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Association between maladaptive sleep hygiene behaviors and sleep quality in the general population

Clara Sancho-Domingo, José Luis Carballo, Ainhoa Coloma-Carmona, and Jesús Rodríguez-Marín

Center of Applied Psychology of the Miguel Hernández University of Elche, Spain

Prevalence of sleep problems has grown globally in recent years and sleep hygiene recommendations have shown inconsistent results. This study aims to analyze the quality of sleep in a non-clinical population and its association with maladaptive sleep hygiene. A total of 465 participants, with median age of 35 years (Interquartile range – IQR = 28–44), completed the Sleep Hygiene Practices Scale (SHPS) and the Pittsburgh Sleep Quality Index (PSQI). Sample was divided into *good quality sleepers* (GQS; 52.7%, n = 245) and *poor quality sleepers* (PQS; 47.3%, n = 220). Comparison tests showed PQS had significant higher scores on SHPS (M = 61; IQR = 55–68, $p < .01$) compared with GQS (M = 68; IQR = 62–74). A logistic regression model indicated that only cognitive-arousal behaviors and inconsistent bedtimes were significant to classify poor sleep ($R^2 = .35$; $p < .01$). In conclusion, poor sleep quality is common among healthy individuals and strongly associated with pre-sleep cognitive activity. This suggests that interventions aiming to improve sleep quality should consider strategies that would retract attention from concerns and worries at bedtime.

Key words: sleep hygiene, arousal behaviors, sleep quality, cognitive activity, irregular bedtime

Highlights:

- Sleep problems are common among healthy adults.
- Maladaptive sleep hygiene interferes with sleep quality.
- Pre-sleep cognitive activity and inconsistent bedtime are related to poor sleep.

Corresponding author: jcarballo@umh.es

Despite the awareness of sleep importance, prevalence of sleep problems in the general population has increased globally in recent years (Adams et al., 2017; Ford, Cunningham, & Croft, 2015; Kronholm et al., 2016). International studies indicate that the percentage of people with sleep problems ranges between 20% and 45% (Ford et al., 2015; Léger, Poursain, Neubauer, & Uchiyama, 2008; Madrid-Valero, Martínez-Selva, do Couto, Sánchez-Romera, & Ordoñana, 2017). These sleep problems refer to sleep difficulties rather than specific sleep disorders, such as reduction of sleep time, difficulty initiating or maintaining sleep, or poor subjective sleep quality. Due to the growth of sleep problems among healthy individuals, public health is at risk for developing several illnesses associated to poor sleep quality, such as obesity and type 2 diabetes (Tan, Chapman, Cedernaes, & Benedict, 2017) cardiovascular diseases (Cappuccio, Cooper, D'Elia, Strazzullo, & Miller, 2011) or some types of cancer (Gu et al., 2017; Kakizaki et al., 2013; Sen et al., 2017).

Although there is no consensus about the definition of sleep quality, Buysse (2014) identifies several indicators to delineate it, such as: sleep duration, sleep latency, arousals after sleep onset, regular bedtime, and the level of subjective satisfaction with the quality of sleep. Maintaining a regular schedule for bedtimes/wake-times can enhance subjective sleep quality, reduce latency of sleep and increase sleep efficiency (Härmä et al., 2018; Soehner, Kennedy, & Monk, 2011). Furthermore, the lack or excess of hours of sleep can lead to symptoms of depression and anxiety (Kalmbach, Arnedt, Swanson, Rapier, & Ciesla, 2017), hinder memory consolidation (Born & Wilhelm, 2012) and develop daytime sleepiness (Hardin & Pandya, 2013). In addition, night awakenings or sleep disruption could increase the state of fatigue, augment sleepiness levels (Devine, Haack, Yang, & Mullington, 2017) and intensify negative mood (Finan, Quartana, & Smith, 2015).

