



Sleep Disorders and Subjective Well-Being in Portuguese Adults: Evidence from a Representative Study

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Abstract

Objective The quality and quantity of sleep affect people's well-being, as chronic sleep disorders are associated with social, physical, and psychological problems, as well as low self-reported life satisfaction. The present cross-sectional study examined the associations of sleep disorders with self-reported life satisfaction in Portuguese adults.

Materials and Methods Data from a representative sample of the Portuguese population (14,341 participants, aged ≥ 18 years) extracted from the Sixth Portuguese National Health Survey was analyzed. Data on subjective well-being and sleep disorders was collected through a questionnaire, and multivariable regression models were performed to examine the associations between these variables, adjusted for potential confounders such as age, gender, level of schooling, degree of urbanization, and family income.

Results Sleep disorders were negatively associated with self-reported life satisfaction. Having at least one sleep disturbance in the last two weeks was significantly associated with a 3-point decrease in life satisfaction: $\beta = -3.0$ (95% confidence interval = -3.2 – -2.7).

Discussion Among Portuguese adults, sleep disorders were associated with a decline in life satisfaction. The present study provides new evidence from a representative sample to support the promotion of good sleep hygiene intervention programs.

Keywords

- ▶ adult
- ▶ sleep disorders
- ▶ motivation
- ▶ happiness

Introduction

Sleep is a natural and basic function that is essential to people's health and well-being. It has been considered one of the most relevant emerging subjects because of the associations involving sleep and different health fields, like physical (obesity, for example)^{1,2} and mental health (depression and anxiety, for example).³ Although fundamental, sleep continues to be over-

looked. Sleep disorders can have multiple effects on health, and are commonly associated with irritability, lack of motivation, and low life satisfaction.⁴ A recent study⁵ found insomnia may present isolated, associated with medical and mental health disorders, or even be considered a risk factor that worsens these conditions. In addition, excessive daytime sleepiness is considered not only an outcome of behavioral

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issues, sleep disorders (such as sleep apnea syndrome and circadian disorders) or other medical conditions, but also a predictor of other conditions, such as cardiovascular and neurodegenerative disorders.⁶

It has been widely described in the literature that sleep disorders are directly associated with gender (women may present more sleep problems than men),⁷⁻⁹ level of schooling (short sleep is associated with lower levels when compared with higher levels),⁸ and age (aging decreases total sleep time and sleep efficiency).¹⁰ However, the sleep disorders that can be observed in older age may be linked to certain comorbidities associated with aging, instead of aging per se.¹¹

The quality and quantity of sleep affect people's well-being, as chronic sleep disorders are associated with social problems, worse performance of their roles, physical and psychological problems, low self-rated health status, and problems at work, due to tiredness and lack of concentration.¹² Sleep disturbances are also considered a predisposing factor and a possible symptom of depression.¹³⁻¹⁵ However, different levels of life satisfaction (cognitive component of subjective well-being, in which the person evaluates their life based on certain parameters, such as work, health, family, finances etc.) can mediate the association between depression and quality of sleep, as high levels of life satisfaction can be a resilience factor.^{12,16}

While multiple studies¹⁷⁻¹⁹ report associations involving sleep disorders, mental health, and well-being, to our knowledge there is scarce evidence about life satisfaction and sleep disorders in a nationwide sample. Hence, we aim to evaluate the associations between sleep disorders and subjective well-being in a representative sample of Portuguese adults. Based on previous research, we hypothesize that there is a negative association between sleep disorders and subjective well-being.

Materials and Methods

The present study was conducted in accordance with the 1964 Declaration of Helsinki, and all ethical issues were safeguarded. Written informed assent and consent were obtained from all participants. As in other national health surveys (NHSs) developed in Europe following the official European Union's (EU) act on public health (EU regulation number 141/2013), approval from the Ethics Committee was not mandatory. However, appropriate organizational and technical measures were adopted to protect data and mitigate the risks inherent in data treatment, including anonymization, encryption, and access control. There is no disclosure or communication of individual results.

Participants, Study Design, and Data Source

In the present study, we collected data from the Sixth Portuguese NHS, developed by the National Institute of Statistics. Sampling procedures included the selection of participants from households between September and December 2019, using a multistage random probability design. The sample selection followed a stratified and multistage sampling

scheme by regions or subregions (1999 and 2013) of level II of the Nomenclature of Territorial Units for Statistics (NUTS II), in which the primary sampling units, consisting of 1 or more contiguous cells of the 1-km² INSPIRE Registry grid, were systematically selected with probability proportional to the size of the number of main household units. Secondary units (accommodation) were selected at random and systematically within the units of the first stage. A primary sampling unit of 1,179 and 22,191 household units was collected and randomly selected within each territorial unit.

