Bial

Final Report - 57/06

The diurnal pattern of cortisol secretion in relation to season in healthy participants and those with seasonal affective disorder

Brief summary of project and key findings

The aims of this study were to investigate seasonal differences in the diurnal pattern of cortisol secretion and to investigate whether participants with seasonal affective disorder (SAD) present with exaggerated sensitivity to seasonal changes in light availability. It was hypothesised that there would be differences in the diurnal cortisol profile between summer and winter for both SAD and healthy participants and that these differences will be greater in SAD suffers compared to healthy participants. The study was a naturalistic design with participants collecting multiple saliva samples (in which cortisol was measured) in their home environment. Each participant completed the procedure in winter and in summer with conditions being counterbalanced. In line with best practice guidelines, cortisol was be measured on two consecutive weekdays in both summer and in winter.

The objective of the research was to enhance theoretical understanding of the regulation of cortisol secretion over the day and inform best practice for the ever increasing number of psychophysiological studies that include cortisol cycles as a variable as well as contribute to the understanding of the pathophysiology and treatment of SAD.

In line with the hypothesis we found that the awakening cortisol response was attenuated in SAD participants compared to matched controls during winter months but not during the summer. Non-seasonal participants did not show changes in their patterns of cortisol secretion.

Methodology:

Ethical Considerations:

The project was conducted in accordance with the Ethical Guidelines for Research with Human Participants as laid down in the British Psychological Society's Code of Conduct, Ethical Principles and Guidelines. Ethical implications and the psychological consequences for the participants in this project are considered from the standpoint of the participants. Every effort was made to engender mutual respect and confidence between the investigator and participants. The proposed programme of research for the project was submitted to the University of Westminster's Ethics Committee for consideration and approval gained in June 2007.

Developing relationships with SAD community in the UK:

There was ongoing communication with the Seasonal Affective Disorder Association (SADA) in the UK, which is a voluntary organisation and registered charity which informs the public and health professions about SAD and supports and advises sufferers of the illness. Awareness of the project was generated by advertisements in the tri-yearly newsletter (August 07 and Jan 08) and Dr Lisa Thorn attended SADA's Annual General Meeting in October 2007, where she gave a presentation about the project.

Recruitment:

Twenty six participants with SAD completed all aspects of the study (a further 5 SAD participants completed the interview aspect alone). A group of 26 age- and sex-matched control participants also completed the study.

Interviews with participants:

Interested participants contact Dr Thorn by email or telephone and are assessed for their suitability for inclusion in the study. If participants met the assessment criteria they are given enough detail about the study for them to be able to make a decision as to whether they would like to participate. They were informed that the researcher could visit in their homes or that they could attend the university. All participants are met by Dr Thorn and fully briefed regarding all aspects of the research including the procedure, aims and rationale for each investigation. All reasonable steps are taken to ensure that participants understood the nature of the investigation; both verbal and written information was provided. Informed, written consent of all volunteers was obtained. Participants with SAD are also interviewed in depth regarding all aspects of their SAD including their symtomatology and treatment. All participants were provided with a study pack containing full standardised written instructions, questionnaires and saliva sampling kits which were posted back to the university.

Psychological assessment

To determine trait seasonality all participants completed the seasonality pattern assessment questionnaire (SPAQ). At each assessment point participants also completed the perceived stress (PSS) scale and the Hospital Anxiety and Depression scale (HADS-A and HADS-D) to give an indication of stress, anxiety and depression. At 45 minutes after awakening on each of the 4 saliva collection days (2 in summer and 2 in winter) each participant completed the state stress and arousal checklist (SACL) to determine momentary state stress and arousal

Salivary assays and data file set up:

All saliva samples of the 52 study participants were been assayed in our laboratory using standard and validated enzyme immunoassays. Cortisol data, demographics and the psychological data, was scored and entered into a statistical package (SPSS 15) for statistical analyses.

Results:

Comparison between the SAD and matched non-SAD control participants

There were no differences in demographic characteristics between SAD and control participants (see Table 1).

Table 1 Demographic characteristics of SAD and control participants

	Control (*n* = 26)	SAD (*n* = 26)
Number of female participants (%)	15 (58%)	21 (80%)
Age in years (mean ±SD)	48.6 (±11.7)	50.9 (±12.3)
Health rating (mean ±SD)	4.31 (±0.68)	4.04 (±0.82)
Non-smokers (%)	23 (88%)	23 (88%)
Employment status (% employed)	19 (73%)	18 (69%)

Psychosocial variables

As expected there was a significant difference in seasonality score between the groups (t = 12.867, p < .0005). Scores for SAD participants were significantly greater than controls (see Table 2).

Table 1 Seasonality scores for SAD and control participants

	Group	N	Mean	SD
Seasonality score	control	26	4.31	3.29
	experimental	26	15.65	3.05

SAD participants reported greater overall perceived stress than controls and had greater levels of perceived stress in winter than in summer (see Figure 1). This was also apparent for both HADS anxiety (see Figure 2) and HADS depression (see Figure 3). State stress measured by the stress arousal checklist also exhibited the same pattern (see Figure 4).