Several studies have analyzed the efficacy of sleep hygiene programs designed to improve sleep quality through several behavioral and environmental guidelines. These programs have shown to reinforce cognitive-behavioral therapy efficacy as an adjuvant (Chen, Kuo, & Chueh, 2010; Friedrich & Schlarb, 2018) and improve sleep quality in general population (Morita, Miyazaki, & Okawa, 2012; O'Donnell & Driller, 2017; Wolfson, Harkins, Johnson, & Marco, 2015). However, the reviewed literature shows discrepancies regarding which sleep recommendations help reduce and prevent sleep problems in the general public (Irish, Kline, Gunn, Buysse, & Hall, 2015). Lack of empirical support for these recommendation exists in the general population and is usually tested under laboratory settings (Irish et al., 2015). Therefore, due to the relevance sleep quality has for health preservation and the role behavioral practices have for promoting healthy sleep, it appears important to study in depth which sleep hygiene guidelines yield stronger association with sleep quality. Thus, the aim of this study is to analyze the quality of sleep of the Spanish general population and to examine the relationship between sleep hygiene behaviors and sleep quality.

Method

Participants

As shown in Figure 1, a total of 674 Spaniards participated in the study, out of which 31% (n = 209) were excluded since they represented a clinical sample according to the following exclusion criteria: 1) to be diagnosed or receive medical/psychological treatment for any sleep or psychological disorder (10.3%, n = 69); and 2) to score over 10 in the Insomnia Severity Index (ISI; Bastien, Vallières, & Morin, 2001) as this is considered a clinical outcome (21%, n = 140) (Morin, Belleville, Bélanger, & Ivers, 2011).

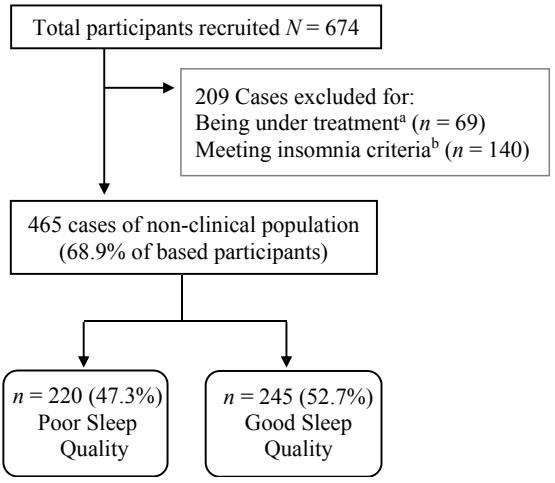

Figure 1. Sample selection flowchart.
[a]Receive medical/psychological treatment for any sleep or psychological disorder
[b]Categorized as clinical insomnia with Insomnia Severity Index (ISI > 10)

The final sample included 465 participants with median age of 35 years (IQR = 28–44) ranging from 18 and 75 years. This sample size was sufficient as the minimum sample size required for an expected rate of 38% of sleep problems in the Spanish population (Madrid-Valero et al., 2017) was 255 participants (95% confidence interval, ±5 margin error).

The majority of participants were women 70.3% (n = 327), had a higher education level (65.4%; n = 304), were full-time or part-time employees (70.5%, n = 328), and were married or in a stable relationship (50.5%, n = 235). Likewise, one third of the sample (n = 142) were people working night shifts (n = 47) or taking care of people during night (e.g., babies, elderly, or ill people; n = 95). See Table 1.

Sample was divided into two groups according to the Pittsburgh Sleep Quality Index (PSQI) score (Buysse, Reynolds, Monk, Berman, & Kupfer, 1989): 52.7% (n = 245) of *good quality sleepers* (GQS; PSQI cut off ≤ 5) and 47.7% (n = 220) of *poor quality sleepers* (PQS; PSQI cut off > 5). Regarding this, no significant differences were found for any sociodemographic variables between GSQ and PSQ groups.

