

Seasonal affective disorder and engagement in physical activities among adults in Alaska

Elaine M. Drew ^a, Bridget L. Hanson^b and Kevin Huo^a

^aDepartment of Anthropology, University of Alaska Fairbanks, Fairbanks, AK, USA; ^bInstitute of Social and Economic Research, University of Alaska Anchorage, Anchorage, AK, USA

ABSTRACT

Seasonal affective disorder (SAD) is a type of depression in which symptoms occur during a particular season. While physical activity has been shown to improve symptoms for depression in general populations, the relationships between physical activity and experiences of seasonality and SAD remain underexplored. We conducted a survey with adult members of a recreational gym in Fairbanks, Alaska. The survey collected self-report data on sociodemographics, health behaviours, and elements of the Seasonal Pattern Assessment Questionnaire (SPAQ). Results indicate that 18.68% of our study participants meet the criteria for winter-pattern SAD and 43.96% meet the criteria for subsyndromal SAD (“winter blues”). We conducted two regressions to understand experiences of SAD and predictors of seasonality more generally. Gender was a significant predictor of SAD, with women more likely than men to experience SAD ($p = .04$). Being social at the gym, whether going to the gym with others or participating in activities with others, was associated with higher seasonality than being independent at the gym ($p = .03$). Younger age was also associated with higher seasonality ($p < .001$). This study contributes new insights about the relationship between engagement in physical activities and experiences of seasonality among adults in a northern latitude.

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Introduction

Seasonal affective disorder or SAD is defined in the *Diagnostic and Statistical Manual of Mental Disorders*, Fifth Edition (DSM-5) as a type of recurrent major depressive disorder with a seasonal pattern [1]. This type of depression occurs during a specific time of year, with the onset of symptoms for winter-pattern SAD, the predominant subtype and focus of this study, occurring in the fall or winter months with remission or relief from symptoms occurring in the spring or summer months. An estimated 10% to 20% of recurrent depression cases follow a seasonal pattern [2]. Severity ranges from a mild form of cyclical “winter blues” known as subsyndromal-SAD or S-SAD [3] to serious depression that is moderate to disabling, with some individuals requiring significant medical intervention [4,5]. Gender and age are leading sociodemographic correlates, with a higher incidence reported for women than men and among adults under 40 years of age [6,7].

Leading aetiological explanations for SAD have focused on the regulation of neurotransmitters and hormones in response to changes in circadian rhythms related to the loss of daylight during winter [8–12]. In addition, epidemiological studies have demonstrated

a significant correlation between latitude and the prevalence of SAD in North America, with the prevalence increasing with distance from the equator [3,13,14]. However, these correlations do not hold across studies globally [3,13], suggesting that biological, environmental, and sociocultural factors may play important but varying roles in shaping prevalence [14].

Individuals diagnosed with SAD report a range of symptoms including depressed mood and sadness, irritability, abnormal lack of energy, excessive sleepiness during the day, difficulty concentrating, withdrawal from social situations, and increased appetite typically described as an increased craving for carbohydrates and sugars [15]. Treatments for SAD include antidepressant medications, bright light therapy, vitamin D therapy, and psychological or psychiatric counselling [16,17].

Physical activity is often recommended as a form of treatment for depressive disorders in general populations [18–21]. Multiple studies have demonstrated that engagement in physical activities can help alleviate SAD symptoms and improve mood and energy, especially when an exercise intervention is paired with bright light therapy [18,22]. In a review of intervention studies examining the effects of exercise on SAD, Peiser

[23] found that the studies consistently reported improvements of mood following trials lasting one week to eight weeks, with most trials involving forms of aerobic exercise. However, physiological explanations for such improvements, such as exercise effects on melatonin secretion and circadian adaptation in mammals [24], do not hold consistently across human studies and therefore remain inconclusive [23].

Given that SAD is associated with social withdrawal and isolation, it is surprising that the social dimensions of exercise interventions for SAD remain underexplored. Many types of physical activity, such as those undertaken in a community recreational centre, increase opportunities to interact and socialise with others. In addition, various forms of social support for physical activity, such as encouragement from others in one's social network or exercise norms in one's family, are positively correlated with exercise satisfaction and regimen adherence [25]. Such findings have important implications for the development of sustainable physical activity treatments for those suffering from SAD.

