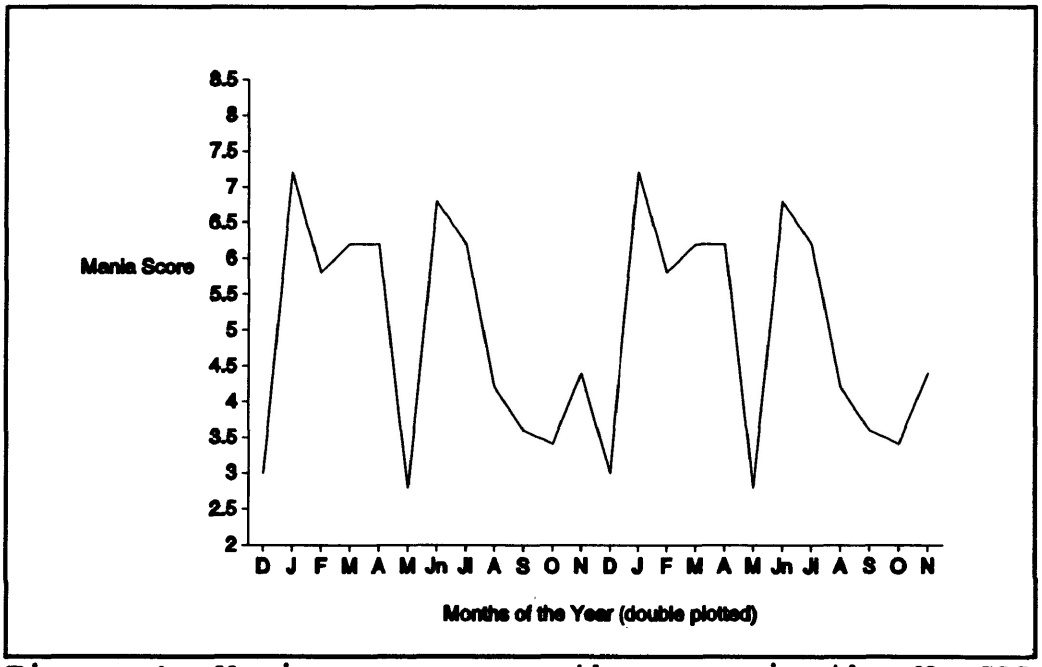

Figure 4. Mania score over the year in the No-SAD group.

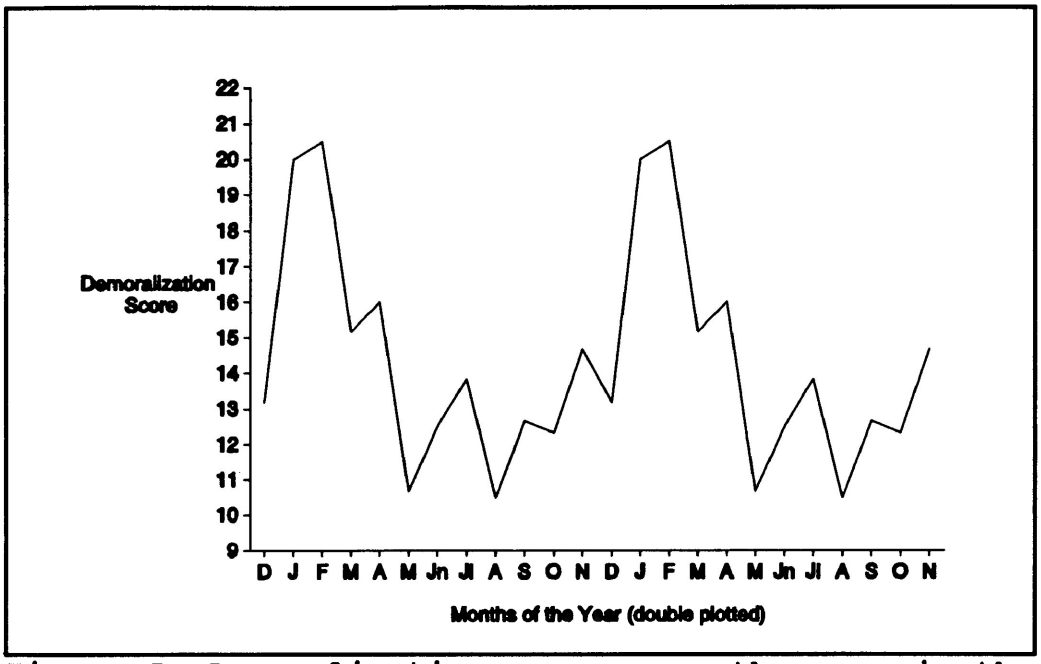

Figure 5. Demoralization score over the year in the SAD group.

controlled for by reordering them-- putting the winter months in the middle of the sequence. Despite this statistical control, the trends discussed above were still evident.

When orthogonal contrasts were carried out among the specific seasonality groups, interesting results were uncovered. In particular, the No-SAD group exhibited linear trends over the year with respect to both the BDI [$F(1,4)=22.07$, $p<.01$] and Mania scores [$F(1,4)=80.02$, $p<.001$] (see Figure 3 and 4 respectively). While the two graphs in Figures 3 and 4 do not appear to be linear, one should keep in mind that the small size of the groups being analyzed may have played a role in these significant findings. In contrast, the SAD group exhibited a quadratic trend across the Demoralization measure [$F(13.46$, $p<.01$] (see Figure 5).

Expanding on these significant monthly results, attention was focused on the seasonal aspect of the changes in mood over the year. Consequently, the BDI, Demoralization, Mania scores and food items were organized into season groupings. The result of these transformations of the scores and food items were four means that more aptly captured seasonal averages. [the results from December 1992 were categorized into the Winter grouping along with measures from January and February 1992]

Overall, the Demoralization score significantly differed across the seasons [$F(3,45)=4.69$, $p<.006$] (see figure 6). In particular, winter scores were higher than summer $t(17)=3.50$, $p<.003$ and fall scores $t(17)=2.53$, $p<.02$.

A similar trend was apparent with the BDI score however the difference was not as large [$F(3,45)=3.49$, $p<.02$] (see figure 7). Specifically, winter scores were higher than spring [$t(17)=2.12$, $p<.05$] and summer scores [$t(17)=2.76$, $p<.01$]. Over the four seasons, no significant changes were apparent across the mania scale.

Given these overall findings, it was of some theoretical interest to see if these scores differed across the seasons when looking at each of the seasonality groups. In terms of both the BDI [$F(3,15)=3.69$, $p<.04$] and Demoralization [$F(3,15)=8.17$, $p<.002$] scores, the SAD group's average scores significantly differed across the seasons (see Figures 6 and 7 respectively).

With respect to the Demoralization score, the SAD group's curve appeared to be more accentuated. Paired t-test analysis revealed that the SAD group scored

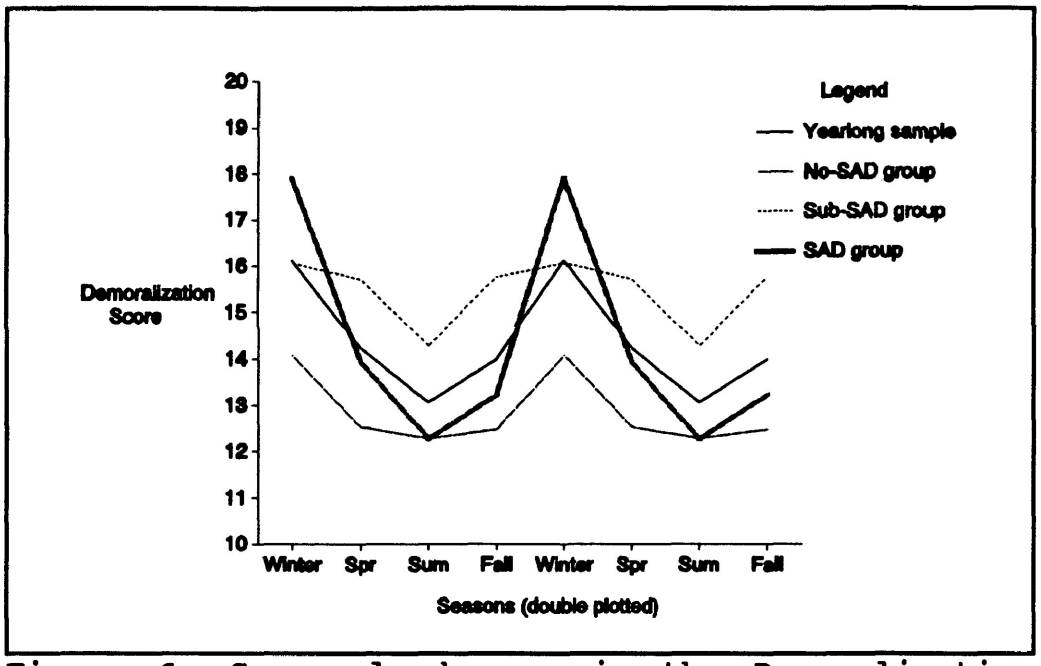

Figure 6. Seasonal changes in the Demoralization score (comparison of yearlong seasonality groups).

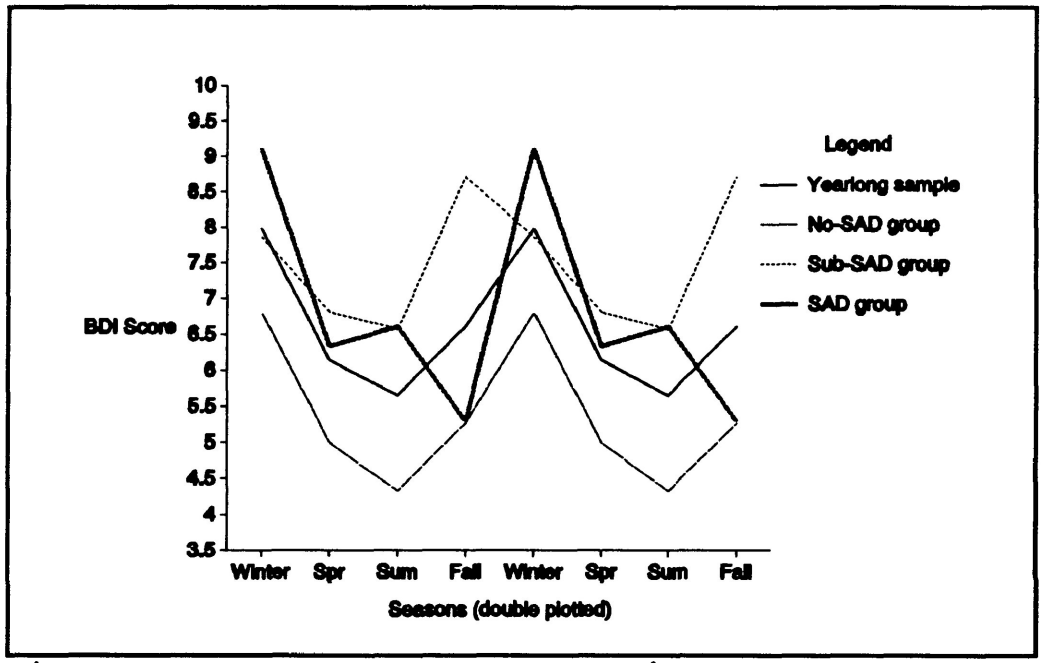

Figure 7. Seasonal changes in the BDI score (comparison of yearlong seasonality groups).

higher in the winter on the Demoralization scale than was the case in the spring [$t(5)= 2.90$, $p<.03$], summer [$t(5)=4.58$, $p<.01$] and fall [$t(5)= 3.61$, $p<.02$] (see Figure 6).