A representative sample of 14,617 (56.7% of female) subjects, aged ≥ 15 years, participated in the present study, distributed by main Portuguese territorial units, such as North, Center, Lisbon, Alentejo, and Algarve, as well as Madeira and the Azores. Data collection included a questionnaire about social and demographic characteristics, health, and chronic diseases. In the current manuscript, we included only adults (≥ 18 years old), with a final sample of 14,341 individuals. Permission from the National Statistical Institute was obtained before the analysis of this dataset.

Sociodemographic Characteristics

We collected data on the participants' age, gender, level of schooling, family income, and degree of urbanization. Age was classified in 5-year age groups, starting at age 15 up to 85 or older. Gender was divided into male and female. Level of schooling comprised the following categories: none, basic 1st and 2nd cycles, basic 3rd cycle, high school, post-high school, professional technical course, bachelor or 1st cycle degree, pre-Bologna degree or master's 2nd cycle, and doctorate. The categories concerning family income were defined as quintiles of monthly income. The degree of urbanization was divided into the following categories: densely-populated area, moderately-populated area, and sparsely-populated area.

Sleep Disorders

Regarding sleep disorders, the NHS asks about their frequency through the eight-item Patient Health Questionnaire depression scale (PHQ-8), and the participants answered the following question: "How often did you have difficulty falling asleep or did you sleep too little or too much?" The answers to these questions have the following categories: "never," "several days," "more than half the days," and "almost every day." In the present investigation, the frequency of sleep disturbances was divided into "yes" (with the inclusion of the categories "several days," "more than half the days," and "almost every day") and "no" (with the inclusion of the category "never").

Subjective Well-being

To assess subjective well-being, the NHS used the multiitem Satisfaction with Life Scale (SWLS), whose reliability and validity have been verified for the Portuguese population.²⁰ It includes a 5-item scale that evaluates life satisfaction using a Likert scale with scores ranging from 1 (totally disagree) to 7 (totally agree). The 5 statements presented are: "In most ways, my life is close to my ideal;" "The conditions of my life are excellent;" "I am satisfied with my life;" "So far I have gotten the important things I want in life;" and "If I could live

my life over, I would change almost nothing.” The scores on this scale vary between 5 and 35.²¹

Statistical Analysis

Descriptive statistics were used for the analysis of the socio-demographic characteristics, and they were expressed as mean and standard deviation (SD) values, as well as percentages (%), according to the type of variables. The bivariate differences were analyzed using the Mann-Whitney and Chi-squared tests.

Associations between sleep disorders (exposure) and subjective well-being (outcome) were assessed using generalized linear models (GLMs), which were further adjusted for age, gender, family income, and degree of urbanization. Data analyses were performed using the IBM SPSS Statistics for Windows (IBM Corp., Armonk, NY, United States) software, version 27.0, and significance was set at $p = 0.05$.

Results

The sociodemographic characteristics of the 14,341 participants are summarized in **Table 1**. Most of the subjects were aged between 40 and 64 years, and 42.7% of them had a level of schooling above middle school. The national prevalence of sleep disorders is of 42.9%, and it is significantly

higher in women than in men. The participants reported an average life satisfaction score of 24.1 (SD = ± 6.2).

After adjusting for age, gender, level of schooling, degree of urbanization, and family income (**Table 2**), the participants that reported a sleep disturbance in the previous 2 weeks, when compared with those that reported none, had lower scores on the SWLS: $\beta = 3.0$; 95% confidence interval (95%CI) = -3.2 – -2.7 . Furthermore, the men and women who reported a sleep disturbance in the previous 2 weeks had significantly lower scores on the SWLS ($\beta = -3.1$ [95%CI = -3.5 – -2.9] and -2.9 [95%CI = -3.1 – -2.6] respectively) compared to those who reported none.

