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Seasonal sensitivity in a high-latitude population and its relationship to adaptation variables and style of seasonal work organization

Sensibilidad estacional en población de altas latitudes y su relación con variables de adaptación y estilo de organización temporal del trabajo

Sensibilidade estacional em população de altas latitudes e sua relação com variáveis de adaptação e estilo de organização temporal de trabalho

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***Abstract*:** This study is intended to determine the frequency of seasonal sensitivity in a sample of a Chilean high latitude (extreme southerly) population, and its correlation with labor activities involved in several types of shift work, with variables of general adaptation. A total of 465 participants took part in answering questionnaires to measure seasonality impacts through SPAQ (Seasonal Pattern Assessment Questionnaire), subjective happiness (Oxford scale), social adaptation (Bell), and anxiety and depression (MASQE30). The principal results indicate that the frequency of seasonal sensitivity in this sample was high, in a moderate level near the upper limit, and this is considered to have a significantly negative impact on daily life. Regarding seasonal patterns, the most common effect was in the summer profile, suggesting that people perceive benefits with the increase in sunlight, which correlates negatively with happiness. The analysis according to work-shift shows differential profiles for each one. These results are discussed relative to the importance for development of public policies to further the physical and mental health of extreme-southern populations.

***Keywords**:* seasonal sensitivity; pattern; social adaptation; work shift; happiness.

***Resumen*:** El trabajo estudió la frecuencia de sensibilidad estacional en una muestra de población austral chilena, alta latitud sur y su relación con actividades laborales desarrolladas en diferentes turnos de trabajo y con variables de adaptación general. Un total de 465 personas participaron respondiendo instrumentos midiendo estacionalidad (SPAQ), felicidad subjetiva (Escala de Oxford), adaptación social (Bell) y ansiedad y depresión (MASQE30). Los resultados principales indican que la frecuencia de sensibilidad estacional es alta, su nivel declarado en promedio es moderado, en su límite superior, y es evaluada como de impacto negativo significativo en la vida diaria. Respecto de los patrones estacionales, el más numeroso fue el de verano, que indica que las personas perciben beneficios con el aumento de luz, lo que correlaciona negativamente con la felicidad. Los análisis según turno de trabajo mostraron perfiles diferenciales para cada uno. Se discuten estos resultados en torno a su importancia para el desarrollo de políticas públicas asociadas a la salud física y mental de poblaciones australes.

Palabras clave: sensibilidad estacional; patrones; adaptación social; turno de trabajo; felicidad.

***Resumo*:** Este trabalho estudou a frequência de sensibilidade sazonal em uma amostra de população austral chilena, nas altas latitudes do sul, e sua relação com atividades laborais desenvolvidas em diferentes turnos de trabalho e com variáveis de adaptação geral. Um total de 465 pessoas participaram respondendo instrumentos que mediam a sazonalidade (SPAQ), a felicidade subjetiva (Escala de Oxford), a adaptação social (Bell) e a ansiedade e a depressão (MASQE30). Os principais resultados indicam que a frequência de sensibilidade estacional é alta, seu nível declarado em média é moderado em seu limite superior e é avaliado como de impacto negativo significativo na vida diária. Com respeito aos padrões estacionais, o mais numeroso foi o do verão, que indica que as pessoas percebem benefícios com o aumento da luz, o que se relaciona negativamente com a felicidade. As análises de acordo com o turno de trabalho mostraram perfis diferenciais para cada um deles. Discutem-se esses resultados em torno a sua importância para o desenvolvimento de políticas públicas associadas a saúde física e mental das populações austrais.

***Palavras-chave**:* sensibilidade estacional; padrões; adaptação social; turno de trabalho; felicidade.

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Human beings have shown considerable ability to adapt to many natural environments, though this process may have impacts on the well-being and health of people. There are numerous environmental variables that condition the psychological functioning of people and their social adaptation (Argyle, 1992; Barrientos, 2005; Diener, 1994; Diener, Suh, Lucas & Smith, 1999). Among the physical conditioning factors, exposure to changes in natural sunlight, varying due to the seasons of the year, occupies a conspicuous place (Wehr et al., 2001), particularly in areas where changes in luminosity are more extreme (e.g., in high latitudes).

