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Association of sleep duration with mental health: results from a Spanish general population survey

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Abstract

Purpose The purpose of the present study was to evaluate the association of sleep duration and mental health among the general population.

Methods A cross-sectional study was carried out with an adult Spanish population sample between 16 and 64 years old. The information was obtained from data provided by a randomly selected representative sample of 505 adults stratified by age, sex, and geographic area. Participants were interviewed face-to-face in their respective households with questions including sociodemographic characteristics, lifestyle, sleep duration, and the 12-item General Health Questionnaire to screen risk for poor mental health. The duration of sleep hours were grouped into the following categories: < 6 h, 6-7 h, and, > 7 h. Regression analysis was used to assess associations between sleep duration and risk of poor mental health.

Results A percentage of respondents 13.1% reported sleeping less than 6 h. The analysis demonstrated a significant ($p = 0.001$) negative ($B = -0.512$) relationship between hours of sleep and risk of poor mental health (GHQ-12), demonstrating that reduced sleep duration increases the risk of poor mental health.

Conclusions Sleep duration lower than 6 h is prevalent among the general population in Spain, especially among women and people who frequently use electronic devices. The results show that people who experience shorter sleep duration face a greater risk of poor mental health. These findings suggest that it is important to raise awareness of healthy sleeping habits, with emphasis on adequate sleep duration.

Keywords Sleep duration · Lifestyle · Mental health · GHQ-12

Introduction

Mental disorders are common [1], constituting 13% of the global burden of disease surpassing both cardiovascular disease and cancer [2]. It is estimated that one in four worldwide will be affected by a mental disorder at some stage of life [3]; meanwhile, 7% of the European Union (EU) adult population (18–65 years) is or has been affected by at least one mental disorder in the past 12 months [4].

Although chronic sleep loss is common in today's society, many people are unaware of the potential adverse health effects of habitual sleep restriction [5]. Short sleep duration is considered to be shorter in length than 7–8 h in a 24-h period [6]. Scientific reports have provided evidence that habitual short sleep duration is associated with mortality [7], obesity [8], diabetes type 2 [9], cardiovascular disease [10], and automobile and workplace accidents [11].

Sleep is vital for normal brain function and there is a complex bidirectional relationship between disturbed sleep and cognitive and mental health problems [12]. Sleep duration is important for physical and psychological wellbeing. Decreasing sleep duration below the required optimum time can cause a number of neurobehavioral deficits, including loss of attention, decreased working memory, reduced cognitive performance, depressed mood, and perseverative thinking [13, 14]. The use of multiple forms of technology influence sleep duration and worsening daytime functioning as well as quality of life [15]. Despite all of this, chronic sleep deficiency is a growing and underestimated determinant of health status [16].

Olta Braçe, Dustin T. Duncan, José Correa-Fernández and Marco Garrido-Cumbrera contributed equally to this work.

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Many studies addressing sleep and mental health have focused on insomnia rather than sleep duration, and most have been carried out in Anglo-Saxon contexts [17, 18]. Moreover, these previous studies have targeted a specific population such as nurses [19], military [20], or veterans [21] considered to have a greater probability of suffering from mental illness [22, 23].

Our hypothesis is that people who experience shorter sleep duration are at greater risk of poor mental health than those who sleep the recommended hours. The objective of the present study was to evaluate the impact of reduced sleep duration on the mental health, controlling by sociodemographic and lifestyle variables, of a sample of adults from the general population in Spain. The ultimate purpose of our research is to obtain scientific evidence on the association of sleep duration and psychological health of the general population.

Participants and methods

Study design

In order to study the effects of sleep duration on mental health, a population survey was carried out with a representative adult population sample (16 to 64 years old) residing in the municipality of Mairena del Aljarafe located in the Seville Metropolitan Area (Spain), occupies an area of 17.61 km^2. This municipality is characterized by a strong urban expansion associated with a spectacular population growth [24]. In relation to the metropolitan area, Mairena del Aljarafe has a strong connection and dependence with the city of Seville. It is characterized by a young population with a medium-high economic level that resides in areas of low population density following the urban sprawl patterns.