Figure 1 Perceived Stress Scale scores for control and SAD participants in summer and winter

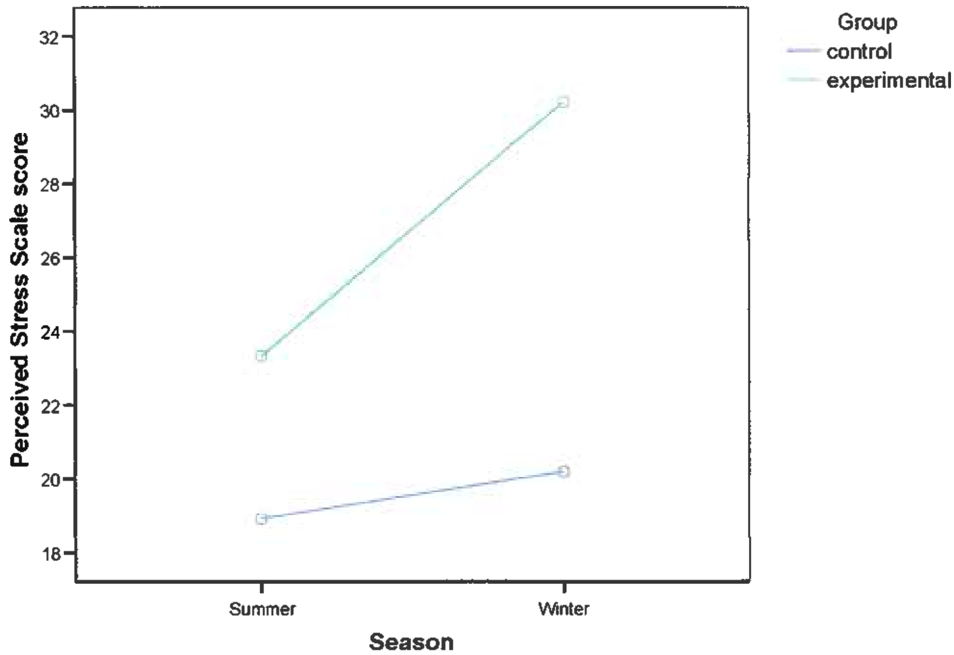


Figure 2 HADS anxiety scores for control and SAD participants in summer and winter

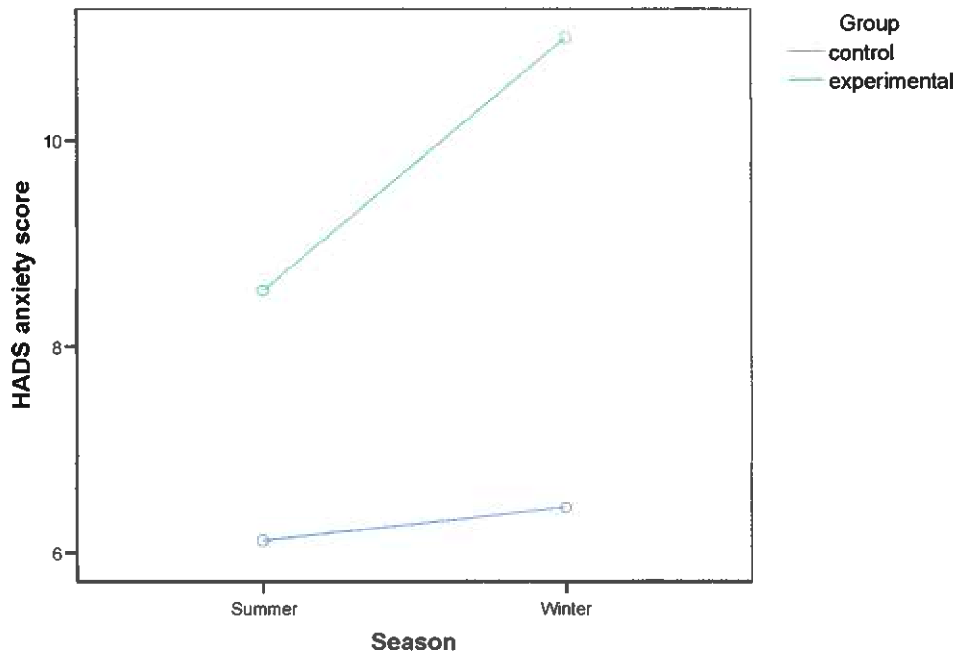


Figure 3 HADS depression scores for control and SAD participants in summer and winter