The BDI score among the SAD group followed more of a linear trend, with the lowest score coming in the fall. Specifically, the SAD group scored higher in the winter on this scale than in the fall [$t(5)=3.35$, $p<.02$] (see Figure 7). This is in contrast to the "quadratic-type" trend expected over the seasons on the BDI measure.

Repeated measures ANOVA of the Mania scores across the seasons revealed significant interactions between spring mania scores and the seasonality groups [$F=(4,30)=3.84$, $p<.01$] as well as between summer mania scores and the seasonality groups [$F(4,30)=3.09$, $p<.03$]. Figures 8 and 9 depict these interactions.

These significant interactions reveal a general tendency among the No-SAD group to apparently score higher over the first two months of each the spring and summer seasons than in the last month. The general trend among the Sub-SAD groups was to report lower Mania scores in the middle month of both the spring and summer. Specifically, the Sub-SAD group reported a significant increase in average Mania scores from July to August [$t(6)=-2.66$, $p<.04$].

Among the SAD group, two different patterns were apparent. Over the spring, average Mania scores significantly decreased from March to April [$t(5)=2.91$, $p<.03$] and in turn significantly increased from April to May [$t(5)=-2.99$, $p<.03$]. In the summer, the reverse pattern was apparent (although the differences were not significant).

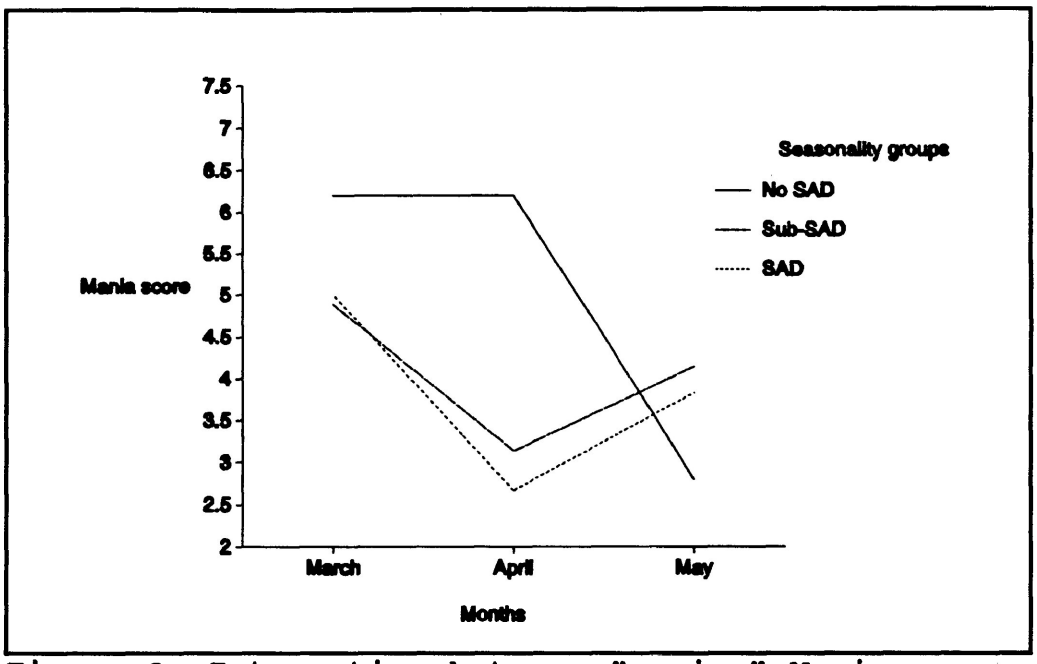

Figure 8. Interaction between "spring" Mania scores and seasonality groups.

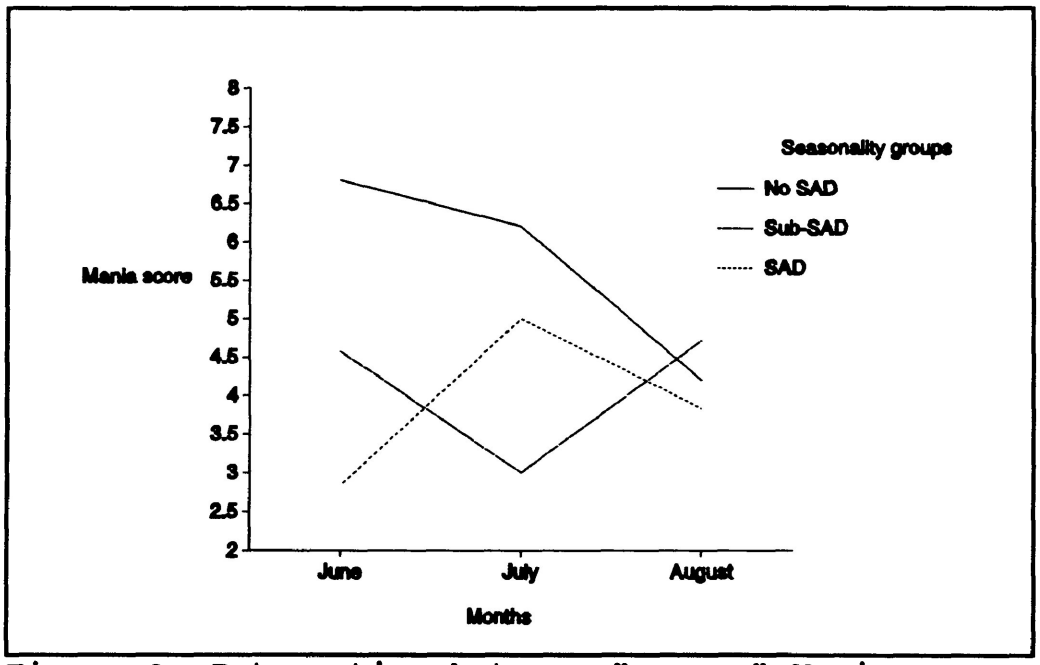

Figure 9. Interaction between "summer" Mania scores and seasonality groups.

Table 21

Significant Seasonal Changes in Reported Food Intake in the Yearlong Sample

	Seasons			
	Winter	Spring	Summer	Fall
Food items				
pasta	3.20	2.76	2.91	2.80*
chocolate	2.30	1.94	1.59	1.74*
candy	2.15	1.56	1.37	1.50*
Food groups				
bulk carbohydrates	2.84	2.58	2.72	2.59**
carbohydrates	2.42	2.25	2.26	2.17**
all foods	2.16	2.02	2.02	1.96**
fats	2.05	1.92	1.85	1.66**

* - significant ANOVA at the $p<.05$ level
** - significant ANOVA at the $p<.01$ level

In terms of food intake over the year, some significant differences were uncovered concerning pasta [$F(3,45)=3.13$, $p<.04$], chocolate [$F(3,45)=3.60$, $p<.02$] and especially candy [$F(3,45)=9.66$, $p<.001$] (see Table 21). The general trend among specific food items appeared to involve a general decrease in reported weekly intake.

Table 22

Significant Paired T-Test Findings Involving Food Intake Over the Seasons in the Yearlong Sample

	Seasons compared	
	Winter/Fall	**Winter/Spring**
Food items		
pasta	3.20/2.80**	3.20/2.76**
chocolate	2.30/1.74**	2.29/1.94
candy	2.15/1.50***	2.15/1.56***
Food groups		
bulk carbohydrates	2.84/2.59**	2.84/2.58**
carbohydrates	2.42/2.17***	2.42/2.25*
all foods	2.16/1.96**	2.16/2.02*
fats	2.05/1.66***	2.05/1.92

* -significant paired t-test at the $p<.05$ level
** -significant paired t-test at the $p<.01$ level
*** -significant paired t-test at the $p<.001$ level

Significant results were also obtained among the food groups: carbohydrates [$F(3,51)=4.14$, $p<.01$], fats [$F(3,51)= 4.30$, $p<.009$], bulk carbohydrates [$F(3,51)=3,18$, $p<.03$], and all foods in general [$F(3,51)=3,28$, $p<.03$] differed across seasons. Once again, the general trend suggested an overall decrease in intake over the seasons.

Table 22 summarizes the significant paired t-test findings across the various food items and groups. The most apparent and consistent difference was between winter and fall. However, participants did report significant decreases in the intake of pasta, candy, bulk carbohydrates, carbohydrates and all foods in general from winter to spring.

Significant interactions between the seasonality groups and beef [$F(6,45)=3.72$, $p<.01$], fish [$F(6,45)= 3.45$, $p<.01$] and chicken [$F(6,45)=2.63$, $p<.03$] intake over the four seasons were identified (see figures 10, 11 and 12 respectively).

The No-SAD group reported a significant decrease in the consumption of beef from spring to summer [$t(4)=4.80$, $p<.01$]. In terms of fish consumption, the No-SAD group reported a higher intake in the spring than both the Sub-SAD [$t(10)=2.66$, $p<.02$] and SAD groups [$t(9)=2.41$, $p<.04$]. Overall, the low scoring seasonality group appeared to report consuming the highest amounts of beef and fish in the spring.

No significant differences were uncovered between the Sub-SAD and SAD groups in terms of weekly chicken intake. However, when compared to the No-SAD group in the winter, both the Sub-SAD [$t(10)=-2.83$, $p<.02$] and SAD groups [$t(9)= -2.36$, $p<.04$] reported a higher weekly intake of chicken.