Data source (survey)

This was a cross-sectional study using data extracted from the 2015 Commuting, Daily Habits and Urban Health Survey. [24] The survey was carried out in the municipality of Mairena del Aljarafe between January and April 2015. From a policy perspective, it was carried out by the Health Territory Research (HTR) group of the University of Seville in conjunction with the City of Mairena del Aljarafe. The municipality had input into the design of the survey and also provided field collectors who were trained up by researchers from the HTR. A representative sample of 505 adults (16–64 years old) stratified by age, gender, and geographic area was collected, being a representative sample of a population of 44,582 inhabitants according to the 2014 Population Census, with a confidence level above 95%. This sample was randomly selected, and the people interviewed face-to-face in their respective household dwelling at the time of the survey. The questionnaire was divided into the following domains: sociodemographic characteristics, lifestyle, sleep duration, and health-related outcomes.

Variables

Sociodemographic characteristics

Participants were asked to report their gender (male, female); age (in years) and were categorized into three groups: 16–31, 32–48, 49–64; civil status (single, married, divorced, living with a partner, widowed), and employment status (employed, unemployed, student, retired, non-contributory pension, homemaker).

Lifestyle habits

The population survey includes the following items related to lifestyle habits: alcohol intake (yes, no); smoking (yes, no); no. of hours watching TV per day (never, < 1, 1–2, 2–5, > 5); no. of hours playing videogames per day (never, < 1, 1–2, 2–5, > 5); no. of hours on the internet per day not related to work (never, < 1, 1–2, 2–5, > 5); no. of hours using smartphone and/or tablet per day (never, < 1, 1–2, 2–5,> 5).

Sleep duration

Self-reported daily sleep duration was measured using the following question: "How many hours a day do you sleep usually?" The possible responses were < 6 h; 6–7 h; > 7–8 h, and > 8 h. In order to carry out the analysis, these four options were grouped into three categories as per previous studies [25]. The duration of sleep hours were grouped into the following categories: < 6 h, 6–7 h, and > 7 h.

Mental health

To assess mental health, the 12-item General Health Questionnaire (GHQ-12) was included in the survey. This is a self-administered screening tool that aims to detect psychological morbidity among the general population and those who are likely to have or be at risk of developing psychiatric disorders [26]. GHQ-12 includes 12 items valued using the original scoring method as shown in Laaksonen et al. [27] and Hamer et al. [28]. We use a 4-point Likert scale (less than usual, no more than usual, rather more than usual, or much more than usual). Total GHQ-12 scores range between 0 and 36, with higher scores reflecting an increased risk of psychiatric comorbidity. To determine the risk of mental disorders, the Likert scale was transformed to (0, 0, 1, 1). The scoring system assigns to each individual a value between 0 (minimum) and 12 (maximum) of risk of poor mental health. In the Spanish version of the GHQ-12, the optimal cutoff point identifying those at risk of poor mental health was

Table 1 Sociodemographic factors, lifestyle habits and health-related outcomes according to sleep duration levels (short <6 h, 6–7 h, and >7 h) $N = 505$