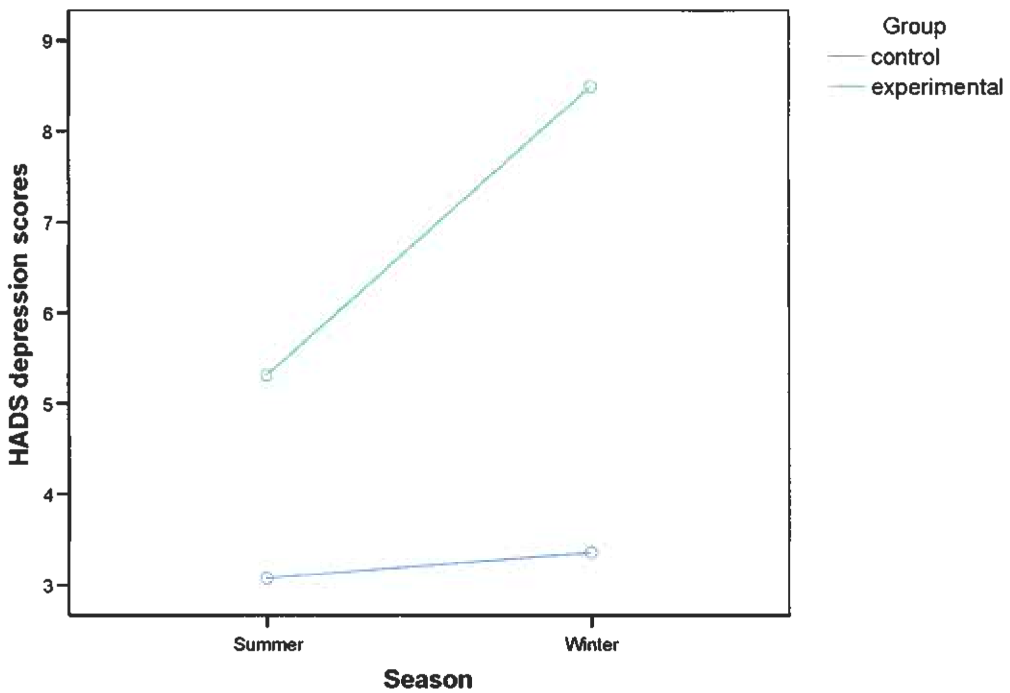


Figure 4 State stress (SACL) scores for control and SAD participants in summer and winter

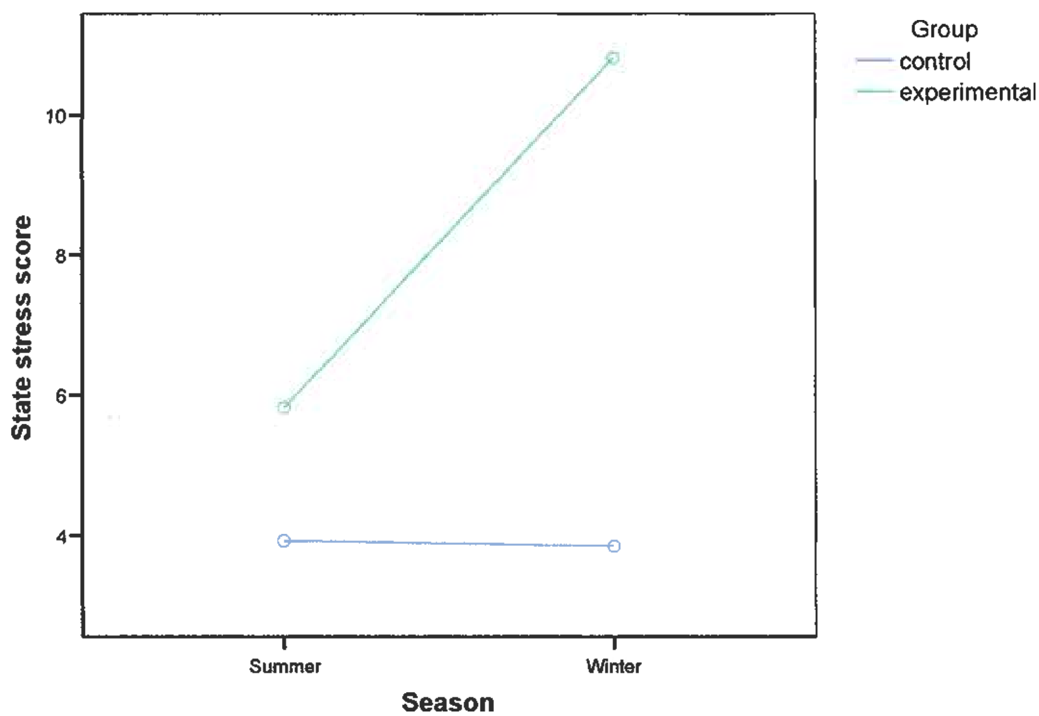
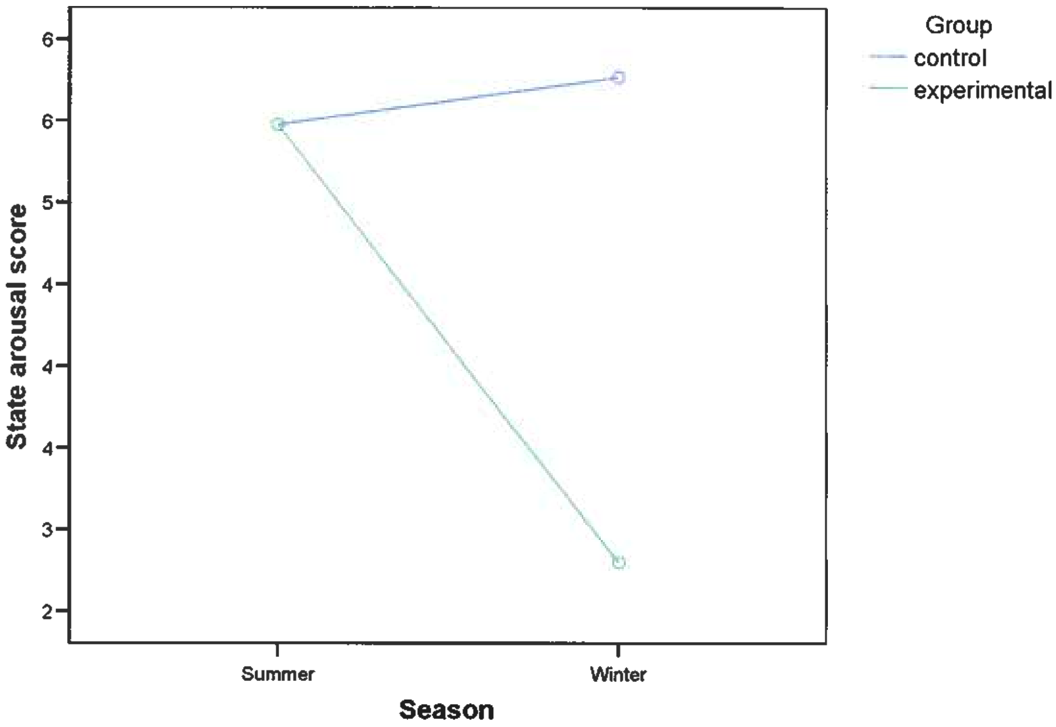