Changes in the length of daylight hours have been shown to have an impact on some of the primary aspects of the social adaptation of human beings, affecting their habits, moods, and perception of well-being (Malbos, 2020; Rohan, Sigmon & Dorhofer, 2003). Changes in the degree of natural light have a biological impact on serotonin and cortisol levels, with the resulting behavioral changes that accompany them (Gatón, González & Gaviria, 2015; Labbé, Veliz, Saavedra, Arab & Martorell, 2011; Lambert, Reid, Kaye, Jennings & Esler, 2002; Lansdowne & Provost, 1998).

The principal effects observed due to these changes have been consolidated in the concepts of "seasonality" or "seasonal sensitivity." Both refer to seasonal variations in both mood and behavior, as well as in other aspects of life such as social activity, weight gain, sexual desire, and vitality (Rohan et al., 2003; Rosen et al. 1990; Rosenthal, 1993; Rumble et al. 2018; Stumpf & Privette, 1989; Wirz-Justice, Graw, Kraüchi & Wacker, 2003).

In winter, conditions are such that the reduction in sunlight may bring about symptoms of depression and anxiety, in what has been popularly called "winter blues," which can be defined as a feeling of sadness or unhappiness associated with a sensation of the cold and darkness of winter (Gatón et al., 2015).

A psychopathological derivative of this phenomenon is Seasonal Affective Disorder (SAD), first described by Rosenthal et al. (1984, 1986) who tried to explain the phenomenon of the depressive experience of winters and its spontaneous remission in spring/summer and postulated that the decrease in natural daylight was the cause of this malaise. Its main symptoms include sadness, anxiety, irritability, anhedonia, asthenia, and difficulty in mental concentration (Wirz-Justice et al., 2003).

Studies conducted in several countries indicate that the prevalence of malaise associated with seasonality is high, bordering on 85 % (Dam, Jakobsen & Mellerup, 1998; Kasper, Wehr, Bartko, Gaist & Rosenthal, 1989). Seasonal sensitivity has revealed connections with numerous biological diseases such as angina, diabetes, hypertension, and high cholesterol, among others, affecting the satisfactory conduct of adult life of those who suffer from it, as well as in interpersonal, family, and work dimensions. (Basnet, Rokaya, Bhattarai and Münzbergová, 2016; Garbazza and Benedetti, 2018; Gatón et al., 2015; Joiner, Catanzaro, Laurent, Sandin & Blalock, 1996; Kasper et al., 1989; Kawasaki et al., 2018; Oyane et al., 2010; Saarijärvi, Lauerma, Helenius, and Anglé, 1999).

Although there are descriptions of the phenomenon in nosological manuals such as the DSM-5 (American Psychiatric Association, 2013), the most commonly employed tool in the research into this phenomenon is the questionnaire for measuring seasonal patterns (SPAQ; Rosenthal, Bradt and Wehr, 1984). This tool makes it possible to calculate a general

seasonality index (GSI) and identify the seasons of the year in which people indicate the greatest changes in their general habits. Thus, the presence of a winter and/or summer pattern can be established. The general seasonal pattern is defined by the presence of daylight changes in both summer and winter for at least one month. The summer seasonal pattern implies the perception that changes in summer daylight provide positive effects (feeling better when there is more daylight). The winter seasonal pattern is related to being affected by changes in daylight in winter (decreased sense of well-being when there is less daylight) (Magnusson, 1996).

The relationship between seasonal sensitivity and socio-demographic variables such as age, educational level, sex, etc., has not revealed conclusive differences (Bjorvatn, Saxvig, Waage & Pallesen, 2020; Gatón et al., 2015; Magnusson, 2000; Rosen et al., 1990). Linkage between extreme (high) latitudes and individual chronotype has also been the subject of controversy, although there is evidence of the significance of these two variables.