Socio-demographic characteristics	No. hours of sleep/day												
	<6h *n* = 66 (13.1%)				6–7 h *n* = 284 (56.2%)				> 7 h *n* = 155 (30.7%)				*p* value
	Male	Female	Total	*p* value	Male	Female	Total	*p* value	Male	Female	Total	*p* value	
Sex													
Male	28 (11.2)				137 (54.6)				86 (34.3)				0.156
Female	38 (15.0)				147 (57.9)				69 (27.2)				
Age group *N:* 505													
16–31	3 (30.0)	7 (70.0)	10 (7.5)	0.254	18 (35.3)	33 (64.7)	51 (38.1)	0.106	48 (65.8)	25 (34.2)	73 (54.5)	0.052	**<0.001****
32–48	16 (53.3)	14 (46.7)	30 (14.4)		68 (52.7)	61 (47.3)	129 (62.0)		23 (46.9)	26 (53.1)	49 (23.6)		
49–64	9 (34.6)	17 (65.4)	26 (16.0)		51 (49.0)	53 (51.0)	104 (63.8)		15 (45.5)	18 (54.5)	33 (20.2)		
Civil status *N:* 505													
Single	8 (42.1)	11 (57.9)	19 (9.5)	0.205	45 (47.9)	49 (52.1)	94 (47.0)	0.123	55 (63.2)	32 (36.8)	87 (43.5)	0.215	**<0.001****
Married	18 (48.6)	19 (51.4)	37 (14.2)		82 (48.0)	89 (52.0)	171 (65.8)		24 (46.2)	28 (53.8)	52 (20.0)		
Divorced	0 (0.0)	4 (100.0)	4 (14.3)		10 (66.7)	5 (33.3)	15 (53.6)		3 (33.3)	6 (66.7)	9 (32.1)		
Living with a partner	1 (100.0)	0 (0.0)	1 (33.3)		0 (0.0)	0 (0.0)	0 (0.0)		1 (50.0)	1 (50.0)	2 (66.7)		
Widowed	1 (20.0)	4 (80.0)	5 (35.7)		0 (0.0)	4 (100.0)	5 (35.7)		3 (60.0)	2 (40.0)	5 (35.7)		
Educational level *N:* 505													
Uneducated	2 (40.0)	3 (60.0)	5 (35.7)	0.243	4 (57.1)	3 (42.9)	7 (50.0)	0.385	0 (0.0)	2 (100.0)	2 (14.3)	0.107	**<0.001****
Primary school	11 (50.0)	11 (50.0)	22 (16.9)		21 (40.4)	31 (59.6)	52 (40.0)		37 (66.1)	19 (33.9)	56 (43.1)		
High school	12 (50.0)	12 (50.0)	24 (14.2)		45 (45.5)	54 (54.5)	99 (58.6)		24 (52.2)	22 (47.8)	46 (27.2)		
University	3 (20.0)	12 (80.0)	15 (7.8)		67 (53.2)	59 (46.8)	126 (65.6)		25 (49.0)	26 (51.0)	51 (26.6)		
Job status *N:* 505													
Employed	22 (56.4)	17 (43.6)	39 (13.3)	0.081	107 (54.3)	90 (45.7)	197 (67.0)	**<0.001****	28 (48.3)	30 (51.7)	58 (19.7)	**0.005***	**<0.001****
Unemployed	5 (33.3)	10 (66.7)	15 (18.3)		11 (30.6)	25 (69.4)	36 (43.9)		15 (48.4)	16 (51.6)	31 (37.8)		
Student	0 (0.0)	3 (100.0)	3 (3.7)		11 (40.7)	16 (59.3)	27 (32.9)		36 (69.2)	16 (30.8)	52 (63.4)		
Retired	1 (20.0)	4 (80.0)	5 (26.3)		8 (88.9)	1 (11.1)	9 (47.4)		4 (80.0)	1 (20.0)	5 (26.3)		
Non-contributory pension	0 (0.0)	2 (100.0)	2 (66.7)		0 (0.0)	1 (100.0)	1 (33.3)		0 (0.0)	0 (0.0)	0 (0.0)		
Homemaker	0 (0.0)	2 (100.0)	2 (9.1)		0 (0.0)	14 (100.0)	14 (63.6)		0 (0.0)	6 (100.0)	6 (27.3)		
Lifestyle													
Alcohol intake													
Yes	5 (62.5)	3 (37.5)	8 (15.1)	0.220	26 (89.7)	3 (10.3)	29 (54.7)	**<0.001****	10 (62.5)	6 (37.5)	16 (30.2)	0.551	0.898
Not	23 (39.7)	35 (60.3)	58 (12.8)		111 (43.5)	144 (56.5)	255 (56.4)		76 (54.7)	63 (45.3)	139 (30.8)		
Smoker *N:* 505													
Yes	11 (50.0)	11 (50.0)	22 (16.5)		40 (62.5)	24 (37.5)	64 (48.1)	**0.009***	28 (59.6)	19 (40.4)	47 (35.3)	0.499	0.080
Not	17 (38.6)	27 (61.4)	44 (11.8)		97 (44.1)	123 (55.9)	220 (59.1)		58 (53.7)	50 (46.3)	108 (29.0)		

Table 1 (continued)