Figure 5 State arousal (SACL) scores for control and SAD participants in summer and winter



State arousal on the other hand exhibited the opposite pattern, being significantly lower in winter for SAD participants (see Figure 5).

Patterns of cortisol secretion

Figures 6 and 7 illustrate the pattern of cortisol secretion in summer and winter for both groups. The awakening cortisol response was attenuated for SAD participants in winter in line with the hypothesis. Figures 8 and 9 display the awakening cortisol response in detail.

Figure 6 Mean salivary free cortisol concentrations (nmol/l) across the day for control and SAD participants in summer

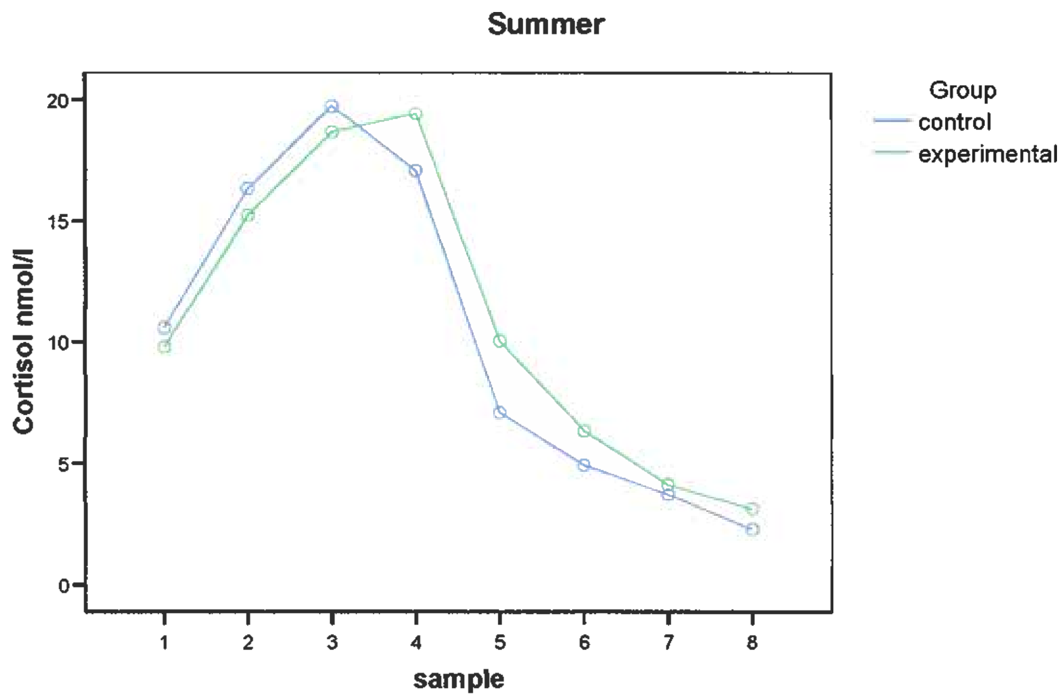


Figure 7 Mean salivary free cortisol concentrations (nmol/l) across the day for control and SAD participants in winter