Populations from high latitudes, particularly in the northern hemisphere, have shown a high incidence of seasonal sensitivity, particularly during winter (Kegel, Dam, Ali & Bjerregaard, 2009). However, there are individual differences in the way in which people adjust their biological clocks to the changes in darkness and daylight that occur in a day. The term for this is *chronotype* (Roenneberg, Pilz, Zerbino & Winnebeck, 2019). The determination of a chronotype comes from the individual circadian variation, in which people can be separated into three different types: Morning (early riser), Intermediate, and Evening (late night), according to the time of day when a person feels most alert (Adan et al., 2012; Kivelä, Papadopoulos and Antypa, 2018). Recent studies indicate the existence of a positive relationship between the Evening chronotype and the presence of seasonal sensitivity (Bjorvatn et al., 2020).

With respect to psychological variables, there are studies in the adult population of the relationship between seasonal sensitivity and general well-being (anxiety, negative feelings, perception of happiness, etc.) (Kasper et al., 1989). However, the effect of natural light deprivation in work environments and seasonal sensitivity has not been addressed. Workers who carry out activities either only during the day (diurnal), at night (nocturnal) or alternating (sometimes during the day and sometimes at night) can present differing seasonal sensitivity profiles.

Those workers not in the day-only class suffer from an unregulated or non-normative life from a social point of view, affecting their socio-family and psychological life factors. Some of these present symptoms of depression even without taking into account the seasonal factor (Goodrich & Weaver, 1998). Night work is associated with decreased productivity and increased risk of serious accidents when this lasts for long periods (Nielsen et al., 2018). Workers with alternating day-night shifts have shown increased stress and greater difficulties in adapting adequately to work, particularly in activities that involve caring for other people (Nabe-Nielsen, Tuchsen, Christensen, Garde & Diderichsen, 2009).

In broad terms, research carried out during more than 60 years in people who work non-day shifts (night or alternating) consistently show indications of impairment in their physical and psychological health, showing a higher prevalence of anxiety and dysthymic patterns, negative emotions, and a generally low sense of well-being and perceived happiness (Bohle, Willaby, Quinlan & McNamara, 2011; Fischer et al., 2019). Based on the convergence of the effects of seasonal sensitivity and shift work, it may be possible to

hypothesize that both interact in intensifying positive effects (activity and enthusiasm) as well as negative effects (such as nervousness, pessimism, and low self-esteem), subjective happiness perception, and, in global terms, social adaptation (Bharvad, 2015; Buckby, Cotton, Cosgrave, Killackey & Yung, 2008; Jiménez & López-Zafra, 2011; Rosenthal, 1993; Watson, Clark & Carey, 1988).

Finally, social adaptation can be understood as a process that attempts to maintain or reach a balance between the needs of the self as an organism and its relationship with the social or physical environment (Bell, 1934; Birchwood, Smith, Cochrane, Wetton & Copestake, 1990; Lyubomirsky, 2008; Vendrik, 2013). In the social environment it can be seen the demands of work during different times (shifts) and in the physical environment the varying daylight conditions of a living space. Social adaptation includes a subjective element that is manifested in the perception of achieving or not achieving a state of happiness (Lyubomirsky & Lepper, 1999; Lyubomirsky, Sheldon & Schkade, 2005).

In summary, seasonality can be considered an environmental or atmospheric factor influencing psychological balance (Goikolea, Miralles, Cabré, Vieta & Bulbena, 2003). Its effects are broad and may include psychological and psychopathological consequences that affect a perception of well-being. The effects of seasonality may be paradoxical, but they affect an individual's overall adaptation. Although some of the moderating factors of seasonality are known, there are evidently no studies that deal with its relationship with exposure to daylight that is limited by work activities. The present study thus intends to explore the frequency in which seasonal sensitivity occurs, its severity, preferential patterns, and its relationship to positive and negative emotions, perceived happiness, and social adaptation in a population sample from a high southern latitude location (53° 9′45.72 ″ S, 70° 54′29.16 ″ W), where day, night, and alternating work shifts are involved.