Socio-demographic characteristics	No. hours of sleep/day												
	<6h *n* = 66 (13.1%)				6–7 h *n* = 284 (56.2%)				> 7 h *n* = 155 (30.7%)				*p* value
	Male	Female	Total	*p* value	Male	Female	Total	*p* value	Male	Female	Total	*p* value	
No. hours watching TV/day *N:* 505													
Never	1 (14.3)	6 (85.7)	7 (13.5)	0.190	18 (69.2)	8 (30.8)	26 (50.0)	0.126	11 (57.9)	8 (42.1)	19 (36.5)	0.831	0.138
<1	11 (61.1)	7 (38.9)	18 (17.3)		27 (44.3)	34 (55.7)	61 (58.7)		12 (48.0)	13 (52.0)	25 (24.0)		
1–2	14 (42.4)	19 (57.6)	33 (12.1)		79 (49.1)	82 (50.9)	161 (59.2)		46 (59.0)	32 (41.0)	78 (28.7)		
2–5	2 (28.6)	5 (71.4)	7 (12.3)		9 (37.5)	15 (62.5)	24 (42.1)		14 (53.8)	12 (46.2)	26 (45.6)		
> 5	0 (0.0)	1 (100.0)	1 (5.0)		4 (33.3)	8 (66.7)	12 (60.0)		3 (42.9)	4 (57.1)	7 (35.0)		
No. hours using internet/day (not for working) *N:* 505													
Never	3 (21.4)	11 (78.6)	14 (18.2)	0.145	20 (43.5)	26 (56.5)	46 (59.7)	0.401	10 (58.8)	7 (41.2)	17 (22.1)	0.164	**<0.001****
< 1	6 (66.7)	3 (33.3)	9 (20.0)		15 (62.5)	9 (37.5)	24 (53.3)		3 (25.0)	9 (75.0)	12 (26.7)		
1–2	10 (52.6)	9 (47.4)	19 (10.4)		59 (48.8)	62 (51.2)	121 (66.5)		24 (57.1)	18 (42.9)	42 (23.1)		
2–5	5 (50.0)	5 (50.0)	10 (10.0)		23 (41.1)	33 (58.9)	56 (56.0)		17 (50.0)	17 (50.0)	34 (34.0)		
> 5	4 (28.6)	10 (71.4)	14 (13.9)		20 (54.1)	17 (45.9)	37 (36.6)		32 (64.0)	18 (36.0)	50 (49.5)		
No. hours using smartphone and/or tablet /day *N:* 505													
Never	16 (72.7)	6 (27.3)	22 (14.3)	**0.006***	49 (59.0)	34 (41.0)	83 (53.9)	**0.034***	35 (71.4)	14 (28.6)	49 (31.8)	**0.047***	0.402
< 1	7 (38.9)	11 (61.1)	18 (12.1)		42 (46.7)	48 (53.3)	90 (60.4)		22 (53.7)	19 (46.3)	41 (27.5)		
1–2	4 (18.2)	18 (81.8)	22 (13.9)		37 (40.7)	54 (59.3)	91 (57.6)		19 (42.2)	26 (57.8)	45 (28.5)		
2–5	1 (33.3)	2 (66.7)	3 (7.7)		6 (35.3)	11 (64.7)	17 (43.6)		10 (52.6)	9 (47.4)	19 (48.7)		
> 5	0 (0.0)	1 (100.0)	1 (20.0)		3 (100.0)	0 (0.0)	3 (60.0)		0 (0.0)	1 (100.0)	1 (20.0)		
Health status													
12-item General Health Questionnaire (GHQ-12) *N:* 505													
Risk of poor mental health (≥ 3)	5 (27.8)	13 (72.2)	18 (26.5)	0.140	12 (36.4)	21 (63.6)	33 (48.5)	0.146	7 (41.2)	10 (58.8)	17 (25.0)	0.208	**0.002***

p value for trends using the chi-square test

* $p < 0.05$; ** $p < 0.001$

established at ≥ 3 [29]. A recent study developed in Spain found an alpha Cronbach of 0.76 [30]. In our study, Cronbach's alpha was even higher (0.934), which confirms the reliability of this scale.

Statistical analysis

Bivariate analysis

The Chi-square test was used to analyze categorical variables and compare the distributions of sleep duration measures by sociodemographic, lifestyle habits, and mental health outcomes using the GHQ-12 scale (≥ 3). Statistical significance was determined at $p < 0.05$.