Thus, while the precise mechanisms explaining how physical exercise confers mental health benefits in humans are most likely complex and multifactorial, there remains widespread agreement across scientific and clinical communities that exercise can be an effective treatment for symptoms of depression, including SAD [23]. Yet, little is known about the relationship between seasonality, SAD, and engagement in physical activities, especially among those residing in northern latitudes who may be at greatest risk for developing SAD. Therefore, the current study examined these relationships in a northern Alaskan context.

Methods

The Institutional Review Board at the University of Alaska Fairbanks approved the study protocol (#1379797-1). Informed consent was obtained by providing participants with written information about the study purpose, risks, benefits, the voluntary nature of their participation, and data management, storage, and use for research.

We conducted a survey with a group of adult members of a recreational gym located in Fairbanks, Alaska. Fairbanks has a population of about 31,000 [26] and is located at 64.8° N latitude (about 140 air miles south of the Arctic Circle), which means that residents experience dramatic summer/winter shifts in environmental conditions such as daylight length, temperature, and precipitation. By winter solstice, Fairbanks residents experience approximately 3.5 hours of daylight as compared to nearly 22 hours of daylight on summer solstice. Temperatures also fluctuate dramatically between short warm summer months averaging around

73°F to very low winter temperatures typically below 0°F and often dropping to -20°F or colder. Members of the gym have access to a year-round facility comprising multi-purpose courts (available for playing basketball, tennis, badminton, and other group activities), weight lifting room, open studio (for classes or individual use), indoor climbing wall, indoor track, areas for stretching, and areas for cardiovascular exercise using equipment (treadmills, elliptical machines, stair climbers, and stationary bikes).

The study sample was generated through convenience sampling and included 98 adults (age \geq 18). We recruited participants during the months of February and March through publicly displayed fliers posted at the gym with a link to an online version of the survey. We also recruited participants to complete a paper version through direct, in-person recruitment within the gym lobby. Survey questions were developed through an iterative process involving direct consultation with gym staff in order to revise the survey for clarity and completeness. At the conclusion of the survey, we invited all participants to complete a separate entry form (either online or paper) for a chance to win one of three Fitbit Charge 3 Smartwatches based on a random drawing of all eligible entries. The prize entry forms with identifying information were stored separately from the anonymous survey data. When data collection concluded, we transferred all online prize entry forms to the paper forms and randomly drew three names from a bowl containing all entries. We next contacted the winners by email to arrange delivery of the smartwatches.

The survey included items querying: 1) general respondent social demographics (age, ethnicity, gender, marital status, education, years in residence in Fairbanks/northern latitude); 2) health behaviours involving physical activity; and 3) elements of the Seasonal Pattern Assessment Questionnaire (SPAQ), a self-administered screening questionnaire used to identify those most likely to have a diagnosis of SAD [27]. The SPAQ elements included the six-item Global Seasonality Scale or GSS widely used in epidemiological studies of SAD due to acceptable reliability and validity in estimating seasonal mood and behavioural fluctuations [28–34]. The fact that the surveys were conducted in February and March was not considered a serious methodological concern, since evidence has shown that the month in which participants complete the SPAQ does not influence how they match SAD criteria [13].

Measures

Physical activity

Survey questions focused on participants' experiences at the gym where recruitment occurred. We also

asked participants to rate their physical activity level in a “typical week” (work and leisure) on a scale from 1 (not active) to 4 (very active). Participants indicated how frequently they visit the facility with the following response options, coded from 1 to 4: less than 1 time per week; 1–2 times per week; 3–4 times per week; 5+ times per week. To assess how social participants are at the gym, a measure we call “gym sociality”, the survey asked participants to indicate whether they come to the gym alone or with others and whether they do activities at the gym alone or with others. Responses were coded as independent (0) for participants who come alone and do activities alone and social (1) for participants who come and/or do activities with others. Participants also indicated to what extent they perceived physical activity at the gym as helpful “to minimise the effects of extreme daylight fluctuations” on a scale from 0 (not helpful) to 3 (extremely helpful).

Global Seasonality Scale

The GSS measures seasonal variations for six different domains: sleep length, engagement in social activities, mood (overall feeling of well-being), weight, appetite, and energy level. Each of the six items are rated on a scale from 0 to 4, with 0 for no change (no seasonality), 1 for mild, 2 for moderate, 3 for marked, and 4 for extremely marked change, yielding a total score ranging between 0 and 24. Higher scores indicate a higher degree of seasonal fluctuation in mood and behaviour. In the current sample, the GSS had acceptably high reliability (Cronbach’s alpha = .85 for the six items). We defined the participants in the current study as either having low (GSS ≤ 7), moderate (GSS = 8–10) or high (GSS ≥ 11) seasonality, the typical cut-offs used to differentiate those in the low group most likely to have subsyndromal-SAD (mild “winter blues”) from those in the moderate and high groups most likely to have SAD [35,36].