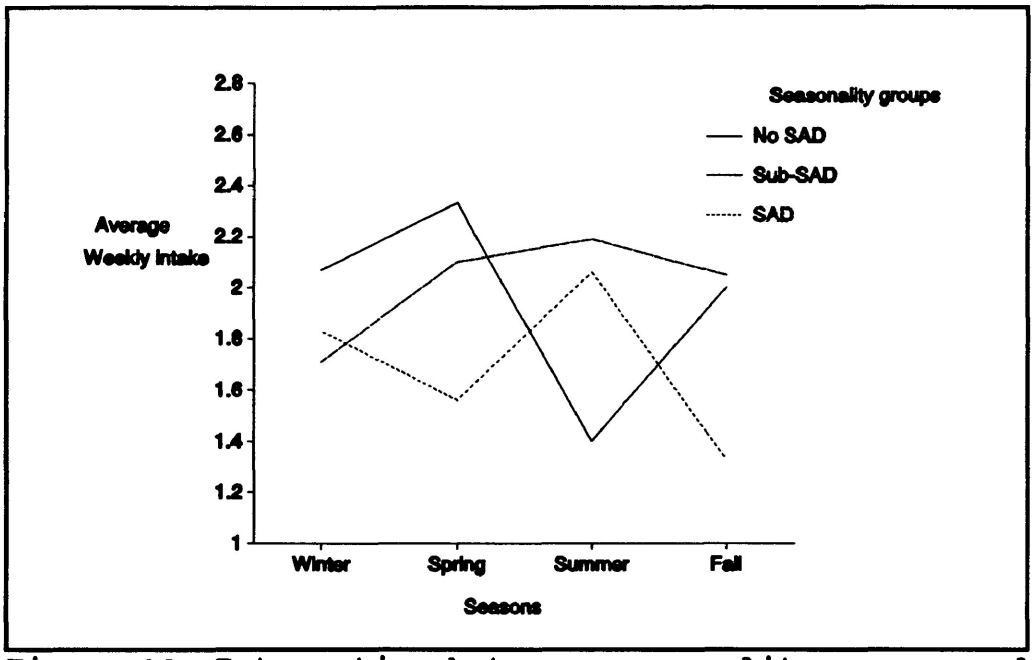

Figure 10. Interaction between seasonality groups and beef intake across the seasons.

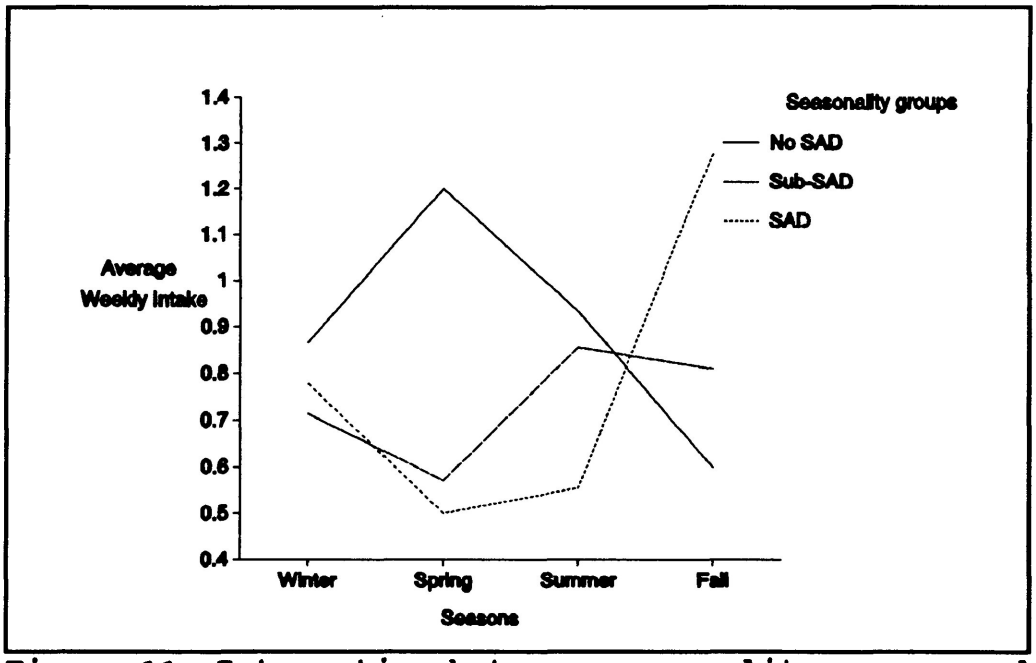

Figure 11. Interaction between seasonality groups and fish intake across the seasons.

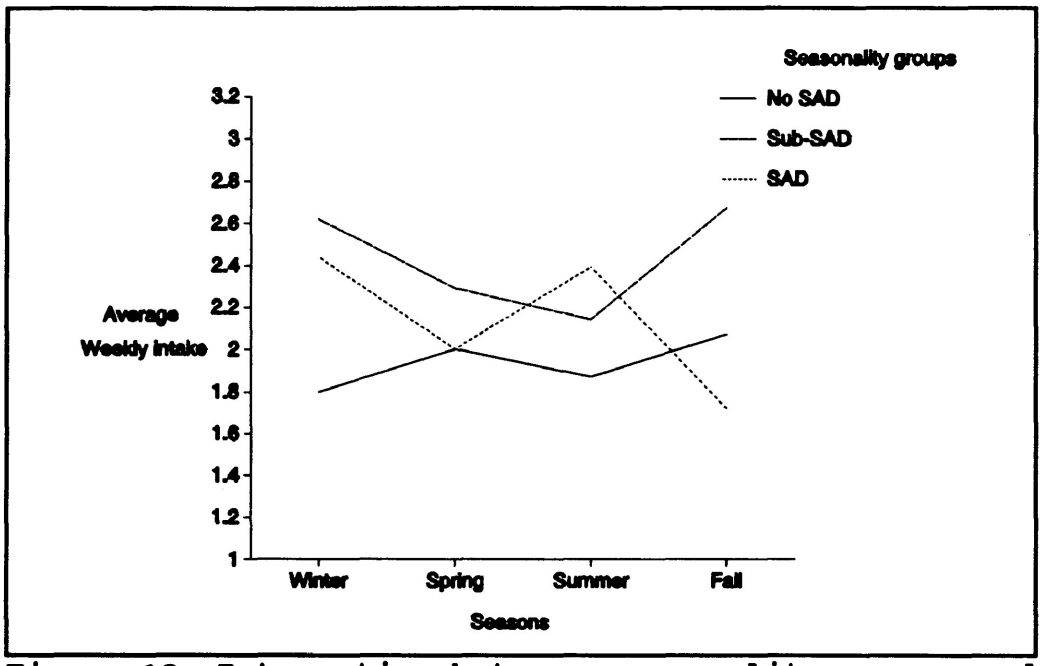

Figure 12. Interaction between seasonality groups and chicken intake across the seasons.

Given the small size of the yearlong sample, one could not expect unambiguous findings. Overall, the results uncovered among food intake did not confirm our original hypotheses about seasonal affective disorder. However, there were some interesting results with respect to the Demoralization and BDI scores--suggesting that there may indeed be seasonal changes in mood. Furthermore, it may be that individuals suffering from SAD may experience these changes in mood more severely.

Discussion

It may be best to preface this discussion with a reminder that this study was mostly based on retrospective and self-rated data. Participants were asked to retrospectively report (to the best of their knowledge) their activities and changes in behaviour. Because of this, only indirect conclusions can be drawn concerning the nature of seasonality. Having said this, it should also be noted that an attempt was made to remedy this reliance on retrospective data by asking the yearlong participants to complete questionnaires at the end of each month.

Prevalence of seasonal affective disorder

The large number of people classified as suffering from subsyndromal-SAD and SAD in this study was well above what has been evidenced in other studies in a general population sample (Kasper et al. 1989). In the Kasper et al. study, 61% of their sample from the general population scored between 0 and 7 and only 17.3% of their sample scored over 10. This is in marked contrast to the sample used in this study in which 40% of the participants scored between 0 and 7 on the SPAQ seasonality score and 43% scored over 10.

The Kasper et al. (1989) study consisted of a random sample interviewed over the phone that was intended to be representative of the general population of Montgomery County, Maryland (to this end, the ratio of males to females was controlled). The Seasonal Pattern Assessment Questionnaire was used to classify participants into seasonality groups (as was done in this study). They found that 4.3% could be considered

as SAD sufferers (with SPAQ seasonality scores of 11 or greater) while 13.5% of the sample were judged to be suffering from sub-syndromal SAD. In the present study, 36% of the sample were placed in the SAD group while 24% scored in the Sub-SAD range.

Obviously, the proportion of people suffering from Sub-SAD and SAD was higher in our study than in Kasper et al.'s (1989). The prevalence of seasonality in our sample may have been due to: a) diagnostic classification of seasonality; b) demographic distribution of the sample; or c) the climate of Northern Ontario.

A plausible explanation for the large SAD group in our study may have been that our criterion for inclusion into this group was not as strict as that offered by the DSM-III-R (1987). The problem in the context of this study was in deciding on explicit yet thorough diagnostic criteria.

The differentiation between Sub-SAD and SAD is very ambiguous. Does a diagnosis of Sub-SAD require a certain number of years experiencing seasonality? Furthermore, if SAD is characterized by a mild to moderate depression, is the subsyndromal form of the disorder characterized by depression at all? Because of the uncertainty in diagnosing Sub-SAD with respect of depression and years of suffering, we decided to follow the simple but explicit guidelines offered by Rosenthal (1989) with respect to the SPAQ score.

However, we were curious to examine the prevalence of SAD when the exact specifications of the DSM-III-R were used. In particular, we did not stress that the participants experience seasonality for at least two years in order to be classified as suffering from SAD.

If this specification would have been used, only 25% of the overall sample could be classified as suffering from SAD-- which is still much higher than Kasper et al.'s (1989) estimate of the prevalence of SAD.

The variable nature of self-reported seasonality was highlighted in the yearlong sample. Individuals reporting high seasonality scores (scoring in the SAD group) in January 1992 tended to report significantly lower scores in September 1992. This suggests that by using the criteria of having suffered from seasonality for at least two years, the incidence of SAD may have been reduced. This may have permitted a more reliable estimate of SAD. However, it is important to note that even though there was an overall decrease in the yearlong SAD group's seasonality scores, it was still classified as within the sub-SAD range.

Even though we did not distinguish between self-reported years of experiencing seasonality, significant differences between the three seasonality groups were nonetheless apparent in this area. In particular, both the Sub-SAD ($\underline{M}$=3.98) and SAD ($\underline{M}$=6.78) groups tended to report having experienced seasonality for more than two years.

If we had been even more selective and used the additional specification that the SAD-sufferer need to be depressed (scoring over 10 on the BDI scale), only 16% of the sample would have been classified as suffering from SAD among this sample. While these more refined classification systems would have reduced the size of the SAD group, it would have swelled membership among the Sub-SAD group. It may simply be a case of semantics because in the end, we are still left with 43% of the participants scoring over 10 on the SPAQ

score. Self-reported seasonality appears to have been more prevalent in our sample.

In our previous study (Alarie & Satinder, 1991), 59% of the participants scored over 10. The sample used in the 1991 study was almost exclusively students. In the present research, an effort was made to recruit a greater number of individuals from the general population-- to try and get away from the bias of a university student population. This was achieved to a certain extent (see Table 1).

Approximately one quarter of the overall sample was characterized by a middle-aged, married individuals involved in the work force. Furthermore, a small but important (due to their low-scoring tendencies--see Table 4) group of individuals over the age of 50 were involved in the study. These two factors may help explain the reduction in the percentage of people scoring over 10 on the SPAQ scale (from 59% to 43%) compared to our previous study (Alarie & Satinder, 1991). More specifically, a smaller percentage of the participants were categorized in the SAD group (35% compared to 47% in 1991) whereas a larger segment of the sample made up the No-SAD group (40% compared to 31% in 1991).