Table 1
Sociodemographic and sleep characteristics of the sample and intergroup difference analysis between Good Quality Sleepers (GQS) and Poor Quality Sleepers (PQS)

Variables	Total (N = 465)	GSQ (n = 245)	PSQ (n = 220)	Z/χ^2 (p)[a]
Sociodemographic				
Age *mean* (*SD*) / median (IQR) years	37.04 (12.33) / 35 (28–44)	37.57 (12.8) / 36 (27.48)	36.44 (11.8) / 34 (28–42)	-0.83 (.41)
% (n) Women	70.3 (327)	66.5 (163)	74.5 (164)	3.19 (.07)
% (n) Higher education	65.4 (304)	67.3 (165)	63.2 (139)	0.71 (.40)
% (n) Employees	70.5 (328)	71 (174)	70 (154)	0.02 (.89)
% (n) Stable relationship	50.5 (235)	42.2 (128)	48.6 (107)	0.47 (.49)
% (n) Work night shifts	10.1 (47)	10.2 (25)	10 (22)	0.01 (.99)
% (n) Night caregivers	20.4 (95)	22 (54)	25.9 (57)	0.75 (.39)
Sleep quality				
PSQI *mean* (*SD*) / *median* (IQR)	5.72 (2.50) / 5 (4–7)	3.88 (1.08) / 4 (3–5)	7.81 (1.89) / 7 (6–9)	-18.77 (<.01)
Duration				
Hours *mean* (*SD*) / *median* (IQR)	6.87 (1.03) / 7 (6–8)	7.28 (0.88) / 7 (7–8)	6.42 (1.00) / 6 (6–7)	-9.60 (<.01)
% (n) < 7 hrs.	37.4 (174)	16.3 (40)	60.9 (134)	96.49 (<.01)
Latency				
Minutes *mean* (*SD*) / median (IQR)	19.93 (16.20) / 15 (10–30)	13.79 (10.75) / 10 (5–15)	26.76 (18.38) / 20 (15–30)	-8.47 (<.01)
% (n) ≥ 30 min.	30 (138)	13.9 (34)	47.3 (116)	60.35 (<.01)
% (n) Awakenings ≥ 3 d/w.	20.6 (199)	10.6 (26)	31.8 (70)	30.54 (<.01)
% (n) Sleepiness ≥ 3 d/w.	7.3 (34)	2.4 (6)	12.7 (28)	16.58 (<.01)
% (n) Medication use (yes)	11.4 (53)	6.1 (15)	17.3 (38)	13.29 (<.01)
% (n) Subjective bad quality	11.6 (54)	1.6 (4)	22.7 (50)	48.22 (<.01)

Note. [a]Chi square for non-continuous variables and Mann-Whitney U test for continuous variables with p value; d/w = days per week.

Variables and Measurements

We assessed general sociodemographic variables (i.e., age, sex, marital status, level of education, employment situation, working night shifts and taking care of people during night) and also:

Insomnia criteria. We used the self-reported questionnaire Insomnia Severity Index (ISI; Bastien et al., 2001) to identify people that could be diagnosed with insomnia using a cut-off point of 10 (Morin et al., 2011). The ISI provides information about insomnia severity, sleeping problems, level of satisfaction, and the impact on life quality. The 7 items of the questionnaire are rated on a 5-point Likert scale and the total scores range from 0 to 28, where higher values represent more severe insomnia. A study with the Spanish version in the general population showed adequate psychometric properties (Fernandez-Mendoza et al., 2012). Data

from this study suggested acceptable reliability of the ISI with values of Cronbach's alpha and omega of $\alpha = .65$ and $\omega = .75$.

Sleep quality. The Pittsburgh Sleep Quality Index (PSQI; Buysse et al., 1989) measured sleep quality within the past month through seven sleep components: 1) number of hours of sleep, 2) sleep latency or time it takes to fall asleep, 3) sleep efficiency which refers to the percentage of time spent asleep while in bed, 4) night disturbances as nightmares, awakenings, snoring, etc., 5) use of hypnotic medication for sleep problems, 6) daytime dysfunction or sleepiness, and 7) subjective quality of sleep. The global score of the 19-items PSQI ranges from 0 to 21, where scores over 5 indicate poor quality of sleep. The Spanish version showed good internal consistency with Cronbach's $\alpha = .81$, and sound validity, with an 88.63% sensitivity and a 74.19% specificity (Royuela & Macías Fernández, 1997). Alpha and omega PSQI values in this study were $\alpha = .70$ and $\omega = .75$.