Other elements of the SPAQ included the months of the year when participants feel worst and a Problem Rating Score (PRS) in which participants rate whether or not they experience seasonal changes in mood and behaviour as a problem on a scale from 0 to 5, with 0 for no problem, 1 for mild problem, 2 for moderate problem, 3 for marked problem, 4 for severe problem, and 5 for disabling problem.

It is important to note that our survey included the GSS and other elements of the SPAQ to facilitate the categorisation and comparison of participant subgroups for research, not patient subgroups based on clinical diagnosis. We do not know if participants meeting our measurement criteria would be diagnosed with SAD by a health professional using clinical assessments, such as the Structured Clinical Interview for DSM Disorders (SCID) [37] and the Structured

Interview Guide for the Hamilton Depression Rating Scale, Seasonal Affective Disorder version (SIGH-SAD) [38].

Seasonal Affective Disorder – winter pattern

Measurement criteria for the winter-pattern SAD subgroup (hereafter SAD) included GSS score, PRS score, and which month(s) participants identified they “feel worst.” If a participant had a high GSS score (≥11), indicated that seasonal changes are a problem at least to a moderate degree (PRS score ≥2), and indicated that they “feel worst” in any of the winter months but not in any of the summer months, then they were assigned to the winter-pattern SAD subgroup. While some research studies in the continental U.S. include only January and February in their definition of winter months, it was appropriate given our research site in Alaska to use the “arctic” criteria [39] in which winter months include November and December in addition to January and February, and summer months include May and June in addition to July and August. Therefore, participants were assigned to the SAD subgroup if they indicated feeling worst in any of the winter months (November through February) but not in any summer months (May through August).

Subsyndromal Seasonal Affective Disorder

Measurement criteria for the subsyndromal-SAD subgroup (S-SAD) included a GSS score of 11 or higher and PRS score < 2 (participants who reported that seasonal change was perceived as mild or no problem). We also included participants with moderate GSS scores (between 8 and 10) who reported that seasonal change was a problem at least to a mild degree (PRS score ≥ 1).

Data analysis

Data collected through the online and paper versions of the survey were collated into one spreadsheet and verified by a second member of the research team independently prior to analysis. We performed all statistical analysis using SPSS for Windows, version 25. A p-value < .05 was chosen to indicate statistical significance. Missing data were excluded from the analyses, and partially complete responses were discarded. Imputation was not used. To understand the relationships between participant characteristics and behaviours related to experiences of seasonality, we calculated descriptive statistics for the study variables and conducted two regressions. The first, a binary logistic regression, tested demographic predictors of SAD experiences. The second, a linear regression model, assessed predictors of SAD experiences more

broadly by testing demographic characteristics as well as gym experiences as predictors of GSS.

Results

We received 42 completed paper surveys and 56 completed online surveys. Of those 98, seven participants did not complete the survey questions related to the key variables for this study (i.e. GSS questions), leaving 91 completed surveys. Two participants did not respond to the “feel worse” question but answered all remaining study questions. Those participants were included with no months considered “feel worst”. Table 1 highlights key sociodemographic characteristics of our study sample. All demographic information was self-report. Gender was collected via an open-ended question; the female group includes one response of “female/prefer non-binary”.

Seasonality descriptives

Of the 91 participants, 17 (18.68%) met the criteria for the winter-pattern SAD subgroup and 40 (43.96%) met the criteria for the S-SAD subgroup. More women than men reported seasonal effects in all categories. Average

Table 1. Sociodemographic characteristics of survey participants (n = 91).