As mentioned above, age accounted for much of the differences found amongst the occupational and marital status groups. In this respect, the age groups seemed to underscore much of the primary demographic differences within the sample. Just how much of these age-related differences were manifested in the seasonality group findings? More importantly, given the large segment of the sample under the age of 25, how much of an influence did this age group have on the

prevalence of seasonality?

As mentioned above, much of the sample consisted of single students and most of these students were under the age of 25 (see Table 3). Furthermore, the relationship between age and the SPAQ, Demoralization and Mania scores were all negative (see Table 5). Therefore the tendency across this sample seemed to be for the older participants to score lower on the SPAQ, Demoralization and Mania scales and, accordingly, for the younger participants to score higher.

The overrepresentation of students may have produced an artificially higher prevalence of seasonality in the sample. This fact may help explain the high rate of seasonality in this study as well as in our previous research project (Alarie & Satinder, 1991). The question then becomes, was the prevalence of seasonality in this sample associated with age per se or with the university student mind-set? Furthermore, was it the university student sample or age itself that was responsible for the significant differences among the age and seasonality groups?

Both marital status [$F(1,234)=32.44$, $p<.001$] and age groupings [$F(1,229)=58.756$, $p<.001$] explained a significant portion of the difference in SPAQ score when entered seperately. However, when all the demographic variables were entered as covariates, the influence of marital status became negligeable while occupation became a significant covariate [$F(1,221)=21.718$, $p<.001$]. In any event, the percentages of explained variance involved in all three cases were rather small-- with age representing the largest percentage of variance (see Table 23).

Table 23

Percentages of Explained Variance Due to Gender, Occupational, Marital Status and Age Groupings When Entered as Covariates

	ANCOVA analyses	
	Entered together as covariates	Entered separately as covariates
Gender	2%***	1%***
Occupation	2%***	0.1%
Marital Status	0.1%	3%***
Age Groups	4%***	5%***

*** - significant ANCOVA at the $p<.001$ level

Another demographic variable that should be considered when discussing the prevalence of seasonal affective disorder is gender. Research in this area has shown that women tend to be overrepresented across Sub-SAD and SAD samples (Rosenthal et al. 1984; Kasper et al. 1989; Eastwood et al., 1985). Estimates have ranged from 71% to as high as 86%. In our study there was an a priori imbalance between males and females.

While no overall gender differences were apparent across the SPAQ, BDI, Demoralization and Mania scales, it is important to keep in mind the fact that the results may have been influenced by this imbalance. As indicated in Capulak and Satinder's study (1993),

women under the age of 40 in this sample scored higher on the SPAQ score than males. Given the fact that the average age of this sample was 30.6 and that 69% were women, it is very likely that the overrepresentation of women had an effect on the prevalence of seasonality.

When gender was included as a covariate in an analysis looking at SPAQ score across the seasonality groups, this variable significantly explained a portion of the difference across the groups [$F(1,235)=12.43$, $p<.001$]. Furthermore, as indicated in Table 23, gender was only responsible for between 1% and 2% of the entire explained variance.

While it is possible that seasonality may have been influenced by the overrepresentation of students, females and/or age differences, one cannot overlook the fact that seasonality was still very prevalent in this sample. One factor that may help in understanding this finding is the climate of Northern Ontario.

We are left with the possibility that the northern climate in this region may also have been partly responsible for the increased proportion of individuals reporting seasonality. The winters in Northern Ontario are longer and certainly much colder than those in the Mideastern United States-- where much of the research on SAD has taken place.

Certainly, research in the area of seasonal affective disorder has shown that the severity (Lingjaerde et al., 1986; Potkin et al., 1986) and prevalence (Rosen & Moghadam, 1991) of this disorder can increase with variations in latitude. For example, travelling south to warmer climates has been shown to reduce the negative symptoms of SAD (Rosenthal et al., 1984).

Blackwood and Satinder (1993) examined the differences in self-reported seasonality between individuals from Eastern and Western Ontario within the present sample. Eastern Ontario consists of the "Golden Horseshoe" region surrounding the Great Lakes. This part of Ontario is generally warmer than Western Ontario during the winter, mostly due to its proximity to the Great Lakes.

The goal of Blackwood and Satinder's (1993) study was to examine the effect of weather (in a more northerly climate such as Thunder Bay) on two samples originating from different parts of Ontario. It was found that the Western Ontarians reported cold weather as more problematic than did the individuals from Eastern Ontario; suggesting that weather, not sunshine may play an important role in the process of seasonal affective disorder.

It should be noted that the weather in 1992 was not typical of most years in this region or this country for that matter. A variety of reasons exist for the abnormal weather pattern. However, the most probable explanation may be the fact that there was a volcanic eruption in the South Pacific in 1991. Not only was there a slight decrease in the average temperature but there was also a decrease in the amount of sunlight (see Table 24). This may have influenced the results obtained over the winter and especially the summer.

As Table 24 indicates, during the month of January (1992), the average temperature was slightly higher than is normally the case. Certainly, the slight increase could not help explain the prevalence of seasonality among the sample. However, if one examines

Table 24

Temperature and hours of sunlight for Thunder Bay (1992)

	Average	Normal	Difference
Temperatures *			
January	-11.3	-15.4	+ 4.1
February	-9.4	-13.0	+ 3.6
March	-5.5	-6.3	+ 0.8
April	1.2	2.5	- 1.3
May	10.0	8.8	+ 1.2
June	12.2	14.0	- 1.8
July	14.3	17.6	- 3.3
August	14.8	16.4	- 1.6
September	11.4	11.1	+ 0.3
October	4.2	5.7	- 1.5
November	-3.2	-2.6	- 0.6
December	-9.9	-11.1	+ 1.2
Hours of sunshine			
January	78.1	118.4	- 40.3
February	92.4	146.7	- 54.3
March	172.8	172.8	0
April	124.4	215.4	- 91.0
May	265.7	252.2	+ 13.5
June	234.9	262.0	- 27.1
July	198.8	303.7	-104.9
August	238.9	255.9	- 17.0
September	155.5	167.9	- 12.4
October	127.5	127.9	- 0.4
November	71.8	86.5	- 14.7
December	61.0	93.4	- 32.4

Note - data provided by Environment Canada (1993)
* - Celsius

the difference in sunlight, it becomes apparent that there was a considerable decrease in the hours of sunlight compared to the what is normally experienced in January (381 hours less of sunshine). This factor may have played a role in the overall higher rate of seasonality-- especially given the proposed importance of light in the etiology and treatment of SAD (Wehr & Rosenthal, 1989; Rosenthal et al. 1984).

In the end, we are left with a very high rate of seasonality in a young, student sample. The classification system used may have shifted the membership of the groups but it could not hide this high rate of self-reported seasonality. While the northerly climate may help to understand the prevalence of SAD it may not entirely explain this finding. It seems likely that the demographics of this sample along with the northern location of the study contributed to a higher rate of seasonality.

Seasonality

Given the fact that the seasonality groups were based on the SPAQ score, it is not surprising that the groups differed on this measure. Furthermore, every SPAQ item distinguished the three groups so that the SAD group rated their seasonal changes in behaviour the highest. Based on these findings, it would be appropriate to suggest that seasonality involves significant (self-reported) changes in one's sleep, activity, energy, mood, weight and appetite over the year.

The critical word in this analysis is self-reported-- whether or not these changes actually occur is debatable but irrelevant since it is the

individuals' personal experience that is being measured. Ultimately, diagnosis of seasonal affective disorder must rely on the person's subjective experience. The only way to objectively measure seasonality is to measure daily changes in physiology, behaviour, diet and mood-- a difficult task indeed.

However, given the difference in January and September SPAQ scores among the yearlong sample (see Table 18), the validity of this measure must be questionned. The seasonality score may reflect more a seasonal state of mind rather than an accurate measure of seasonality.

As mentioned above, more explicit classification systems could have been used to diagnose SAD (using years of suffering and/or self-reported depression). However, despite these attempts at reorganizing participants into Sub-SAD and SAD groups, it is likely that differences across the three groups would have remained the same regardless of the classification system used.

In particular, the differences described earlier in this study among the seasonality groups (Tables 7, 8, 9 and 10) were still evident when using either the years of suffering criteria or the years of suffering and depression criterion. Table 25 summarizes the means on the SPAQ, BDI, Demoralization and Mania scales across the three different SAD groupings (it should be noted that the increase in BDI score among the SAD III sample is undoubtedly the result of using the BDI as a criteria for inclusion into the SAD group).

These findings suggest that using the SPAQ score alone was sensitive enough to pick up general differences in the sample in terms of seasonality.

Table 25

Means of Different SAD Groupings Across SPAQ, BDI and Total Scales

	Different SAD groupings		
Scores	SAD I (n=84)	SAD II (n=58)	SAD III (n=38)
SPAQ	14.81	14.96	15.26
BDI	12.42	12.96	16.00
Demoralization	20.36	20.73	22.74
Mania	5.37	4.80	4.97

Note - SAD I = SAD group based solely on seasonality score
SAD II = SAD group based on seasonality score and at least two years of seasonality
SAD III = SAD group based on seasonality score, at least two years of seasonality and a score of 11 or higher on the BDI scale

While more refined clinical distinctions could have been made based on more explicit criteria or even individual case studies of the participants, the seasonality score still seemed to capture the overall differences between those people who reportedly suffer from seasonality and those who do not.

Individuals scoring high on the SPAQ score were more likely to report feeling best, socializing most, eating least and losing the most weight during the summer than those scoring lower on the seasonality scale. Furthermore, individuals in the SAD group were most likely to believe subjectively that they felt worst, socialized least, slept most, ate most and gained the most weight in the winter. This pattern fits the schema of seasonality proposed by earlier researchers (Rosenthal et al. 1984; Wehr & Rosenthal, 1989; Albert et al., 1991; Rosenthal et al., 1987).

The seasonality groups differed in terms of self-perceived depression over the month of January, 1992. As expected, the higher a person's seasonality score, the more likely he or she was to have felt depressed over the month of January 1992. However, at the upper end of the seasonality spectrum (involving the SAD group) the average BDI score could still be classified as mild to moderate depression. This is in line with the research into seasonal affective disorder describing the depressive aspect of the disorder as mild to moderate-- certainly not severe enough to warrant the diagnosis of dysthymia but serious enough to mildly interfere with daily activities (Wehr & Rosenthal, 1989; Thompson & Isaacs, 1988; Rosenthal et al., 1984).

Of interest among the BDI and Demoralization scores is the fact that people in the SAD group came across as less satisfied with themselves-- as reporting a greater sense of failure than people in the other groups. This aspect of the findings may help describe the depression among SAD sufferers. Based on these findings, individuals scoring high on the SPAQ measure

reported more self-dislike and reported experiencing less confidence in themselves over the month of January, 1992.