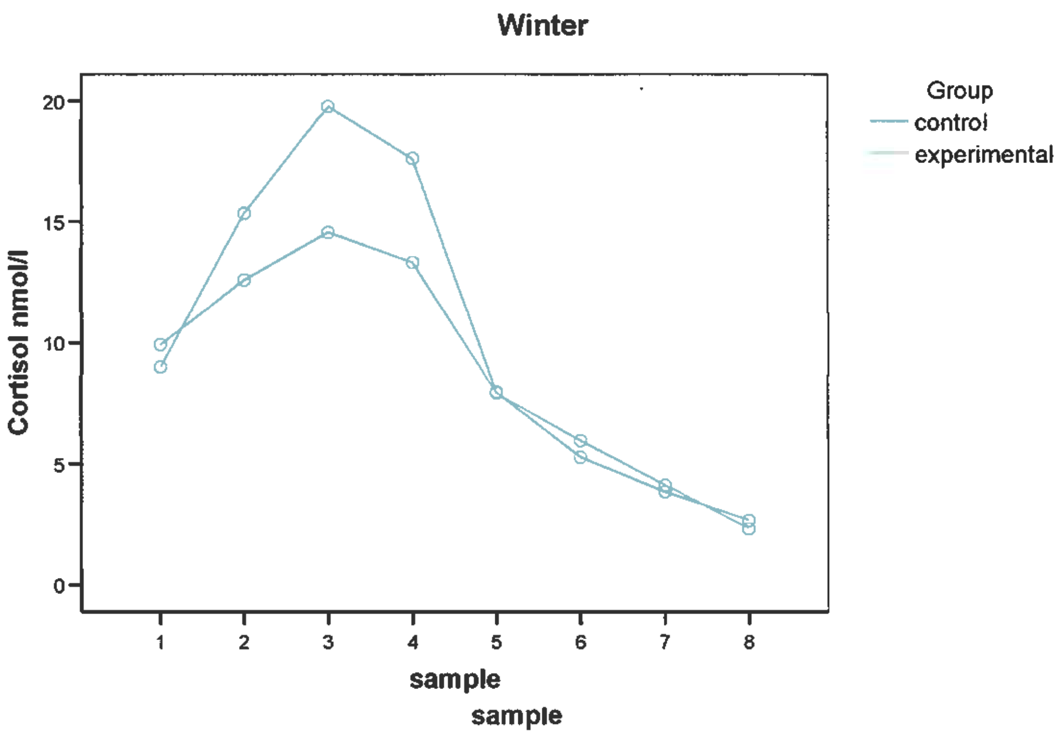


Figure 8 Mean salivary free cortisol concentrations (nmol/l) following awakening for control and SAD participants in summer

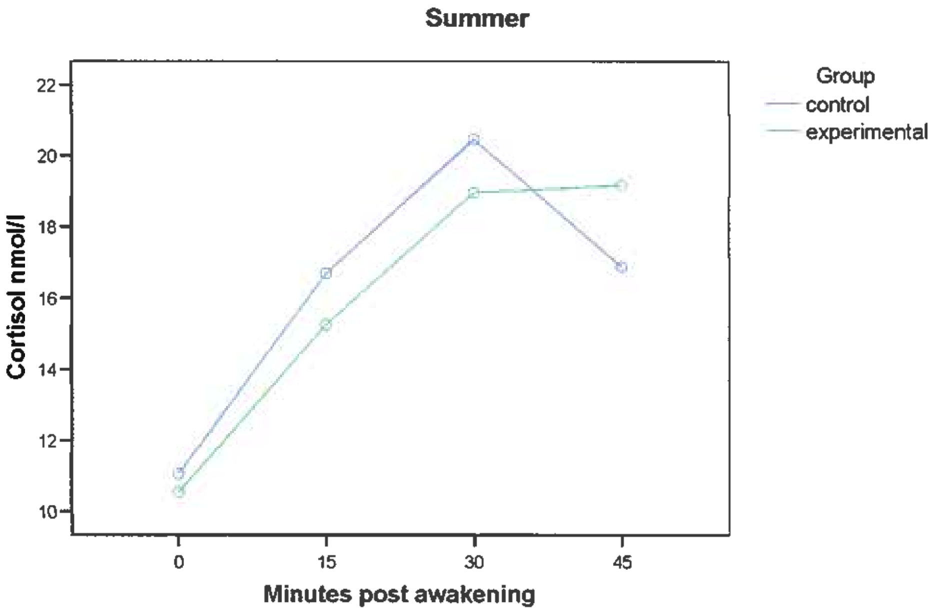
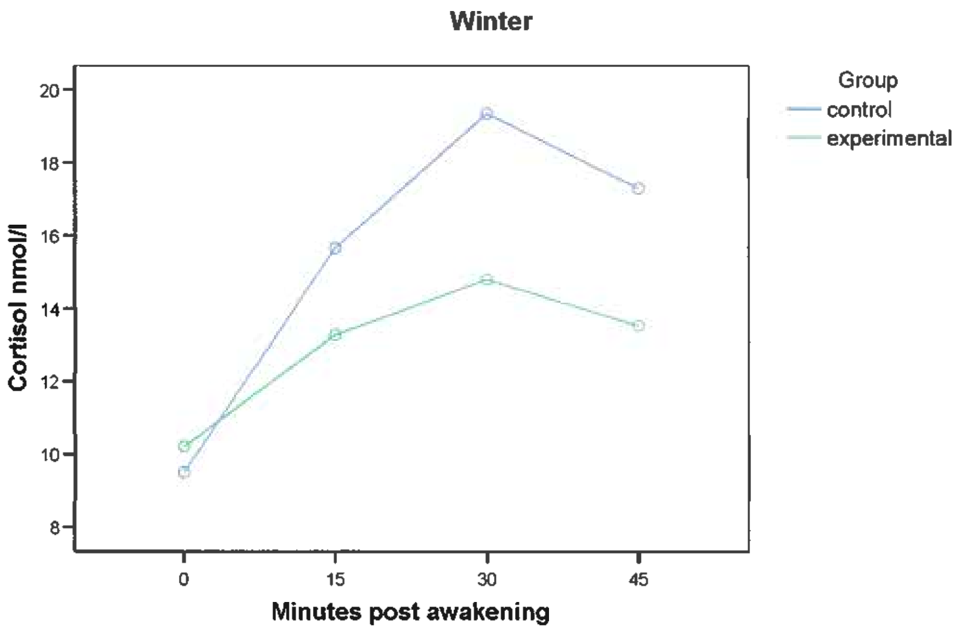