	n	%
Gender		
Male	48	52.75
Female	43	47.25
Age		
18–20	32	35.16
21–29	24	26.37
30–44	15	16.48
45–59	11	12.09
60+	9	9.89
Ethnicity		
White	65	71.43
Multi-Ethnic (includes Hispanic in combination)	13	14.29
Asian	6	6.59
Native American/Alaska Native	3	3.30
Black/African American	2	2.20
Native Hawaiian/Pacific Islander	1	1.10
Hispanic (alone)	1	1.10
Education		
High school diploma	20	21.98
1–3 years post-secondary	31	34.07
Bachelor’s degree	17	18.68
Master’s degree	14	15.38
Doctoral degree	9	9.89
Marital Status		
Single	57	62.64
Married	30	32.97
Divorced/Separated	4	4.40
Years Living in Northern Latitude		
Less than 2	11	12.09
2–4	18	19.78
5–10	17	18.68
11–20	16	17.58
More than 20	29	31.87

GSS scores decreased with age and more younger people than older people met criteria for winter-pattern SAD and S-SAD. However, generally feeling worse in winter and having some problems with seasonal change were more evenly experienced among those under 60 years old. See Table 2 for descriptives of seasonality experiences by gender and age.

Physical activity descriptives

In terms of their physical activity level in a typical week (work and leisure), 24.2% of participants reported being very active, 59.3% moderately active, 15.4% somewhat active, and only one person (1.1%) reported being not active. Most participants (69.23%) reported exercising at the gym 2–4 times per week and most (52.75%) were independent at the gym versus social. On average, participants regarded their activities at the gym to be moderately helpful in combating the effects of daylight fluctuations ($M = 1.51$; $SD = .97$).

Predictors of seasonality

We conducted two regressions to test the relationships between participant characteristics and behaviours and outcomes related to experiences of seasonality. First, we used a binary logistic regression to test whether demographic characteristics predicted SAD experiences. For this regression, we combined the two classifications of SAD and sub-SAD to capture any SAD experience, which resulted in 62.64% of the sample classified as having a SAD experience. Based on previous research regarding age, gender, and length of residency in a northern latitude as main demographics associated with SAD [3,6,7], we used a two-block design with these three demographics in the first block. To test whether additional demographics provided increased value in predicting SAD, we added ethnicity, education, and marital status [2,40,41] in the second block. The first block was statistically significant, $\chi^2(3) = 8.97$, $p < .05$, $R^2 = .09$. The second block was not significant overall and was therefore not presented. Table 3 below presents the predictors in the first block. Gender was a significant predictor, with women more likely than men to experience SAD. Age approached significance, reflecting that younger individuals were more likely than older individuals to experience SAD. Years spent at northern latitudes were not a significant predictor.

While it is important to understand SAD and sub-SAD and much of the literature focuses on these categories, individuals’ experiences of seasonality can have profound impacts on their lives in general, even without considering the additional criteria required for SAD or sub-SAD (i.e. severity of the problem and in which

Table 2. Seasonality and SAD by gender and age.

	n	GSS Score <i>M (SD)</i>	% Feeling Worst in Winter	% Seasonal Change Problems	% Meet SAD Criteria	% Meet S-SAD Criteria
Overall	91	10.87 (5.29)	74.73	48.35	18.68	43.96
Men	48	9.88 (5.39)	68.75	45.83	14.58	37.50
Women	43	11.98 (5.01)	81.40	51.16	23.26	51.16
18–20	32	12.16 (4.81)	75.00	59.38	21.88	46.87
21–29	24	11.83 (5.04)	70.83	45.83	20.83	50.00
30–44	15	10.73 (5.55)	93.33	53.33	20.00	40.00
45–59	11	8.45 (5.32)	81.82	36.36	18.18	36.36
60+	9	6.89 (5.25)	44.44	22.22	0.00	33.33

Table 3. Logistic regression predicting SAD or sub-SAD experience.

Predictor	Odds Ratio	95% Confidence Interval	<i>p</i>
Gender	2.65	1.07–6.59	.04
Age	.67	.45–1.01	.06
Northern years	1.15	.78–1.69	.49

months it occurs). Therefore, in this study, we sought to understand the associations between seasonality more broadly and participants' gym experiences. Thus, the second regression model explored predictors of GSS, adding physical activity variables to the model. Using a multiple linear regression, we again included demographics of age, gender, and years at northern latitude in the first step. In the second step, we added three physical activity variables: frequency of gym use, perceived effectiveness of gym activities in minimising negative seasonal effects, and whether gym activities were independent or social. The overall model was significant at the first step, $F(3, 87) = 5.24, p < .01, R^2 = .15, \hat{r}^2 = .18$, as well as the second step, $F(6, 84) = 3.91, p < .01, R^2 = .22, \hat{r}^2 = .28$. Applying standard interpretations of Cohen's \hat{r}^2 for effect sizes, we conclude a medium effect size at each step [42]. Table 4 presents the predictors at each step. In this regression, age was significant in both steps and, in addition, one of the three gym-related variables (i.e. gym sociality) was a significant predictor of GSS in the second step. As expected, age was negatively correlated with GSS, with increasing age associated with lower GSS scores. Being social at the gym, whether it was going to the gym with others or participating in activities with others while there, was associated with higher GSS scores than being independent at the gym.