If these findings are accurate they offer a new view of the depression inherent among SAD sufferers. The change in mood described in the research up to this point has stated that people with SAD are depressed and that this depression is mild to moderate with atypical vegetative symptoms (Wehr & Rosenthal, 1989; Blehar & Rosenthal, 1989). Thompson and Isaacs (1988) described SAD-sufferers as irritable and anxious but not much else has been said about the nature of the depression.

Little has been said about the type of depression that is involved-- is it turned inward or outward? Does the individual blame self or others? Is there a sense of helplessness, failure or dissatisfaction? How does the individual perceive others and their environment? Up to this point the focus has mostly been on the biological causes without much emphasis on the characteristics of the disorder in general, and the depression in particular. What is the experience of the individual?

Based on our findings, there is evidence to suggest that the depression may involve a general sense of dissatisfaction with one's self. The lack of energy, the increase in weight and appetite, and the need for sleep may make the individual feel lazy, overweight and tired. The natural tendency may be for the person to blame self-- to see themselves as the cause of the negative lifestyle changes. Thus the general sense of dissatisfaction. In this sense, the depression would stem from seasonality.

Given the general sense of dissatisfaction common among SAD-sufferers, it may be useful to consider the distribution of divorced individuals in the Sub-SAD and SAD groupings (see Table 6). Seventy-five percent of divorced participants had SPAQ scores higher than 7 and 57% of these divorced individuals scored in the SAD group. Were these scores a reflection of dissatisfaction with self due to the divorce? Without exact data on the nature of these individuals' relationships, it would be difficult to say for sure. However, 75% of divorced participants in the SAD group had experienced seasonality for more than 2 years.

An intriguing question stemming from the discussion above is: does seasonality bring on the depression or does the depression bring on the "seasonality"? Is it the person's sense of dissatisfaction that brings about the changes in behaviour or is it the changes in behaviour and/or lifestyle that bring about the depression? That question could be answered by looking at the individual's past history.

Indeed, if the same reaction occurs only every winter, it is likely that the individual is suffering from seasonality and not a general sense of dissatisfaction. However, it may be difficult to ascertain what is the cause if it is the first time a person is reporting changes in behaviour coupled with depression during the winter.

Young, Watel, Lahmeyer and Eastman (1991) have attempted to shed some light onto the nebulous relationship between depression and seasonality. They described what they termed secondary depressive symptoms among SAD-sufferers which are very similar to

the depressive features that characterized the SAD group in this study.

According to Young et al. (1991), social withdrawal, negative self-evaluation, self-reproach, loss of interest, anxiety and difficulties concentrating were seen as symptoms arising from the experience of seasonality itself. Based on their research, it is suggested that these secondary symptoms stem from the core symptoms of SAD: a decrease in energy and increases in sleep and appetite. Consequently, the secondary symptoms become apparent later on in the fall or winter, once seasonality has become a problem.

Young et al. (1991) propose that phototherapy may be most useful in treating the sleep-energy-appetite syndrome and that psychotherapy could be used conjointly for the secondary (cognitive) symptoms. In this way, the biological cause is treated while providing support for the client's emotional and cognitive experience.

In the context of this study, the question then becomes, did depression or general sense of dissatisfaction with self and/or others cause seasonality? If it did, one would have expected a very high correlation between seasonality and depression as defined by the BDI and Demoralization scales. On the basis of our findings, it seems that the SPAQ score was a reflection of something more than simply depression or "demoralization".

While the SPAQ and BDI scores were highly correlated, an important mediating factor was the Demoralization score. When this variable was partialled out (Table 5), the relationship between SPAQ

and BDI scores fell significantly from .57 to .23. Similarly, when the BDI score was statistically controlled, the relationship between the SPAQ and Demoralization scores significantly dropped from .62 to .34. As a result, depression seemed to be only one aspect of seasonality-- depression does not define SAD in and of itself.

Based on our findings, it seems unlikely that seasonality was purely an artifact of depression or of a general sense of dissatisfaction with one's current situation. Yet, individuals in the SAD group did report feeling more dissatisfied with self. Therefore, it is plausible that seasonality may entrain secondary depressive symptoms. However, given the correlational nature of our analyses, causation cannot be determined.

Related to the issue of the interdependence between seasonality and mood is the interesting relationship between the seasonality groups and depression (see Table 7). While the depressive symptoms increased as a function of the seasonality score among the No-SAD group, this was not the case in the Sub-SAD and SAD groups. This suggests that depression does not continue to increase in severity as the seasonality score increases. Instead, there may be a level (sub-syndromal) at which depression levels off somewhat.

As a result, there may be a limit to the severity of depression in SAD. The results of the present study indicate that the depression among SAD sufferers tended to be mild to moderate in severity (see Table 7). This corresponds to research done by Rosenthal et al. (1984) indicating that depression in SAD is not overwhelmingly incapacitating.

The relationship between the seasonality groups and depression also highlights the fact that depression was not the principal characteristic defining individuals in the SAD group. As the severity of seasonality increased, the reported severity of depression did not necessarily follow a similar pattern. Seasonality is not merely depression-- there is more to this disorder.

Complicating these findings somewhat were the differences for males and females in terms of the relationship between Demoralization, BDI and SPAQ scores across the seasonality groups (see Table 8). It would appear that the males and females experienced seasonality differently. It seems that depression was more of a prominent feature in the reported seasonality among the women in this sample. Specifically, the males did not seem to experience depressive symptoms to the same degree that the females did in accordance with seasonality. This may have been due to the cultural stigma attached to males admitting weaknesses (in this case, depression).

Difference in food consumption is another important factor involved in SAD. Seasonal affective disorder implies not only a change in weight and eating habits, but usually an increase in weight and a greater intake of carbohydrate-rich, high calorie foods (Rosenthal et al. 1989; Krauchi et al., 1990; Krauchi & Wirz-Justice, 1989). In this sense, the individual may try to energize themselves by elevating their glucose levels and reestablishing a chemical balance. What makes this process even more reinforcing is that it is coupled with a pleasurable early experience (Krauchi et al., 1990). Unfortunately, attempts at self-medication

are short-lived and short-term. The result is usually weight gain, especially if the individual does not or cannot involve him or herself in activities (which is often the case with SAD-sufferers).

Results involving the weight-change groupings suggest that increased appetite (and subsequent weight-gain) may be a person's response to decreases in energy. As would be expected, individuals in the over 8 lbs. weight-change groups reported greater seasonal fluctuations in appetite and weight on the SPAQ scale, however they also indicated greater seasonal changes in energy. Furthermore, these same individuals reported the greatest weight gain and eating the most in the winter. Its seems plausible, therefore, that decreases in energy during the winter are met by attempts to self-medicate via increase food intake.

In general, the results of this study seemed to suggest that there were differences in carbohydrate intake based on severity of seasonality (see Table 12). In fact, the Sub-SAD and SAD groups reported eating more chocolate than the No-SAD group over the month of January 1992. This certainly would fit the picture painted above involving a self-medicating tendency among those suffering from marked seasonality.

However, an intriguing pattern was apparent in Table 12 involving the sub-syndromal group. Apart from reporting a significantly higher intake of pasta in January 1992, this group also appeared (although not significantly so) to ingest a higher quantity of chocolate, potato chips, carbohydrates and high calorie foods than did the SAD group.

Since depression does not seem to be as severe in subsyndromal SAD, it may be that these people struggle to cope with more of the core symptoms of seasonality. The lack of energy may not be so severe as to be incapacitating and resistant to self-medication. As a result, these people may actively try to cope by eating more. Because the increase in food intake is successful, they resort to this technique more than is the case with SAD-sufferers.

Among SAD-sufferers, the lack of energy may be so severe that increased eating may not be as effective. Nonetheless, the SAD-sufferer may still continue to cope by eating more (although to a lesser degree than with Sub-SAD-sufferers). The weight gain that ensues conspires to make the situation worse. Gradually, the lack of energy, increased weight and constant need for sleep combine to produce a more profound, cognitively-based depression that is secondary to the original symptoms.

However, given the somewhat rudimentary method used to measure dietary patterns, we were unable to precisely and confidently define this trend. Future research could help better define the relationship between food intake and seasonality by using a more precise dietary inventory-- one in which the person's eating habits are recorded daily.

What also remains unclear is the composition of the sub-syndromal SAD group. Future research in the area of seasonal affective disorder must try to better define and understand this group. Does this group actually exist? Or is it simply characterized by individuals who either do or do not suffer from SAD-- a "mixed bag".

With respect to the sample used in this study, the Sub-SAD group was found to be homogeneous in terms of SPAQ, Demoralization, Mania and BDI scores-- suggesting that the sub-syndromal classification may indeed be identifying a separate group. However, a more intensive study focusing on the sub-syndromal group would help distinguish these individuals from SAD-sufferers.

Differences over the year

The final goal of this study was to examine the change in mood and behaviour of participants over the winter and summer. Here it was proposed that the winter months would have a "depressing" effect on people, especially on the individuals reporting more pronounced seasonality. In contrast, it was suggested that during the summer months, individuals experiencing more pronounced seasonality would report surges in energy and mood-- the summer months would have an "energizing" effect on these people.

Based on our findings, there is evidence to suggest that the yearlong sample did differ in terms of mood over the year. Specifically, the entire yearlong sample seemed to feel more depressed and "demoralized" in the winter and fall. This is in line with the research suggesting that most people experience seasonal variations in mood and behaviour (Kasper et al. 1989; Eastwood et al., 1985).

The Demoralization score significantly differed across the SAD group in terms of monthly and seasonal variations. Overall, the SAD group appeared to experience a greater fluctuation with respect to the Demoralization measure (see Figures 5 and 7). This

corresponds to Eastwood et al's (1985) suggestion that individuals suffering from seasonal affective disorder experience greater seasonal fluctuations in mood than normal individuals.

The SAD group's scores on the BDI scale were somewhat more ambiguous. While there was a significant difference across the seasons in this group, it principally stemmed from the discrepancy between the winter and fall BDI scores. Furthermore, a strong quadratic trend was not evident in this group.

The slight discrepancy between the Demoralization and BDI scores in the SAD group is somewhat surprising. Given the significant positive correlation between these two scales (see Table 5), one would have expected similar findings over time on these measures. However, what has been uncovered is a subtle difference between these scales. This may be the result of the differences in what these scales measure.

It seems that the Demoralization and BDI items did not tap precisely the same things. While differences in sadness, crying, self-satisfaction, insomnia and weight changes were assessed by both scales, each scale targeted specific cognitive dimensions. In particular, the Demoralization subscale measured aspects such as helplessness, level of motivation and self-confidence. In contrast, the BDI scale focused on such aspects as pessimism, guilt, self-accusation and social withdrawal.

It may be that the dimensions tapped by the Demoralization scale are more variable over the year and/or were more characteristic of the yearlong SAD sample. Certainly, a person's level of motivation and sense of helplessness could conceivably change as a

result of seasonal changes in energy and fatigue level. This corresponds to the hypothesis that certain depressive symptoms may be related to more insidious core seasonality symptoms (Young et al., 1991).