Figure 9 Mean salivary free cortisol concentrations (nmol/l) following awakening for control and SAD participants in winter



Results 2:

Characteristics of the SAD Participants

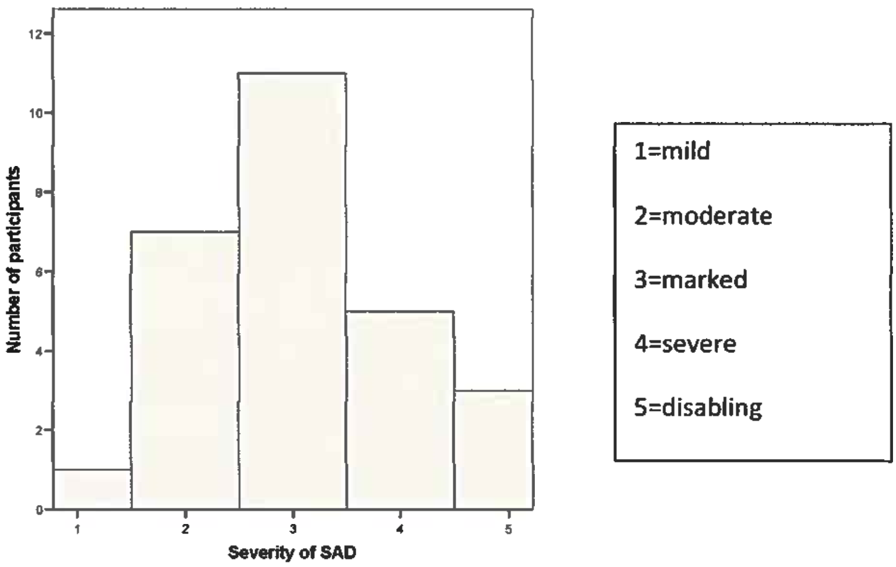
Thirty-one people with SAD participated in the interview part of the study, 8 male and 23 female. (Out of these, 26 completed all aspects of the study, 5 male and 21 female.) The average age of participants with SAD was 49, and participants ranged from 26 – 75 years old. Twenty-four participants were currently employed and 7 were retired. Other than their SAD, participants generally rated their health as being fair to excellent. No participant rated their health as poor or very poor. The majority of participants (90%) were non-smokers.

Seasonal Pattern Assessment Questionnaire

The Seasonal Pattern Assessment Questionnaire (SPAQ) was developed by Rosenthal, Genhart, Sack et al. (1987). All participants exhibited a winter seasonal pattern, indicating that they experience their symptoms during the winter months.

The central feature of the SPAQ is the six item Seasonality Scale Index (SSI) which has possible scores ranging from 0 to 24 with high scores indicating greater seasonality. A score from 8 to 11 is an indication of subsyndromal Seasonal Affective Disorder (SAD) and a score of 11 or more indicates that the individual may well suffer from SAD. Participants' scores ranged from 12 to 24, indicating that they were all suffering from SAD. All participants reported that their SAD interfered with their everyday life. When asked to rate the severity of their SAD the majority of participants reported that it was marked, with three participants reporting that their symptoms were disabling (see Figure 1 below).