Table 4. Linear regression predicting GSS.

Predictor	Step 1			Step 2		
	β	95% Confidence Interval	<i>p</i>	β	95% Confidence Interval	<i>p</i>
Gender	.18	–.16 – 3.98	.07	.16	–.39 – 3.71	.11
Age	–.40	–2.52 – –.64	.00	–.40	–2.52 – –.62	.00
Northern years	.16	–.29 – 1.47	.19	.19	–.18 – 1.58	.12
Frequency of gym use				–.07	–1.61 – .74	.47
Effectiveness of gym				.14	–.35 – 1.83	.18
Gym sociality				.21	.19 – 4.32	.03

Discussion

SAD prevalence and sociodemographics

While the prevalence of symptoms meeting the winter-pattern SAD criteria in our study sample was nearly twice the rate reported in an earlier study conducted in Fairbanks, Alaska [7], 18.68% compared with 9.2%, respectively, a high prevalence overall is consistent with research showing a higher prevalence in northernmost latitudes [7,14,43,44]. However, years of residency in Alaska or another northern latitude was not a significant predictor of SAD experiences. Given that 68% of our participants reported living in a high latitude for five or more years (and many for their entire lives), we expected to see a negative correlation between SAD experiences and length of stay, as has been shown in prior studies [7,45–47], as well as studies showing a higher prevalence of SAD among people who migrated from lower to higher latitudes [48–50]. Because our sample skewed younger, we may have lacked the necessary variability and power to assess the influence of this time-sensitive variable. Prospective, longitudinal studies tracking length of stay and following individuals over time (especially people who develop SAD as well as those who shift from having SAD to having non-seasonal depression) are needed to help clarify SAD aetiology and risk [51].

Our findings are consistent with prior studies reporting gender and age as primary sociodemographic correlates of SAD experiences. Gender was significantly associated with SAD criteria such that symptoms were reported more often by women than men. Age was also associated with SAD experiences, reflecting that younger individuals were more likely than older

individuals to experience SAD. These findings are consistent with numerous studies showing that women have a higher incidence of SAD than men and that SAD is more prevalent in adults under 40 years of age [3,6,7]. Epidemiological studies have reported SAD sex ratios (women: men) ranging from 2.7:1 to as high as 9:1 [52]. A prior study in Fairbanks, Alaska reported a sex ratio of 3:2 [7], which is consistent with our ratio of 2.9:2. Given that our overall prevalence of SAD experiences was high (about 19%), the ratio between men and women is smaller than in other geographic areas, likely because SAD experiences are more common overall. More research is needed to clarify the complex gender factors that may be impacting sex ratios across studies, such as gender differences in reporting depressive symptoms, help-seeking behaviours, and weather attitudes [52], as well as the possibility that increases of SAD in the overall population in more northern communities dampens the gender difference. At present, the specific mechanisms underlying differences in SAD prevalence by gender and age remain unclear [53].

Seasonality, physical activity and gym sociality

Our findings show that being social at the gym (i.e. gym sociality) was a significant predictor of higher GSS. In other words, participants who typically go to the gym with others and/or do activities with others (as compared to those who typically go to the gym alone and do activities alone) are more likely to report a higher degree of seasonal fluctuations in mood and behaviour. Yet, this finding is unexpected and seems counterintuitively related to GSS. One interpretation is that independent exercisers may be highly motivated by individual goals, such as endurance athletes – runners, swimmers, cyclists, and serious weight lifters. Individuals who engage in physical activity for training are likely to be focused on the physical activity itself, compared to social exercisers who might engage in activities at the gym for general fitness as well as social reasons. If the independent exercisers are more serious, such as following a more regular schedule or rigorous exercise regimen throughout the seasons, they might also experience greater benefits in terms of mood and behaviour stability.

Another possible explanation for this finding is an error in our measurement of gym sociality. In the survey, we asked participants to select one of four options to describe their “typical visit to the gym.” Participants who selected “I come alone and do activities alone” were coded as independent. However, the three remaining choices (I come alone but do activities with others; I come with others but do activities alone; and I come with others and do activities with others) were coded as being “social” at the gym.