Given a decrease in energy and an increase in fatigue, a SAD-sufferer may indeed feel like he or she has less motivation to initiate activities. Furthermore, when faced with a change in energy and eating habits prompted by the onset of winter, the same individual may feel helpless to change the process (given its seasonal dimension). The Demoralization scale may have been better suited to pick up the aspects of SAD that were more susceptible to seasonal variation.

As mentioned above, the Demoralization subscale items were taken from the Psychiatric Epidemiological Research Interview (Dohrenwend et al., 1980). This measure was devised as a screening instrument, not as a diagnostic tool. It was intended as a first-stage instrument in a two-stage assessment of various psychological disorders in the general community (Shrout, Dohrenwend & Levav, 1986). The items were designed to be sensitive to general rather than specific fluctuations across a general population.

In contrast, the Beck Depression Inventory was devised to be more clinically and diagnostically relevant. This psychometric instrument is more refined and precise in its scope. As a result, more definite discriminations can be made based on its overall score. However, the BDI score may be more resistant to minor fluctuations in mood that occur in the general population.

The range of possible responses on the BDI was more restricted (4 possible responses) than on the Demoralization scale (5 possible responses). While the differences between the ranges of responses appears small, it is important to keep in mind that the differences between the SAD group's responses across these two measures was not that large either.

The overall trend among the Mania score tended to be linear rather than quadratic. Instead of witnessing an increase in manic behaviour over the summer, participants reported an overall decline from January to December. Against a priori predictions, the highest average score on the Mania subscale tended to be in January, when "manic" behaviours were predicted to be at their lowest manifestation.

It should be noted that the Mania scores were moderately high over the summer months (see Figure 4). Furthermore, the SAD group did report increased Mania scores in the month of July (see Figure 9). Overall, however, these results do not offer compelling evidence to support the hypothesis that SAD-sufferers experience a hyperthymic state in the summer (Blehar & Rosenthal, 1989).

Unclear in this discussion involving the Mania score is the interaction between this measure, the seasonality groups and the spring/summer months (see Figures 8 and 9). In both the spring and summer, the No-SAD group exhibited the same trend: scoring higher on the Mania scale (significantly in the month of April) than either the Sub-SAD and SAD groups in the first two months before falling to a lower level in the last month. This tendency to score higher was expected among the SAD group-- given the hypothesis that

seasonal affective disorder may be a bipolar in nature (Blehar & Rosenthal, 1989; Garvey et al., 1988; Thompson & Isaacs, 1988; Rosenthal et al., 1984).

As mentioned above, the Mania subscale items have not been validated as separate test items. These were included in this study in an attempt to assess the validity of the concept that seasonal affective disorder is a bipolar disorder. Given the results of this study, one is left with more questions than answers.

It may be that with more precise measures, hyperthymia can be more reliably measured. It should be noted that the items included in the Mania subscale were more akin to, quite naturally, mania rather than hyperthymia or even hypomania. As a result, this instrument may not have been sensitive enough to pick up differences in our sample.

Related to this issue is the imprecise nature of the summer dimension of SAD. So little is known about this part of the disorder that it is difficult to measure it. With a better understanding of this dimension of seasonality, more appropriate instruments can be found or even devised in order to study hyperthymia.

Given the fact that a person's mood may fluctuate over the year, the question that comes to mind is: does the weather influence a person's rating of seasonality. One would think that it should not-- a person's rating of seasonality should be stable over a certain amount of time; certainly over the period of a year. This study attempted to answer this question by testing the yearlong participants on two separate occasions on the Seasonal Pattern Assessment Questionnaire.

Overall, very few differences were apparent between the two testings. However, on the most telling measure-- the SPAQ score-- there was an important difference. Specifically, the people who had scored in the SAD group at the first testing in January, scored significantly lower at the September testing. This certainly underlines the influence of seasons on the perceptions of SAD-sufferers.

It may be that SAD sufferers do indeed experience the changes of the seasons more intensely than do other people. This sensitivity to the seasons not only influences their moods, behaviours and possibly even their diet, but also their very perceptions of seasonality. In other words, during the winter, the SAD group in this sample rated their seasonality quite high but in September, when the weather was not as cold and there was an increase in daily sunshine, they rated their level of seasonality significantly lower.

Based on these preliminary results, it may be that individuals scoring high on the seasonality score experience their seasonality differently over the year. Intuitively, this does make some sense given the fact that the people reporting more severe seasonality are, in essence, more influenced by the weather. Therefore, it is reasonable to assume that these weather-sensitive individuals may fluctuate in their assessment of seasonality depending on the weather or season. Specifically, they rate seasonality more severely in the winter. Assessing seasonality among SAD-sufferers may be more a reflection of their current "seasonal" state of mind rather than an accurate measure of their level of seasonality per se.

Weather may indeed play a role in the prevalence and the fluctuation in seasonality. It is important to note, however, that even though the SAD group scored lower on the SPAQ scale in September, the score was still within the sub-syndromal range, nonetheless indicating a problem with seasonality (see Table 18).

With respect to the food items and food groups over the year, the results were less clear. The overall trend across the significant findings (see Table 18) indicated that participants tended to decrease their reported weekly consumption over time. This may be due to actual experience or may be the result of a practice effect. As the year wore on, the participants may have become increasingly accustomed to filling out the food inventory. Consequently, they may have begun to answer in an rather automatic fashion.

An interesting finding was the significant interactions between meat intake (fish, beef and chicken) over the year across the seasonality groups. The No-SAD group reported consuming the most beef and fish during the spring while the other two groups reported lower rates of consumption. If individuals suffering from seasonality need to medicate themselves in the winter, is the reverse true in the summer (they eat less carbohydrates than the average person)? If seasonal affective disorder is bipolar in nature, does the increase in energy in the summer necessitate or negate the consumption of high calorie foods?

If there is a seasonal ebb and flow of food intake, the answer to these questions would suppose that during the summer months the eating habits of SAD-sufferers may be characterized by a decrease in their self-medicating tendency. Thus, there would be less of

a reliance on high-calorie, high-carbohydrate foods. This would fit with the pattern revealed in the spring among beef and fish intake as well as the self-reports from the SAD group indicating that they were most likely to eat least (and consequently lose the most weight) in the summer (see Table 12). But how does one explain the spurt in consumption among the No-SAD group that is only apparent in the spring?

It is obvious that the many questions raised with respect to food intake cannot be confidently answered with the instrument used in this study. The problem that became evident as the study proceeded was the lack of precision inherent in the food inventory. For example, the term "bread" has many different meanings for different people.

This questionnaire was used as an exploratory part of the study but the lack of precision made it difficult for both the participants and the researchers to fully understand food intake patterns. Future research in this area would benefit by collaborating first with a dietician and/or health care professional well-versed in the area of nutrition.

Finally, some very preliminary and intriguing evidence was presented to suggest that there may be personality differences across the seasonality groups. It may be that SAD-sufferers tend to be less extraverted by nature. As a result, when substantial impediments to activity arise in the winter in the form of unfavorable weather and decreased energy, these people may not have the personal orientation to motivate themselves to go out of the home and keep active. Instead, they may stay in and ruminate (prompting secondary symptoms) precisely at the time

have to be replicated on a much larger sample to be clearly understood.

However, as mentioned several times, an important limitation of the yearlong aspect of this study was the small sample size. One cannot be confident that the results obtained are a reflection of the specific sample used or of a more general trend in the population. However, as is the case with much of the research in this area, this study can be seen as a vista opening doors and asking questions for future research.

Conclusion

While seasonality appeared to be more prevalent in the sample tested in this study, one must consider the large segment of single students under the age of 25. It is probable that these individuals biased the results somewhat. However, the northerly location of Thunder Bay undoubtedly influenced the sizable manifestation of seasonality.

Overall, the results of this study tend to confirm the findings of other research in terms of the characteristic features of seasonal affective disorder. In particular, there is support for the notion that seasonal affective disorder is characterized by atypical vegetative symptoms. However, new light may have been shed on the depressive process underlying seasonality.

Especially prevalent among SAD-sufferers, a secondary-type of depression may set in due to an awareness of the inability to cope with a severe lack of energy and hypersomnia. This cognitively-based

depression may be characterized by a general sense of dissatisfaction (with self) and helplessness. Evidence of this type of depression was found among SAD-sufferers in this study. Therefore, as Young et al. (1991) suggested, it may be that the core dimensions of seasonal affective disorder (lack of energy, increased fatigue and food consumption) spawn secondary symptoms in the form of a more cognitive depression.

In studying seasonal affective disorder in the future, it may be useful to focus on the characteristics of the depression inherent in SAD in order to fashion treatment accordingly. Even though a biological mechanism may be responsible for SAD, an understanding of the depression underlying the disorder will help clinicians deal with concerns and issues the client may bring to therapy. No intervention is instantaneously effective and therefore, helping the client cope with the depression may be crucial to the eventual success of treatment.

A question raised by this study's results is the impact of diet. More specifically, does food help an individual cope with the change in energy and mood that accompanies SAD? If so, at what stage is this self-medication more pronounced, if indeed it varies at all across SAD sufferers? Some preliminary evidence was provided suggesting that a lack of energy during the winter may prompt the need to eat more-- self-medicate. Furthermore, it is plausible, based on our findings, that because seasonality is less severe among subsyndromal-SAD-sufferers, more active attempts at self-medicating may be evident.

While there appears to be a relation between mood and food intake (Silverstone, 1987) future research could try to understand the exact dietary process underlying seasonal affective disorder. Are SAD sufferers simply trying to cope with their illness by eating more? If so, what biological processes are being activated by this self-medicating process?

As far as the yearlong approach to studying SAD, the results were mixed. Changes in mood do appear to occur over the course of a year but whether seasonality influences the severity of these changes was unclear based on the results of this study. Furthermore, the bipolar aspect of SAD was not identified using a rudimentary approach to measuring "manic" behaviours.

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Appendix A

Definition of SAD

Major Depressive Episode-- seasonal pattern:

" A. There has been a regular temporal relationship between the onset of Bipolar Disorder (including Bipolar Disorder NOS) or Recurrent Major Depression (including Depressive Disorder NOS) and a particular 60-day period of the year (eg., regular appearance of depression between the beginning of October and the end of November).

Note: Do not include cases where there is an obvious effect of seasonally related psychosocial stressors, e.g., regularly being unemployed every winter.

B. Full remissions (or change from depression to mania or hypomania) also occurred within a particular 60-day period of the year (e.g., depression disappears from mid-February to mid-April.

C. There have been at least three episodes of mood disturbance in three separate years that demonstrated the temporal seasonal relationship defined in A and B; at least two of the years were consecutive.