Discussion

The current study reports inverse associations between sleep disorders and subjective well-being in a nationwide sample of Portuguese adults. These results are to some extent in accordance with those of previous studies that found that sleep disorders are directly associated with irritability, problems with concentration and memory, and difficulty in making decisions,^{16,22} as well as reduction in quality of life and well-being,²³ which together can lead to low life satisfaction. Moreover, recent studies^{5,6} show that sleep disorders, like insomnia, circadian disorders or excessive day time sleepiness

Table 1 Selected characteristics of the Portuguese National Health Survey.

	n	^N	Weighted %	Weighted %	
				Women (%)	Men (%)
Participants	14,341	8,599,798	100	53.5	46.5
Age in years					
18–39	2,724	2,583,336	29.0	27.4	30.9
40–64	6,271	3,736,038	42.0	41.6	42.5
≥ 65	5,346	2,280,424	25.6	27.9	23.0
Schooling					
None	1,503	565,242	6.4	8.6	3.8
Elementary school	5,752	2,861,725	32.2	30.7	33.9
Middle school	2,407	1,675,706	18.8	17.5	20.4
High school	2,637	2,097,178	23.6	22.2	25.1
Higher education	2,318	1,699,073	19.1	21.1	16.8
Family income					
1st quintile	2,808	1,779,359	20.0	25.7	13.5
2nd quintile	3,575	1,779,990	20.0	25.4	13.8
3rd quintile	2,993	1,779,808	20.0	15.4	25.3
4th quintile	2,616	1,778,523	20.0	16.5	23.9
5th quintile	2,625	1,781,244	20.0	16.9	23.5
Sleep disturbance					
No	8,010	4,977,329	55.9	49.6	63.2
Yes	6,483	3,816,247	42.9	49.1	35.8
Life satisfaction: mean(\pmstandard deviation)	23.6(± 6.3)	8,174,656	24.1(± 6.2)	23.8(6 \pm .3)	24.4(± 6.1)

Notes: n: sample size; ^N: estimated population size; sample weighted by pond 1.

Table 2 Associations between sleep disorders and self-reported life satisfaction in a representative sample of the Portuguese population.

	All		Women		Men	
	Unadjusted (crude β^{\wedge} coefficient (95%CI))	Adjusted ^a (crude β^{\wedge} coefficient (95%CI))	Unadjusted (crude β^{\wedge} coefficient (95%CI))	Adjusted ^a (crude β^{\wedge} coefficient (95%CI))	Unadjusted (crude β^{\wedge} coefficient (95%CI))	Adjusted ^a (crude β^{\wedge} coefficient (95%CI))
<i>Sleep disturbance in the previous two weeks</i>						
Never	Reference	Reference	Reference	Reference	Reference	Reference
At least once	-3.2 (-3.5; -3.1)	-3.0 (-3.2; -2.7)	-3.2 (-3.5; -3.0)	-2.9 (-3.1; -2.6)	-3.2 (-3.6; -2.9)	-3.1 (-3.5 -2.9)

Abbreviation: 95%CI, 95% confidence interval.

Notes: All values are crude β^{\wedge} coefficient (95% CI). ^aGeneralized linear models adjusted for age, gender, level of schooling, family income, and degree of urbanization. Significant associations are in bold.

have a negative effect on physical and mental health, being a risk factor for multiple conditions.

Several mechanisms may explain the aforementioned associations. First, sleep disorders may be linked to disease of the immune system and somatic problems,²² which have been associated with quality of life and changes in mood and other mental illnesses,^{9,16,22} which in turn cause a decrease in the self-reported health status and life satisfaction.^{12,16} Second, life satisfaction has been considered a protective determinant of health, associated with a reduction in the risk of developing chronic diseases and an increase in longevity.²⁴ Therefore, and according to the salutogenic model, life experiences help individuals develop a sense of coherence (SOC, an internal and global ability to experience life as comprehensible, manageable, and meaningful),²⁵ and provides them with the ability to mobilize resources to successfully deal with and manage stressors.²⁶ Individuals with strong SOC mobilize emotional, cognitive and material to cope with problems, and makes people consider a stressor as milder and less conflictual than a individuals with weak SOC.²⁵

In the present study, gender differences were observed regarding sleep disturbances, which is in line with preceding research that has shown that sleep problems and daytime tiredness are more frequent in women than in men, regardless of age.^{27,28} Furthermore, healthy women have a greater sensitivity to the effects of sleep disorders, leading to the development of physical and mental illnesses.²⁹ Additionally, it has been described that women hold superior homeostatic sleep sensitivity and drive than men: even a small sleep problem has a more substantial effect on women's sleep than men's.³⁰ However, more research is needed to clarify the gender disparities.