Figure 10: Distribution of SPAQ scores amongst the SAD participants



The wide range of scores for both overall seasonality and severity of symptoms indicate that the participants' experience of SAD severity is variable. This probably reflects the differing ability of participants to be able to manage their symptoms (see section on management of SAD symptoms).

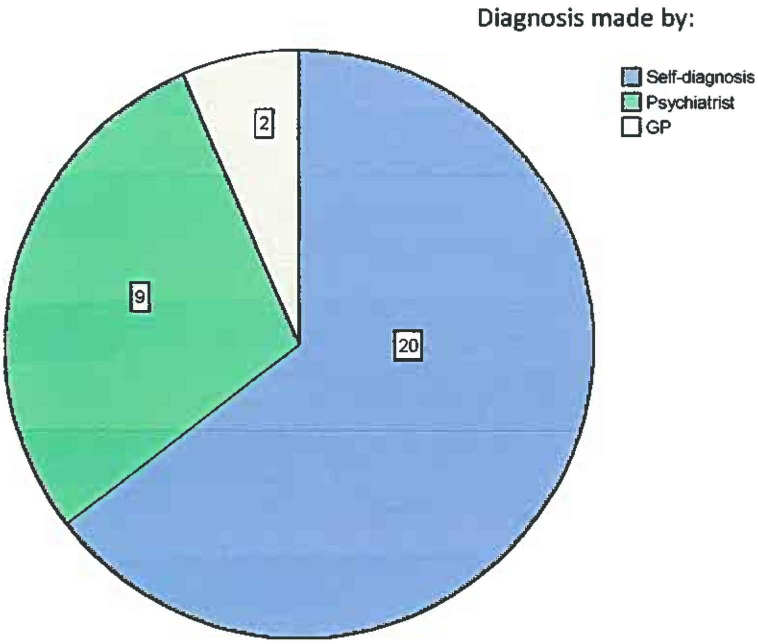
Age of onset of SAD

Five participants spoke of "always preferring the summertime, even since childhood", and so they believed the onset of their SAD was as a child. Three participants traced the onset of their SAD to teenage years. The most common time of onset reported for SAD was when participants were in their 20s, with nine participants initially noticing their symptoms during this age. The remaining 14 participants' onset of SAD was spread equally between 30s, 40s and 50s.

Family history and diagnosis of SAD

Half of participants stated they had no family history of SAD. Nine could identify at least one family member with SAD, and seven confirmed a family history of depression.

Figure 11: Source of diagnosis of SAD



As shown in Figure 2 above two thirds of participants diagnosed themselves with SAD. In contrast, nine participants had been diagnosed by a psychiatrist and the least common source of diagnosis was a GP, by whom only two participants had been diagnosed by. Some participants had had less success with their GP, commenting that they had been very dismissive of their SAD symptoms.

Figure 12: Typical month of onset of annual SAD symptoms

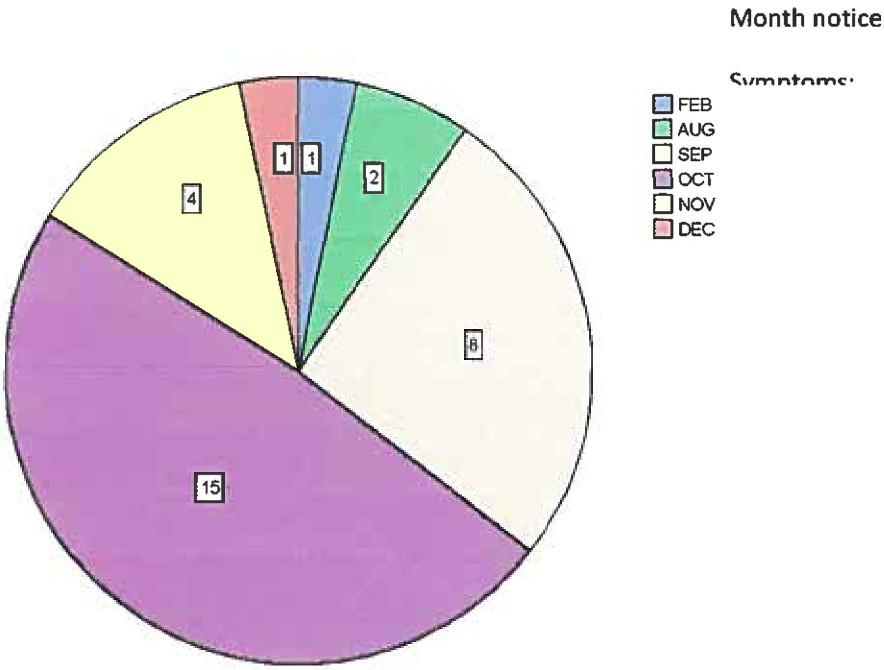


Figure 3 above illustrates the month when participants typically noticed their symptoms each year. The majority of participants spoke of noticing their SAD symptoms initiate or worsen when the clocks change. Some participants associated the onset of their SAD symptoms with certain events, such as Halloween and some spoke of anticipating SAD problems at the end of the summer, as signalled by events such as the Notting Hill carnival. Three quarters of participants described January as their worst month; others named November and December. Often participants reported that their partners noticed the onset of their symptoms before they themselves did.