Regression analysis

The second step consisted of evaluating the strength and direction of a linear relationship between the influence of sleep duration on risk of poor mental health by using a regression analysis while controlling for sex, age group, job status, alcohol intake, smoking, no. of hours watching TV/day, and no. of hours using internet/day. The regression coefficient was considered statistically significant when the p value was < 0.05.

Results

Sleep duration less than 6 hours

Sociodemographic factors

Table 1 shows that sleep duration of less than 6 h per night was in our sample. Gender differences were observed related to sleep duration, with more women experiencing shorter sleep duration than men, although this difference was not statistically significant ($p = 0.156$). A greater proportion of older people experienced shorter sleep duration (< 6 h) compared with younger respondents ($p < 0.001$). A greater proportion of people with a lower level of education had a shorter sleep duration (< 6 h) compared with those who completed high school or university ($p < 0.001$). Job status was also related to sleep duration with 13.3% of those employed and 3.7% of students sleeping less than 6 h per night ($p < 0.001$).

Lifestyle

Gender differences between lifestyle habits and sleep duration were also found. In addition, 23.9% of people who use internet for more than 2 h per day slept less than 6 h ($p < 0.001$).

Health-related outcomes

The mean (± standard deviation) of GHQ-12 was 0.9 ± 2.5, and the prevalence of poor mental health (GHQ-12 ≥ 3) was 13.5%. There exists a statistically significant relationship between sleep duration and mental disorders, with 26.5% of people who reported sleeping less than 6 h are at risk of poor mental health (GHQ-12 ≥ 3) ($p = 0.002$). A percentage of the female cohort (18.4%) who sleep less than 6 h per night reported cardiovascular problems, while for men this figure drops to 3.6% ($p = 0.068$).

Sleep duration longer than 7 hours

Sociodemographic factors

Table 1 shows that a greater propotion of younger people experienced longer sleep duration compared with older people ($p < 0.001$). In addition, a higher proportion of singles had sleep longer than 7 h compared with married people ($p < 0.001$). Longer sleep duration is related to job status, in particular, a higher proportion of those unemployed, or students slept more than 7 h per night compared with those employed or retired ($p < 0.001$).

Lifestyle

Gender differences were also found between the use of electronic devices and sleep duration longer than 7 h with 71.4% of men who did not use the Internet sleeping more than 7 h, while this figure was 28.6% for women ($p < 0.001$).

Regression analysis

A percentage of 13.1% reported sleeping less than 6 h, and 26.5% exhibited poor mental health (according to the GHQ-12 score). To evaluate the influence of sleep duration on mental health, a regression analysis controlled by variables that had shown a significant relationship with sleep duration in the bivariate analyses was performed. The analysis demonstrated that there exists a significant ($p = 0.001$) negative ($B = -0.512$) relationship between hours of sleep and mental health status (GHQ-12) in that reduced sleep duration increases the risk of poor mental health (Table 2).

Likewise, regression analysis between sleep duration and mental health without mediation variables was conducted to observe the strengths of this relationship ($p = 0.005$; $B = -0.443$). The results show that when including the control variables, the regression analysis between the variables hours of sleep and GHQ-12 ($B = -0.512$) improves moderately, which shows that control variables do not have a major impact.

Table 2 Regression analysis between sleep duration and mental health (GHQ-12) $N = 505$

	B	SE	Standardized beta	CI 95%	*p*
Sleep duration	− 0.512	0.156	− 0.143	− 0.819, − 0.205	0.001

Controlled for age, sex, job status, alcohol intake, smoking, and no. of hours watching TV/day, and no. of hours using internet/day

Abbreviation: *SE*, standard error; *CI 95%*, confidence intervals; *p*, *p* value

Discussion

Most studies have shown the importance of sleeping a minimum number of hours in order to cope with daily life activities and body regeneration, with sleep duration less than 6 h being a predictor of poor mental health outcomes [31, 32]. Despite growing evidence about the important role of sleep duration as a determinant of health, it remains unrecognized by national agencies, politicians, scientists, and the general public [16]. The fact that 69.3% of those interviewed for this study in the city of Mairena del Aljarafe experienced a duration of sleep less than 7 h, of which 13.1% had less than 6 h of sleep, points to a key lifestyle risk factor that should be considered by health authorities.