Our results show that men have higher levels of life satisfaction than women. Previous investigations report that life satisfaction is positively associated with the recognition of emotions, with women having a greater ability to recognize emotions than men, mainly negative emotions, such as anger.³¹ In other words, women experience different emotions more commonly and more intensively than men.³² Although emotional intelligence is positively associated with life satisfaction,

recent studies³³ show that the ability to perceive emotions (mood attention) can increase the sensitivity to experience more negative emotions, such as stress, leading to lower levels of satisfaction with life. Moreover, a lower SOC has been associated with women, due to a greater propensity for illnesses such as depression and anxiety,³⁴ which may explain the differences herein obtained. However, more investigation is needed.

Several behavioral issues might be the cause of sleep disorders, including sleep apnea syndrome, circadian problems or other medical or psychiatric conditions;⁶ hence, behavioral changes, such as cessation of smoking and alcohol consumption, increased physical activity, and daily gratitude exercises are essential interventions to increase life satisfaction and reduce the adverse effects of sleep disorders.¹⁷ In fact, high levels of life satisfaction are associated with resilience, a remarkable ability to solve problems and cope,^{12,16} which has been associated with quality of sleep and health in general.¹⁶

Age has been considered a predictor of sleep problems.^{10,12} Although there is no stress associated with the occupational context, aging requires adaptations to a new lifestyle. Moreover, there is a set of chronic diseases that tend to appear during this time, which can have a greater impact on people's daily lives, leading to sleep problems.³⁵ Life satisfaction protects people against physical and cognitive decline in old age, inasmuch as high positive affect can promote a healthy lifestyle, social relationships and self-care.³⁶ High levels of life satisfaction are associated with good self-reported health status, mental health, and socio-demographic conditions, like social support and family income.³⁷ Differences in subjective well-being are associated with discrepancies in income, human rights, social equality,³⁸ and mortality, as different environments may present different degrees of stress.³⁹

Poverty is associated with short sleep duration and worse sleep quality,⁴⁰ as well as low satisfaction with life.⁴¹ In the United States, people from low-income households face a disproportionately greater burden of sleep-related diseases compared to individuals living in affluent households,⁴² once people living in poverty have higher comorbidity,

occupational and psychosocial stress, culture, and beliefs.¹⁸ Improvement in socioeconomic conditions may increase well-being in those with low socioeconomic status.

Like income, the level of schooling plays an important role in health status and sleep duration.⁸ People with low levels of schooling have a short sleep duration⁴³ and low well-being.⁴⁴ There are sparse data available that can explain the mechanisms that may be behind these associations.

The present study has several strengths that should be acknowledged. First, this is a nationally representative sample of Portuguese adults. Second, we used a comprehensive list of relevant covariates, previously associated with life satisfaction and sleep disorders. Third, we performed the analysis according to gender, considering that men and woman have a different perceptions of life satisfaction and sleep disorders. Fourth, the assessment of life satisfaction was performed through the SWLS, an appropriate scale to use in other age groups and widely applied to measure well-being.⁴⁵

On the other hand, the present study is not without limitations. First, the frequency of sleep disorders was self-reported, and it was not possible to exclude recall bias. Objective measures, like actigraphy or polysomnography, would be more accurate to measure the frequency of sleep disturbances.⁴⁶ Second, we did not include data on specific comorbidities that have been associated with sleep and subjective well-being, like anxiety and depression, which would benefit the interpretation of the results. Further research is needed with cross-sectional and longitudinal data to confirm or rule out our findings.

In conclusion, to promote physical and mental health, well-being, and to match the salutogenic method, there are salutary factors that should be identified and fostered so that individuals can recognize, manage, and assign meaning to their own resources and capacities to face stressful life experiences and health problems.

The present study reports bidirectional associations regarding sleep and life satisfaction. A satisfied individual may have better sleep quality, and adequate sleep may positively affect how they evaluate their life. The importance of public awareness regarding sleep problems and subjective well-being should be emphasized, and understanding the predictors of disturbed sleep is warranted.

Future research may help advance knowledge in this field, and it may be advantageous for the development of public health policies that improve the promotion of sleep health to enhance life satisfaction in the general population. Moreover, the development of intervention programs to promote healthy sleep may be useful to improve people's health.

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Conflict of Interests

The authors have no conflict of interests to declare.

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