Method

Participants

A total of 465 volunteers participated, selected by non-random convenience sampling. The inclusion criterion included being of legal age, Chilean nationality, and being actively employed. 54.2 % of the sample indicated that they were day-shift workers (with work activities between 08:00 AM and 7:30 PM), 31.3 % indicated an alternating work shift (some days of the week working a day shift and other times in a night shift) and the remaining 4.53 % worked a night shift (after 7:30 PM and before 08:00 AM). Regarding marital status, the distribution in the three types of work shifts was similar: about 50 % of each subsample declared themselves to be single or without a stable relationship, 43 % were characterized as married or with a stable relationship, while the remaining 7 % were divorced, separated, or widowed. The educational level mode was completed higher studies [secondary school] (67 %) followed by had not completed higher studies (22 %), which was similar for each work shift. The same occurs with the income level, where 92 % indicated income equal to or less than USD700 per month. Regarding the distribution according to gender, 32 % of the participants responded as male and 68 % as female. The distribution according to shift was daytime (78 % female), alternating day-night (62 % female) and night (56 % female). A differentiation was made between those who consider themselves to be *Magellanic* (from the Magallanes region of southern Chile) with 76 % compared to 23.3 % who feel they belong

to another regional group. The ages of participants ranged from 17 to 88 years (M = 34.3; SD = 12.9).

Instruments

All the instruments used were prepared in Chilean Spanish and followed content and construction validation processes, employing regional standards.

Socio-demographic measures. The variables measured included gender, age, city of origin, group membership, time of residence in the region, marital status, formal studies, activity, income, and shift-work type (day, night, or alternating day-night). This instrument has been previously tested to establish its reliability with the test-retest method.

Seasonal Pattern Assessment *Questionnaire* (SPAQ; Goikolea et al., 2003). This attempts to measure the sensitivity of people to changes in light, evaluating the perception of change in mood according to the seasons of the year, as well as symptoms of depression such as changes in diet, mood, changes in sociability, and hours of sleep. It is preferably used as a screening instrument with useful indicators of psychometric quality (Adan, Natali & Fabris, 2006). The instrument consists of several sections. The first, composed of 6 items, explores an individual's sensitivity to seasonal variations in relation to sleep, social activity, general well-being, weight, appetite, and energy level. Answer options range from 0 (*no change*) to 4 (*extreme change*). The sum of the item scores produces a Global Seasonality Score (GSS), with a maximum of 24 points. The highest scores indicate the highest seasonal sensitivity. Scores of less than 10 are categorized as "no seasonal sensitivity", those between 9 and 12-14 as "seasonal sensitivity" (a sub-syndrome of SAD), and more than 15 points is interpreted as the possible presence of SAD. The second section features ten items, to evaluate perceptions for each month of the year (e.g., "I have more social activity") and there is an option for "none". To determine the summer pattern, a statement of perception of sensitivity to daylight changes in the summer months is evaluated. The winter pattern covers sensitivity to changes occurring in the months of that season. In the "mixed pattern", the participant simultaneously indicates sensitivity in summer and winter.

Oxford Subjective Happiness Scale (Lyubomirsky & Lepper, 1999). This scale attempts to obtain a global measure of subjective happiness through statements in which the person evaluates himself or herself or compares him/herself to associates. The query format is made up of four items ("In general I consider myself…", "Compared to most of my peers, I consider myself ...", "Some people are very happy in general. They enjoy life regardless of what happens; they enjoy everything to the fullest. How does this characterization describe you?", "In general, some people are not very happy. Although they are not depressed, they never seem to be as happy as they could be. To what extent does this characterization describe you?"). These are answered using a Likert-type scale of 7 points. High scores (after inverting item 4, which is indirect) indicate high perceived happiness. Cronbach's alpha for this sample is = .77.

Social adaptation questionnaire for adults (Bell, 1934). Its objective here is to measure the general state of adult adaptation using five representative dimensions: family, social, work, health, and emotional. For the present study, the social adaptation subscale was used, with 33 items (with a response scale: yes, no, I don't know), that refers to the formation and maintenance of adequate interpersonal relationships both at an intimate level as well as in the immediate social environment in which an individual is involved (family, work,

community). High scores on this scale suggest difficulties in satisfactory social adaptation, showing difficulties in achieving a satisfactory sense of belonging in a social environment, or perceiving general dissatisfaction with respect to the social spheres in which one works (Bell, 1934; Jiménez & López-Zafra, 2011). Using the Spearman-Brown formula, the original author reported ρ = .80 for social adaptation. Cronbach's alpha for this sample is = .68. Some examples of items are: "Would you feel very intimidated, if you were in charge of launching a project and had to organize a group discussion?"; "Are you intimidated in the presence of people that you admire greatly, but you do not know well?"; "Are you intimidated or self-conscious when applying for a job?"