The results of this study, in line with previous research, show a higher percentage of women experiencing shorter sleep duration than men [33]. This could be due to gender differences, as there was a higher proportion of unemployed women in the sample, and those who are working receive lower salaries generally [34] and often take on several roles simultaneously without being compensated economically. In fact, the increased burden of domestic activities, coupled in many cases with childcare and work outside the home [35], makes life more stressful for women, a factor that may affect their sleep duration, as well as their mental health status.

Screen time has become a serious threat to the population's well-being, as short sleep duration is associated with excessive television viewing and computer use [36–38] and recent increasing use of portable electronic devices [39]. Time spent watching TV can reduce sleep time or increase mental arousal and exposure to blue light, with negative effects on the onset, duration, and quality of sleep [40]. In a study exploring the impact of portable electronic device use in bed on sleep/waking behavior within an adult population, it was found that electronic device usage reduces sleep duration and quality [41]. In this study, the population spending multiple hours per day on electronic devices was associated with sleep duration less than 6 h, but also with sleep duration longer than 7 h.

We have been able to analyze the prevalence of poor mental health, which stands at 13.5%, almost double that of the adult population of the EU, for whom 7% is affected by mental health [4]. In our study, sleep duration was associated with most variables considered, particularly risk of poor mental health. These findings are consistent with previous studies in which shorter sleep was associated with an increased risk of psychological distress [23, 31].

Regarding the respondents who reported sleeping less than 6 h per night (13.1%), it is necessary to indicate that many of them may in fact be suffering from insomnia. According to the ICD-10 criteria, insomnia includes the difficulty initiating or maintaining sleep at least three times per week [42]. A study in Hong Kong found insomnia to be present in 11.9% of the general population with higher proportions among the elderly, women, the less educated, the unemployed, and the divorced or widowed [43]. In our sample, the population sleeping less than 6 h were mostly women (15 vs. 11.2%), divorced and widowed (14.3 and 35.7%, respectively), with low educational level (35.7%), and unemployed (18.3%). These results show that the population with insomnia has similar sociodemographic characteristics to our population who sleep less than 6 h a day. However, further research is needed to corroborate these results. Other studies have shown that people who suffer from insomnia and short sleep duration are at higher risk of poor mental health [23, 43]. Our results would confirm also these findings by showing that shorter sleep duration is associated with a higher risk of poor mental health. From a methodological point of view, one of the strengths of this study is the selection of a representative sample of survey respondents by gender, age group, and geographic area. The face-to-face interview used as a survey method, in which respondents were interviewed on their doorstep, increases the rigor and strength of the information collected. Another strength of this study is that the results come from a randomly selected sample of the general population, so they are free from clinical selection bias or characteristics specific to a given population group.

Although the data were extracted from a population survey conducted door-to-door by trained interviewers, one of the limitations of this study was that sleep duration was not collected and measured but instead self-reported by participants, with the result that this information could include some bias.

For the scientific and theoretical advancement of science, we have been able to identify empirically the relationship between sleep duration and risk of poor mental health in the general population, paying special attention to gender differences and the effects of harmful habits, such as prolonged use of electronic devices.

Conclusions

The present study has shown that sleep duration less than 6 h is a prevalent experience among the general adult population in Spain, especially among women and people who most frequently use electronic devices. These results corroborate the initial hypothesis. Compared with people who sleep the recommended number of hours, people who experience shorter sleep duration face a greater risk of suffering from poor mental health. These findings suggest that healthcare professionals should include information about habits of healthy sleep duration in their clinical practice as a possible way to prevent mental illness in the general population.

Authors' contributions The authors read and approved the final manuscript.

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Declarations

Ethics approval and consent to participate All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. This study includes an anonymous survey, which does not collect any personal data that would allow the individual identification of the respondents. Therefore, in accordance with Spanish legislation, approval by an Ethics Committee was not required. Informed consent was obtained from all participants included in the study.

Conflict of interests The autors declare no conflict of interest.

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