D. Seasonal episodes of mood disturbance, as described above, outnumbered any nonseason episodes of such disturbance that may have occurred by more than three to one."
(DSM-III-R, 1987, p.24)

Appendix B

Seasonal Pattern Assessment Questionnaire

1. name:
2. age:
3. telephone:
4. sex: male _____ female _____
5. marital status: single ___ sep./divorced ___ married ___
   widowed___ common-law___
6. occupation: _____
7. place of birth: city _____ province _____
8. place of permanent residence (if student, where do you spend your summer):_____
9. how many years have you lived at this permanent residence?___
10. how many years and/or months have you lived in this climatic area? ____
11. To what degree do you experience changes with the seasons?

	no change	slight change	moderate change	marked change	extremely marked change
A.sleep length	_____	_____	_____	_____	_____
B.social activity	_____	_____	_____	_____	_____
C.mood	_____	_____	_____	_____	_____
D.weight	_____	_____	_____	_____	_____
E.appetite	_____	_____	_____	_____	_____
F.energy level	_____	_____	_____	_____	_____

12. In the following questions, check for all applicable months. This may be a single month, a cluster of months or any other grouping. At what time of the year do you...

	J	F	M	A	M	J	J	A	S	O	N	D	No particular month
A.feel best	—	—	—	—	—	—	—	—	—	—	—	—	—
B.gain most weight	—	—	—	—	—	—	—	—	—	—	—	—	—
C.socialize most	—	—	—	—	—	—	—	—	—	—	—	—	—
D.sleep most	—	—	—	—	—	—	—	—	—	—	—	—	—
E.eat most	—	—	—	—	—	—	—	—	—	—	—	—	—
F.lose most weight	—	—	—	—	—	—	—	—	—	—	—	—	—
G.socialize least	—	—	—	—	—	—	—	—	—	—	—	—	—
H.feel worst	—	—	—	—	—	—	—	—	—	—	—	—	—
I.eat least	—	—	—	—	—	—	—	—	—	—	—	—	—
J.sleep most	—	—	—	—	—	—	—	—	—	—	—	—	—

13. Using the scale below. indicate how the following weather changes make you feel. (ONE CHECK ONLY FOR EACH 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	__	__	__	__	__	__	__	__
B. hot weather	__	__	__	__	__	__	__	__
C. humid weather	__	__	__	__	__	__	__	__
D. sunny weather	__	__	__	__	__	__	__	__
E. dry weather	__	__	__	__	__	__	__	__
F. grey & cloudy	__	__	__	__	__	__	__	__
G. long days	__	__	__	__	__	__	__	__
H. high pollen	__	__	__	__	__	__	__	__
I. foggy & smoggy	__	__	__	__	__	__	__	__
J. short days	__	__	__	__	__	__	__	__

14. 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 ___

15. Approximately how many hours of each 24-hour day do you sleep during each season (include naps)?

	Hours of sleep																		> 18 hours
Winter (Dec 21-Mar 20)	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	_____
Spring (Mar 21- June 20)	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	_____
Summer (June 21- Sept 20)	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	_____
Fall (Sept 21- Dec 20)	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	_____

16. Do you notice a change in food preferences during the different seasons? Yes__ No__ please specify_____
17. If your experience changes with the seasons, do you feel that these are a problem for you? Yes__ No__
If yes, is this problem: mild__ moderate__ marked__ severe__ disabling__
18. How many years have your been having the "winter blues"? ____

Date: _____

ne: _____ Marital Status: _____ Age: _____ Sex: _____

upation: _____ Education: _____

s questionnaire consists of 21 groups of statements. After reading each group of statements carefully, le the number (0, 1, 2 or 3) next to the one statement in each group which **best** describes the way you e been feeling the **past week, including today.** If several statements within a group seem to apply equally l, circle each one. **Be sure to read all the statements in each group before making your choice.**

	0	I do not feel sad.
	1	I feel sad.
	2	I am sad all the time and I can't snap out of it.
	3	I am so sad or unhappy that I can't stand it.
	0	I am not particularly discouraged about the future.
	1	I feel discouraged about the future.
	2	I feel I have nothing to look forward to.
	3	I feel that the future is hopeless and that things cannot improve.
	0	I do not feel like a failure.
	1	I feel I have failed more than the average person.
	2	As I look back on my life, all I can see is a lot of failures.
	3	I feel I am a complete failure as a person.
	0	I get as much satisfaction out of things as I used to.
	1	I don't enjoy things the way I used to.
	2	I don't get real satisfaction out of anything anymore.
	3	I am dissatisfied or bored with everything.
	0	I don't feel particularly guilty.
	1	I feel guilty a good part of the time.
	2	I feel quite guilty most of the time.
	3	I feel guilty all of the time.
	0	I don't feel I am being punished.
	1	I feel I may be punished.
	2	I expect to be punished.
	3	I feel I am being punished.
	0	I don't feel disappointed in myself.
	1	I am disappointed in myself.
	2	I am disgusted with myself.
	3	I hate myself.
8	0	I don't feel I am any worse than anybody else.
		I am critical of myself for my weaknesses or mistakes.
	2	I blame myself all the time for my faults.
	3	I blame myself for everything bad that happens.
9	0	I don't have any thoughts of killing myself.
	1	I have thoughts of killing myself, but I would not carry them out.
	2	I would like to kill myself.
	3	I would kill myself if I had the chance.
10	0	I don't cry any more than usual.
	1	I cry more now than I used to.
	2	I cry all the time now.
	3	I used to be able to cry, but now I can't cry even though I want to.
11	0	I am no more irritated now than I ever am.
	1	I get annoyed or irritated more easily than I used to.
	2	I feel irritated all the time now.
	3	I don't get irritated at all by the things that used to irritate me.
12	0	I have not lost interest in other people.
	1	I am less interested in other people than I used to be.
	2	I have lost most of my interest in other people.
	3	I have lost all of my interest in other people.
13	0	I make decisions about as well as I ever could.
		I put off making decisions more than I used to.
	2	I have greater difficulty in making decisions than before.
	3	I can't make decisions at all anymore.

_____ Subtotal Page 1

CONTINUED ON BACK

THE PSYCHOLOGICAL CORPORATION
HARCOURT BRACE JOVANOVICH, INC.

Appendix D

Psychiatric Epidemiology Research Interview

1. In general, how satisfied have you been with yourself in the last month...
   a).....very satisfied
   b).....somewhat satisfied
   c).....satisfied
   d).....somewhat dissatisfied
   e).....very dissatisfied

2. During the past month, how often have you been bothered by feelings of sadness or depression -- feeling blue...
   a).....never
   b).....almost never
   c).....sometimes
   d).....fairly often
   e).....very often

3. During the past month, how often have you felt like crying...
   a).....never
   b).....almost never
   c).....sometimes
   d).....fairly often
   e).....very often

4. During the past month, how often have you felt confident...
   a).....very often
   b).....fairly often
   c).....sometimes
   d).....almost never
   e).....very often

5. During the past month, how often have you been bothered by feelings of restlessness...
   a).....never
   b).....almost never
   c).....sometimes
   d).....fairly often
   e).....very often

6. During the past month, how often have you had trouble concentrating or keeping your mind on what you were doing...
   a).....never
   b).....almost never
   c).....sometimes
   d).....fairly often
   e).....very often

7. During the past month, how often have you had trouble getting started on the things you have to do...
   a).....never
   b).....almost never
   c).....sometimes
   d).....fairly often
   e).....very often

8. During the past year, how often have you felt completely helpless about everything...
   a).....never
   b).....almost never
   c).....sometimes
   d).....fairly often
   e).....very often

9. During the past month, how often has your appetite been poor.
   a).....never
   b).....almost never
   c).....sometimes
   d).....fairly often
   e).....very often

10. During the past month, have you gained 5 pounds or more without being on a special diet...
   a).....no
   b).....yes

11. During the past month, how often have you been bothered by nervousness, being fidgety or tense...
   a).....never
   b).....almost never
   c).....sometimes
   d).....fairly often
   e).....very often

12. Druing the past month, how often have you been bothered by tiring out very easily...
   a).....never
   b).....almost never
   c).....sometimes
   d).....fairly often
   e).....very often

13. During the past month, how often have you been troubled by having a hard time getting going when you wake up...
    a).....never
    b).....almost never
    c).....sometimes
    d).....fairly often
    e).....very often

14. During the past month, how often have you had trouble falling asleep...
    a).....never
    b).....almost never
    c).....sometimes
    d).....fairly often
    e).....very often

15. During the past month, how often have you had trouble staying asleep...
    a).....never
    b).....almost never
    c).....sometimes
    d).....fairly often
    e).....very often

16. During the past month, how often have you had periods when you could go for days at a time needing little sleep or rest.
    a).....never
    b).....almost never
    c).....sometimes
    d).....fairly often
    e).....very often

17. During the past month, how often have you had periods when you had so much energy that other people couldn't keep up with you...
    a).....never
    b).....almost never
    c).....sometimes
    d).....fairly often
    e).....very often

18. During the past month, how often have there been periods of several days or weeks when you felt so good or high that you were clearly different from your usual self...
    a).....never
    b).....almost never
    c).....sometimes
    d).....fairly often
    e).....very often

19. During the past month, how often have you had times when it was difficult to concentrate because of feeling talkative, active and high, without drinking or taking drugs...
    a).....never
    b).....almost never
    c).....sometimes
    d).....fairly often
    e).....very often

20. During the past month, how often have you become so excited your thoughts raced ahead faster than you could speak them...
    a).....never
    b).....almost never
    c).....sometimes
    d).....fairly often
    e).....very often

Appendix E

Food/Drink Questionnaire

Name:_____ Date:_____

Please indicate how often you have consumed the following food and drink on a weekly basis during the last month. (example: if you **usually** ate potatoes three times a week **this month**, indicate this by checking off the "three" times column by the item potatoes, pasta).

	never	once	twice	three	more than four
1. bread, rolls, etc.	_____	_____	_____	_____	_____
2. milk	_____	_____	_____	_____	_____
3. coffee, tea	_____	_____	_____	_____	_____
4. fruit juice	_____	_____	_____	_____	_____
5. cheese, yogurt	_____	_____	_____	_____	_____
6. jam, honey	_____	_____	_____	_____	_____
7. butter, margarine	_____	_____	_____	_____	_____
8. fruits	_____	_____	_____	_____	_____
10. potatoes, pasta	_____	_____	_____	_____	_____
11. rice	_____	_____	_____	_____	_____
12. beef	_____	_____	_____	_____	_____
13. fish	_____	_____	_____	_____	_____
14. pork	_____	_____	_____	_____	_____
15. chicken	_____	_____	_____	_____	_____
16. cooked vegetables	_____	_____	_____	_____	_____
17. raw vegetables	_____	_____	_____	_____	_____
18. chocolate	_____	_____	_____	_____	_____
19. ice cream	_____	_____	_____	_____	_____
20. cake, pastry	_____	_____	_____	_____	_____
21. beer	_____	_____	_____	_____	_____
22. wine	_____	_____	_____	_____	_____
23. pop	_____	_____	_____	_____	_____
24. candies	_____	_____	_____	_____	_____
25. potato chips, tacos	_____	_____	_____	_____	_____
26. other:...	_____	_____	_____	_____	_____

The NEO Personality Inventory

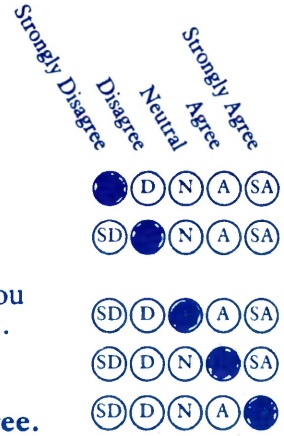
Form S

by Paul Costa, Jr., Ph.D. and Robert McCrae, Ph.D.