Anxiety and Humor Questionnaire (MASQE30; Spanish version of González & Ibáñez, 2018). This is designed to measure three dimensions of the tripartite model of anxiety and depression, including: Negative Affect (NA), Positive Affect (PA) and Somatic Anxiety (SA). The text of this version is in the Canary Islands dialect of Spanish, which is quite similar to Latin American Spanish and features satisfactory indicators of construct validity, through exploratory and confirmatory factor analysis, as well as convergent, discriminant, and predictive validity with anxiety and depression evaluated with the use of questionnaires. Its internal consistency coefficients range between .88 and .92 and reveal a temporal stability that ranges from .47 to .68. The first two dimensions that reached Cronbach's alphas were used for this sampling = .85 and .79 respectively (each one consisting of 10 items). Examples of items from NA: "I am usually dissatisfied with everything", "I usually feel irritable"; and from PA: "I usually have a lot of fun" and "I often feel good about myself".

Procedure

Participation was voluntary. The candidates were contacted in their places of work or study during a period of approximately four months, during the pre-pandemic period. Difficulty accessing shift workers other than "daytime-only" workers required that such people be invited to participate (through public invitation and via social networks) and then arrangements were made for them to answer the survey instruments in a place of their convenience.

Approximately 50 % of the participants received the questionnaires at their workplace, according to their requests. The field application was conducted by a team of two research assistants who were trained in this work. Prior to participating, the candidates were asked to read and sign an informed consent document. This consent form was approved by the Institutional Ethics Committee and notified candidates about their rights in this study, including information on the use of their personal data. The survey instruments were self-applied and their questions doubts were answered during the preparation process.

At the end of this study, the participants received a personal report of their results. This was one way to reward these individuals for their participation, in which their results were included in the central variables of this study. The preparation and delivery of the study was conducted using a double-blind modality so that a particular individual's personal data could not be linked to results beyond the overall data set.

Design

This featured non-experimental cross-sectional correlation.

Analysis Plan

To meet the objective of exploring the frequencies in which seasonal sensitivity may occur, along with its severity and seasonal patterns, descriptive frequency analyses were employed. Using the data from the survey forms, the global seasonality score (GSS) was calculated, grouped according to the presence of summer, winter, or mixed seasonal sensitivity patterns. The severity measures also required descriptive analyses to be carried out on the survey items that evaluated this aspect of the seasonality phenomenon. This included indications referring to effects in six different aspects, including sleep and well-being.

The relationship of seasonal sensitivity indices to positive and negative emotions, perceived happiness, and social adaptation required Spearman's correlational analysis, since the assumption of normality was not met for the happiness variable. For the comparison of the three types of work shifts (day, alternating, and night) single-variable ANOVAs were employed [ANOVA: Analysis of Variance].

Results

Of the total number of participants, 37.5 % indicated that they experience a marked seasonal sensitivity, while another 36 % revealed that this phenomenon is problematic for them. Among the latter, 26.7 % indicated that this effect is mild, 39 % considered it to be moderate, while the remaining 34.3 % report it is important or severe. No indication of a different distribution was observed according to work shift (χ (2, n = 339) = 0.73, n.s.). The global average seasonality (GAS) is in the range of the SAD subsyndrome (table 1). When comparing the GAS score according to work shift, it can be seen that participants who work during daylight hours report a greater degree of seasonality than those on mixed) (alternating) or night shifts (table 2).