There was more variation in the month participants described as their best, as roughly equal numbers chose March, April, May, June, July and August. The majority of participants felt that their symptoms abated in March. Again, the clocks going forward in March, and the subsequent decrease in daylight deprivation was a factor here.

Symptoms of SAD

Participants often described their SAD as a feeling of wanting to hibernate and needing to comfort oneself more than usual. Other participants described it as a feeling of being imprisoned and separate from other people. Participants said:

> *'Feel as though I'm looking through a glass and can't get out and can't communicate with anyone.'*
>
> *'You feel separate from other people. On your own. Like people won't understand.'*
>
> *'It's like going through fog.'*

Another experience frequently mentioned by participants was feeling unlike themselves:

> *'In winter I get fed up, absolutely depressed. I'm not myself in all ways.'*
>
> *'It's like being a different person.'*

Another experience expressed by the participants was of the cessation of symptoms in the summer months and the accompanying feelings of being at ease and feeling like their health is more robust. For example:

> *'When summer arrives it's like 'Hurrah! It's a new day.'*
>
> *'At the end of March I feel refreshed, I feel like I can breathe again.'*

A number of participants mentioned that during the summer months when they are feeling good they forget how bad it is in the winter.

Other than these general descriptions participants reported a whole range of symptoms of SAD. All participants reported a markedly depressed mood and 16 (52%) participants felt that this was the main symptom of their SAD that they had to contend with. Participants reported feelings of "flatness", "deadness", "lack of interest", "decreased motivation" and "no joy".

Twelve participants (39%) reported that they experienced lethargy as the worst aspect of SAD, with some describing the exhaustion they experience as being comparable to chronic fatigue syndrome. They reported waking up feeling tired in winter, having difficulty waking up and getting up, for example:

> *'Waking up in the dark doesn't feel natural…. I'm weighed down by the darkness.'*

> *'I struggle to get out of bed even though I'm awake and it can take up to 2 hours.'*

The extreme lethargy and depression experienced by some participants was often accompanied by anxiety about being unable to cope. In general participants said they found life events more difficult to deal with in winter. In addition to the above symptoms, participants experienced other commonly reported symptoms of SAD - hypersomnia, carbohydrate craving and overeating, decreased alertness, concentration and memory, and decreased sociability.

Management of SAD symptoms

> *'Just knowing about what it is has helped.'*

A key theme arising from the interviews was how participants felt empowered when they found out about SAD. This in turn inspired them to explore techniques to manage their symptoms. One of the most popular treatments reported by participants was use of a lightbox. Twenty-two participants were currently using light boxes during the winter months to control their SAD symptoms. Seven of these participants were also using (or had used) a dawn simulator. Generally participants reported light box use of between 30min – 1hr immediately upon awakening, and some participants also reported using a lightbox in the evening as a means of lengthening the day. For the majority of participants light therapy seemed to control the severity of their symptoms rather than eliminate them altogether. Some participants felt that using the light box was an arduous task and were fed up with having to use it every winter. Although some people just use light therapy, the majority use a combination of management strategies.

Nine participants were currently being prescribed antidepressants for their SAD, most commonly Fluoxetine. Six participants had used antidepressants during particularly bad episodes. Antidepressants failed to work for six participants. In terms of non-prescriptive, alternative treatments five participants said that they were using St. John's Wort and eight participants said they found Omega-3 capsules helpful.

Ten participants had experience of cognitive behavioural therapy (CBT) as a SAD management technique. Several participants said that such therapeutic interventions focused primarily on building up self-esteem, motivation and confidence, so as to combat depressed mood and lethargy. Six participants in the study had engaged in more talking types of therapy, such as counselling or psychotherapy. However, availability of counselling services on the NHS was sometimes limited.

Other management strategies included:

Regular outdoor exercise (walking, running cycling)

Other outdoor activities such as gardening

Ensuring that they get as much natural daylight as possible in winter

Modify home environment: use of daylight bulbs, decorate rooms using light colours, incorporate French windows and conservatory

Modify work environment: desk changes at work so next to window, lightbox on desk, getting outside at lunchtime

Holidaying during winter period

Singing activities (e.g. choir)

Writing journal

Several participants commented that "*doing things*" and "*just getting out*" made them feel better. Ultimately from these interviews, it seems that key to managing SAD is the acceptance of one's abilities and limits, as put by one participant:

I am now able not to push myself; if I have a winter day where I am too tired to function, I have an afternoon sleep (something my mother would be shocked at)