Instructions:

On the accompanying answer sheet, please fill in your name, age, the date, and your sex, using a No. 2 pencil. Mark "Self" in the box labeled "Person Rated", since you are describing yourself. Mark "S" in the box labeled "Form". Please make all your answers on the answer sheet; do not write in this test booklet.

This questionnaire contains 181 statements. Read each carefully. For each statement darken the one bubble on the answer sheet which best represents your opinion, making sure that your answer is in the correctly numbered space.



Mark "SD"	if the statement is definitely false or you **strongly disagree.**
Mark "D"	if the statement is mostly false or you **disagree.**
Mark "N"	if the statement is about equally true or false, or if you cannot decide, or if you are **neutral** on the statement.
Mark "A"	if the statement is mostly true or you **agree.**
Mark "SA"	if the statement is definitely true or you **strongly agree.**

There are no "right" or "wrong" answers, and you need not be an "expert" to complete this questionnaire. The purpose of this questionnaire will be best served if you describe yourself and state your opinions as accurately as possible.

Please read each item carefully and mark the one bubble that best corresponds to your agreement or disagreement. Answer every item. Note that the answers are numbered down the columns on the answer sheet, and make sure that your answer is marked in the correctly numbered space. If you change your mind, please erase your first answer completely.

1. I really like most people I meet.
2. I have a very active imagination.
3. I often feel tense and jittery.
4. I shy away from crowds of people.
5. I keep my belongings neat and clean.
6. Aesthetic and artistic concerns aren't very important to me.
7. I'm an even-tempered person.
8. I am dominant, forceful, and assertive.
9. Without strong emotions, life would be uninteresting to me.
10. I'm pretty good about pacing myself so as to get things done on time.
11. Sometimes I feel completely worthless.
12. I don't get much pleasure from chatting with people.
13. I try to keep all my thoughts directed along realistic lines and avoid flights of fancy.
14. I rarely feel fearful or anxious.
15. I try to perform all the tasks assigned to me conscientiously.
16. I like to have a lot of people around me.
17. I am sometimes completely absorbed in music I am listening to.
18. I often get angry at the way people treat me.
19. I sometimes fail to assert myself as much as I should.
20. I have a clear set of goals and work toward them in an orderly fashion.
21. I rarely experience strong emotions.
22. I have sometimes experienced a deep sense of guilt or sinfulness.
23. I'm known as a warm and friendly person.
24. I have an active fantasy life.
25. I work hard to accomplish my goals.
26. I am easily frightened.
27. I usually prefer to do things alone.
28. Watching ballet or modern dance bores me.
29. I am not considered a touchy or temperamental person.
30. I am not a very methodical person.
31. I never hesitate to assert my rights if I feel I'm being taken advantage of.
32. How I feel about things is important to me.
33. I tend to blame myself when anything goes wrong.

34. Many people think of me as somewhat cold and distant.
35. I pay my debts promptly and in full.
36. I don't like to waste my time daydreaming.
37. I am not a worrier.
38. I really feel the need for other people if I am by myself for long.
39. Certain kinds of music have an endless fascination for me.
40. I waste a lot of time before settling down to work.
41. I am known as hot-blooded and quick-tempered.
42. In meetings, I usually let others do the talking.
43. I find it hard to get in touch with my feelings.
44. I have a low opinion of myself.
45. I try to do jobs carefully, so they won't have to be done again.

▶ *Go to the top of the second column on your answer sheet.*

46. I really enjoy talking to people.
47. I enjoy concentrating on a fantasy or daydream and exploring all its possibilities, letting it grow and develop.
48. I often worry about things that might go wrong.
49. I prefer small parties to large ones.
50. Sometimes I'm not as dependable or reliable as I should be.
51. Poetry has little or no effect on me.
52. It takes a lot to get me mad.
53. I have often been a leader of groups I have belonged to.
54. I experience a wide range of emotions or feelings.
55. I strive to achieve all I can.
56. Sometimes things look pretty bleak and hopeless to me.
57. I find it easy to smile and be outgoing with strangers.
58. If I feel my mind starting to drift off into daydreams, I usually get busy and start concentrating on some work or activity instead.
59. Frightening thoughts sometimes come into my head.
60. When I make a commitment, I can always be counted on to follow through.
61. I'd rather vacation at a popular beach than an isolated cabin in the woods.
62. I am intrigued by the patterns I find in art and nature.
63. I often get disgusted with people I have to deal with.

64. I would rather go my own way than be a leader of others.
65. I like to keep everything in its place so I know just where it is.
66. I seldom pay much attention to my feelings of the moment.
67. I rarely feel lonely or blue.
68. I have strong emotional attachments to my friends.
69. As a child I rarely enjoyed games of make believe.
70. I never seem to be able to get organized.
71. I'm seldom apprehensive about the future.
72. I prefer jobs that let me work alone without being bothered by other people.
73. Sometimes when I am reading poetry or looking at a work of art, I feel a chill or wave of excitement.
74. People I work or associate with find me easy to get along with.
75. I am a productive person who always gets the job done.
76. Other people often look to me to make decisions.
77. I seldom notice the moods or feelings that different environments produce.
78. Too often, when things go wrong, I get discouraged and feel like giving up.
79. I take a personal interest in the people I work with.
80. I tend to be somewhat fastidious or exacting.
81. I would have difficulty just letting my mind wander without control or guidance.
82. I have fewer fears than most people.
83. I would rather watch an event on television than be there in the audience.
84. I enjoy reading poetry that emphasizes feelings and images more than story lines.
85. I strive for excellence in everything I do.
86. There are some people I really hate.
87. Others think of me as being modest and unassuming.
88. I find it easy to empathize — to feel myself what others are feeling.
89. I am seldom sad or depressed.
90. I am easy-going and lackadaisical.

▶ ***Turn your answer sheet over and go to the top of the first column.***

91. I'm not the kind of person who must always be busy with something.
92. I'm pretty set in my ways.
93. I seldom feel self-conscious when I'm around people.
94. I often crave excitement.

95. I believe that most people are basically well-intentioned.
96. I often enjoy playing with theories or abstract ideas.
97. I have trouble resisting my cravings.
98. I have never literally jumped for joy.
99. I believe letting students hear controversial speakers can only confuse and mislead them.
100. I often get into arguments with my family and co-workers.
101. I feel I am capable of coping with most of my problems.
102. When I do things, I do them vigorously.
103. I think it's interesting to learn and develop new hobbies.
104. In dealing with other people, I always dread making a social blunder.
105. I go out of my way to help others if I can.
106. I have sometimes done things just for "kicks" or "thrills".
107. I enjoy solving problems or puzzles.
108. I rarely overindulge in anything.
109. I have sometimes experienced intense joy or ecstasy.
110. It wouldn't bother me if I had to punish a child or pet.
111. I believe that laws and social policies should change to reflect the needs of a changing world.
112. I often feel helpless and want someone else to solve my problems.
113. I have a leisurely style in work and play.
114. I like to follow a strict routine in my work.
115. I think most of the people I deal with are honest and trustworthy.
116. It doesn't embarrass me too much if people ridicule and tease me.
117. I like to be where the action is.
118. I enjoy working on "mind-twister"-type puzzles.
119. When I am having my favorite foods, I tend to eat too much.
120. I try to be courteous to everyone I meet.
121. I am not a cheerful optimist.
122. I believe we should look to our religious authorities for decisions on moral issues.
123. I keep a cool head in emergencies.
124. I often feel as if I'm bursting with energy.
125. Starving masses in foreign countries leave me pretty cold.
126. Once I find the right way to do something, I stick to it.

127. At times I have been so ashamed I just wanted to hide.
128. Fast cars and motorcycles have never had much appeal to me.
129. I find philosophical arguments boring.
130. Some people think I'm selfish and egotistical.
131. I have little difficulty resisting temptation.
132. Sometimes I bubble with happiness.
133. I believe that the different ideas of right and wrong that people in other societies have may be valid for them.
134. When I'm under a great deal of stress, sometimes I feel like I'm going to pieces.
135. I tend to be cynical and skeptical of others' intentions.

▶ ***Go to the top of the second column on your answer sheet.***

136. My work is likely to be slow but steady.
137. I often try new and foreign foods.
138. I often feel inferior to others.
139. I love the excitement of roller coasters.
140. I would rather cooperate with others than compete with them.
141. I sometimes lose interest when people talk about very abstract, theoretical matters.
142. I sometimes eat myself sick.
143. I don't consider myself especially "light-hearted".
144. I believe that loyalty to one's ideals and principles is more important than "open-mindedness".
145. I believe that most people will take advantage of you if you let them.
146. I can handle myself pretty well in a crisis.
147. I usually seem to be in a hurry.
148. I prefer to spend my time in familiar surroundings.
149. I feel comfortable in the presence of my bosses or other authorities.
150. Some people think of me as cold and calculating.
151. I wouldn't enjoy vacationing in Las Vegas.
152. I have little interest in speculating on the nature of the universe or the human condition.
153. I am always able to keep my feelings under control.
154. I am a cheerful, high-spirited person.
155. Most people I know like me.

156. I consider myself broad-minded and tolerant of other people's lifestyles.
157. It's often hard for me to make up my mind.
158. My life is fast-paced.
159. On a vacation, I prefer going back to a tried and true spot.
160. I'm hard-headed and tough-minded in my attitudes.
161. If I have said or done the wrong thing to someone, I can hardly bear to face them again.
162. I'm attracted to bright colors and flashy styles.
163. I have a lot of intellectual curiosity.
164. Sometimes I do things on impulse that I later regret.
165. I generally try to be thoughtful and considerate.
166. I rarely use words like "fantastic!" or "sensational!" to describe my experiences.
167. I think that if people don't know what they believe in by the time they're 25, there's something wrong with them.
168. When everything seems to be going wrong, I can still make good decisions.
169. I am a very active person.
170. If I don't like people, I let them know it.
171. I follow the same route when I go someplace.
172. When people I know do foolish things, I get embarrassed for them.
173. I tend to avoid movies that are shocking or scary.
174. I have a wide range of intellectual interests.
175. In most situations, I try to be aware of how others are thinking and feeling.
176. I seldom give in to my impulses.
177. I laugh easily.
178. I believe that the "new morality" of permissiveness is no morality at all.
179. I'm pretty stable emotionally.
180. If necessary, I am willing to manipulate people to get what I want.
181. I have tried to answer all these questions honestly and accurately.

END OF TEST.

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