However, what constitutes gym sociality is likely a complex phenomenon that may be better captured with a more nuanced measure.

Study participants likely have varying perceptions about whether “going to the gym with others but doing activities alone” is the same type or degree of sociality as “going to the gym with others and doing activities with others”. For example, in a study of the sociality of individuals managing depression, Burgess et al. found that individuals managing depression sometimes choose to be around other people in a busy social setting without direct social interaction, a phenomenon they call “diffuse sociality” [54]. Thus, our study participants who go to the gym with others but do activities alone may be engaging in a form of diffuse sociality rather than direct social interaction during physical activities. Additional work is needed to develop a more precise measure of gym sociality to explain this finding definitively.

Concluding remarks and new research opportunities

The development of culturally appropriate and viable health promotion programmes and services hinges on a thorough understanding of local knowledge, behaviours, and perceptions of risk [55–58]. Currently, most assessments of SAD rely exclusively on a Western clinical paradigm and measurement scales. However, qualitative research examining culture, language, and lived experiences of seasonality can reveal important divergences between local and clinical conceptualisations of seasonality. For example, in an ethnographic study of SAD in Northern Norway, Stuhlmiller [59] found that Northern Norwegians conceptualise seasonality as a normal, nature-driven phenomenon that signifies humans are part of nature and its seasonal rhythms, not separate from them. Thus, symptoms of SAD are regarded as relatively non-problematic shifts in mood and behaviour that represent “a wonder of nature rather than a cause of distress” [59:155]. The study serves as an important reminder that human perceptions and reactions to climate and weather are shaped by culture [60] and result in what Margaret Lock calls “local biologies” [61], a concept that emphasises human illness experience as resulting from physiological, cultural, and environmental interactions.

While some studies have examined cognitive vulnerabilities (such as rumination, maladaptive stress and coping strategies, and negative weather attitudes) contributing to the onset and recurrence of SAD [53,62,63], there is a need for more contextualised, ethnographic research elucidating the relationships of culture,

geography, migration, and experiences of seasonality. Future studies should also consider immigrant paradoxes [64,65] in which recently arrived immigrants tend to have better overall health status than either their peers who have lived in a place longer or native-born residents. These efforts should also include measures of wealth, which are known to have a significant impact on health outcomes over time, especially among migrants [66–68].

In addition, our study reveals that more research is needed to elucidate relationships between sociality, seasonal symptoms, and physical activities at recreational gyms as well as other spaces, such as outdoor recreation, sport activities, or physical activities at home. Research has shown that there is a strong cultural influence on how one perceives exercise in the first place, and this is sorely missing from studies on individual preferences for individualist or collectivistic forms of exercise, as well as how exercise is conceptualised cross-culturally. For example, in research among the Pima Indians, Carolyn Smith-Morris found significantly less cultural value attached to “exercise for exercise’s sake” in contrast to dominant Western perspectives [69], which underscores the importance of including various cultural activities, such as dancing and subsistence activities, as forms of physical activity. In addition, Harada et al. found that in the Japanese context, engaging in exercise with others positively influenced mental well-being while exercising alone did not significantly influence mental health [70]. Thus, we recommend that future studies consider the role of culture in shaping participants’ understanding and practices of exercise and physical activity.

In summary, a more comprehensive understanding of experiences of seasonality and SAD will help clarify human resilience and adaptive capacities to harsh environmental changes among those residing in or migrating to northern latitudes and may assist health providers and communities in developing culturally responsive health and wellness services.

Study limitations

This study is based on a convenience sample recruited through fliers and word of mouth at a community gym. Our sample is younger than the overall population of most Northern communities and may also differ in other demographic characteristics. Given the limitations of convenience sampling, these findings cannot necessarily be considered representative nor used to generalise to the larger population. External validity is limited to study participants and no causal inferences can be drawn. In addition, our findings are limited since we do not know if participants meeting

our measurement criteria for SAD would be diagnosed with SAD by a health professional, in part because we did not administer a clinical diagnostic exam (SCID) and SIGH-SAD depression scale. Nonetheless, our findings increase understanding of the experience of seasonality and SAD among adult recreational gym users in a Northern community.

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ORCID

Elaine M. Drew  <http://orcid.org/0000-0002-6067-3050>

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