Table 1.
Averages, standard deviations, and correlations of variables from the study

	Variables			**Partial correlations**					
		M	*SD*	2	3	4	5	6	7
1	General Seasonality	9.75	5.39	.43**	22**	-.18**	.14**	.24**	-.23
2	Winter profile	-	-	-	.21**	-.21**	.07	.11*	-.22**
3	Summer profile	-	-		-	-.07	.16**	.04	.05
4	Happiness	5.11	1.50			-	-.02	-.17**	.49**
5	General adaptation	20.61	6.40				-	.01	.01
6	Negative affect	2.84	1.86					-	-.16**
7	Positive affect	4.79	1.10						-

Notes: * Significant correlations at $p < .05$ ** Significant correlations at $p < .01$***

Table 2.
Averages according to type of shift

Variables	Daytime		Alternating		Night			
	M	*DE*	*M*	*DE*	*M*	*DE*	*F*	*p*
General seasonality	10.50_a	5.04	9.15_b	5.66	8.11_b	5.63	6.43	.001
Happiness	4.91_a	1.60	5.27_b	1.30	5.61_b	1.38	6.61	.001
General adaptation	22.98_a	5.02	17.57_b	6.51	18.08_b	7.34	44.81	.001
Negative affect	2.77_b	1.12	2.80_b	1.07	3.22_a	1.15	4.32	.014
Positive affect	4.61_a	1.03	5.00_b	1.13	5.04_b	1.14	7.63	.001

With respect to the frequency of the presence of seasonal patterns, 39.4 % of the participants fell within a winter profile, while those with a summer profile reached 71 %. Those who share both profiles combined accounted for 31.8 %. According to work shifts, while the mixed profile is equally distributed among the three types of shifts, the summer and winter profiles do show differences. The distribution of summer profiles was present in 80 % of the daytime shifts, in 70 % of the nighttime shifts and in 58 % of those who work alternating shifts.

In the case of winter profiles, participants who worked or studied on day shifts (49 %) presented a higher percentage of this pattern than those who worked or studied on alternating shifts (34 %) or night shifts (29 %). In other words, the proportion of summer and winter profiles is higher in daytime workers, who are regularly exposed to changes in daylight.

The areas that are perceived as most affected by seasonal sensitivity are shown in Table 3. In general terms, the participants considered marked or very marked changes in energy level (33 %), appetite (21.3 %), and the sleep duration (20.7 %). By shift type, when comparing proportions of agreement, those who worked day shifts revealed that their social activity, mood, and energy levels are indeed affected by seasonal changes. Proportionally, night shift workers indicated less affectation in mood and social life, but more in appetite. In the case of those who work alternating shifts, fewer indicated that there is a negative effect on their energy.

Correlations between the global average of seasonality (GAS) and the other study variables can be observed in Table 1. Both the perception of happiness and social adaptation show significant relationships, indicating that the increase in seasonality is linked to an increase in difficulties in achieving satisfactory social adaptation and happiness, and vice versa. Consistent with the previous result, is seen that an increase in seasonality is also accompanied by greater negative affects and a decrease in positive affects.

The differences according to work shift type are listed in table 3. When comparing the three shifts (day, night, and alternating) differences are evident in the other four proposed variables. The average of perceived happiness and positive affects is lower in the daytime shift, which also shows less social adaptation. The night shift is the one that reports the greatest degree of negative feelings. The alternating day-night shift type does not differ significantly in any consistent manner from the other two shift types, instead showing similarity to each of them in different variables.

Table 3.
Percentages of degree of change according to work shift type

	No change			Small change			Moderate change			Significant change			Very significant change		
	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3
Sleep duration	21	24	16	29	34	30	30	22	32	15	13	15	05	07	07
Social activity	22	45	31	25	24	28	28	21	27	19	08	09	07	02	05
Mood	15	29	24	34	29	33	29	28	23	16	08	11	07	05	09
Weight	11	27	10	31	29	38	43	26	33	11	12	13	05	06	06
Appetite	15	30	16	31	25	36	35	18	31	15	19	12	05	07	06
Energy level	09	24	18	20	24	23	33	18	32	24	23	14	14	11	13

Notes: G1 = Day shift; G2 = Night shift; G3 = Alternating shift.

Discussion and Conclusions

The purpose of this study was to determine the frequency of sensitivity to seasonal changes in sunlight in a sample of working adults who live in a high-latitude southern hemisphere location and who conduct their work in shifts, whether these are day, night, or alternating day and night shifts. The principal results indicate that more than a third of the workers report that they experience seasonal sensitivity at levels that affect their general adaptation. A similar fraction indicates that the effects of changes in natural light are problematic in their daily lives. Although the general average of the sample is in the moderate seasonality range at its upper limit, close to the score that is considered as affected by SAD (Seasonal Affective Disorder), it was day shift workers who reported the greatest impact.

Although the survey instrument used has been criticized for its overrepresentation of this syndrome, the global score indicated the conspicuous presence of seasonal sensitivity. An explanation for this phenomenon may be seen in the geographical factor since the participants live near what is considered a southern high latitude location (approximately 53 degrees south latitude).

On the other hand, the result showing that daytime workers perceive the highest seasonal sensitivity can be explained by the fact that these are the ones who actually witness the changes in daylight more closely during their working hours. On some days, the variation

in loss or gain of minutes of daylight at such a high latitude can reach as much as 5 minutes, which during a week represents a sensitivity phenomenon.

Night-shift workers tend to sleep for a significant part of the day, as do those who work alternating shifts, which also experience more sporadic periods of daylight and, therefore, it could be hypothesized that the perception of changes is less profound. Another possible explanation could be in differences in personality. Different circadian typologies have been described for mornings and evenings, which do not present the same levels of activation (acrophase), in physiological terms (Matthews, 1998).

Concerning participant's preferred conditions, the summer profile turned out to be more frequently preferred than the winter one. Although the workers did not consider changes due to increased sunlight to be negative, this showed evidence of a sensitivity to a potential psychological vulnerability.

The above suggests that these workers are strongly influenced by environmental sunlight conditions, which could result in a sort of instability in psychic well-being, since these subjects felt more susceptible to changes in exposure to daylight hours according to the season (Rihmer, 1980). The interpretation of this result is confirmed by the negative relationship observed between happiness and social adaptation, and "adverse seasonality."

People with seasonal sensitivity, being susceptible to changes in sunlight, may show physiological changes that are manifested in difficulties in regulating moods, in motivation, and energy levels. (Tam et al, 1997). Consequently, higher degrees of seasonality could be negatively linked to perceptions for both happiness and social adaptation. Although it is possible to suggest that there is a causal relationship between these, in which the variable cause would be seasonal sensitivity, additional research would be required to confirm the direction of this effect.

Finally, the fact that seasonality affected day-shift workers report themselves as less happy, less adapted, and less positive than the other two groups of workers could be due to the fact that they may more strongly perceive the pressures of daily life, while the other shift workers perform during hours in which community activities and demands are largely suspended (Angosto, 1992; Fischer et al., 2019).

As for those working alternating shifts, this condition -as suggested in the literature- could allow for better family adaptation (Guérin & Durrmeyer, 1973). A deeper understanding of these differences would require the inclusion of other potentially moderating variables such as the actual time spent on work shift and also other socio-demographic variables including the effectiveness of the social support network.

Since one obvious weakness of the current study is the use of a non-random sample, affecting the population representation, future research should focus on random sampling that includes a larger number of residents, grouped by matching potentially relevant socio-demographic variables such as gender and family composition. The study of this apparently quite frequent phenomenon of seasonality in the local general population should move forward in the determination of moderating variables, such as each adult's position in the work cycle and corresponding longitudinal evolution of such workers.

The theoretical implications of these findings lead us to consider that southern hemisphere high latitude work conditions may present a form of seasonal sensitivity that should be studied in a productive adult population. The reports of the frequency and severity of the seasonality phenomenon tend to be consistent with the available literature, as well as

indications of its amplitude as a negative factor in the general adaptation of people who experience it. Its specific impact on workplace adaptation continues to be a pending challenge since studies on this issue, in this region, are scarce if not entirely absent.

Occupational health care should consider the interaction that this climatic-geographical condition has with other aspects of employment. This study was intended to make a contribution in that area of understanding and care. In practical terms, broadening the knowledge of this subject matter could contribute to establishing efficient public policies to reduce the negative consequences of daylight changes, which are manifested both physically and mentally, and that affect both the personal and collective well-being of an individual within a community.

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