Sleep hygiene. In order to examine bedtime habits in the general population we selected the practices included in the Sleep Hygiene Practice Scale (SHPS; Yang, Lin, Hsu, & Cheng, 2010). This scale assesses how often participants followed 30 maladaptive sleep guidelines with a 5-point Likert scale scored form 1 (*never*) to 5 (*always*). The global score ranges from 30 to 150 with higher scores indicating worse sleep hygiene. The SHPS classifies maladaptive practices into 4 subscales: 1) Arousal-related behaviors; 2) Sleep scheduling and timing; 3) Eating and drinking behaviors; and 4) Sleep environment.

The SHPS was translated and adapted into Spanish by a forward-translation procedure. Before using this version, a pilot study was performed to examine the general functioning of the measure. The Spanish SHPS showed good internal consistency with data collected in this study with values of Cronbach's alpha and omega of $\alpha = .70$ and $\omega = .73$.

Procedure

An online recruitment method was performed to conduct the study using Survio®. The online survey included all the measures of this study and information about participants' data protection and privacy. Likewise, through this survey, we asked the participants for informed consent before completing it.

In order to disseminate the survey via a 'snowball' sampling technique, we selected the first wave of participants that acted as precursors for a chain dissemination of survey. Seed-participants were selected based on diverse sociodemographic characteristics (age, gender, level of education, etc.) from the authors' social context. We contacted them to ask for their collaboration in this study that would include forwarding the survey to multiple people and we informed them about different dissemination paths such as via instant messaging or posts on social networks. Likewise, we asked them to request subsequent participants to also disseminate the link in order to increase the number of referrals.

Statistical Analysis

We performed descriptive analyses (frequencies, means, standard deviations, medians and interquartile ranges) and bivariate analyses. Chi-square test (χ^2) was used to compare non-continuous variables and Mann-Whitney *U* non-parametric test (*Z*) to compare continuous variables due to violation of normality assumption, which was tested with Kolmogorov-Smirnov test. Likewise, Bonferroni adjustment was used for multiple comparisons to control the familywise error rate by dividing the critical value ($\alpha = .05$) by the number of tests performed (.05/30 practices = .0017). Likewise, we calculated Rosenthal *r* effect size with the following thresholds of interpretation: .1 for small effect size, .2

for moderate, and .5 for large (Rosenthal, 1994). Finally, we performed a binary logistic regression to analyze which sleep hygiene guidelines (SHPS) show stronger association with the quality of sleep (PSQI) by entering simultaneously only the sleep hygiene guidelines that were significant in the intergroup comparison analysis. Bonferroni adjustment was also applied for this regression analysis (.05/8 practices = .0063). 95% confidence of level was used to interpret data results.

Results

Sleep Quality and Differences between GQS and PQS

As shown in Table 1, participants stated to sleep an average of 6.87 (*SD* = 1.03) hours per night, of which 37.4% (*n* = 174) did not achieve the minimum recommendation of 7 hours of sleep. Around a third of the sample (*n* = 138) indicated having trouble falling asleep the first 30 minutes, while sleep latency mean average was about 20 (*SD* = 16.2) minutes. Moreover, 20.6% (*n* = 199) of participants had difficulties maintaining sleep, 11.4% (*n* = 53) reported taking hypnotic medication and 7.3% (*n* = 34) experienced sleepiness at least 3 days per week.

Sample's average PSQI score was 5.72 (*SD* = 2.5) whereas the percentage of healthy individuals with poor sleep quality was 47.3% (*n* = 220). By contrast, only 11.6% (*n* = 54) stated to experience poor quality of sleep.

Intergroup comparisons showed that PQSs had significantly higher PSQI scores than GQSs ($Z = -18.77$; $p < .001$), and these differences were also found in all sleep features (see Table 1).

Sleep Hygiene Practices and Differences between GQS and PQS

Figure 2 describes the percentage of participants who more frequently performed the 30 maladaptive sleep hygiene behaviors. More than half of the sample declared to frequently perform (SHPS scores ≥ 3) the following maladaptive sleep behaviors: *sleep in on weekends* (86%), *pondering unresolved matters while lying in bed* (71.4%), perform *lack of regular exercise* (63%), having *inconsistent bedtimes* (61.9%), having *sleep-unrelated items in the bedroom* (61.3%), doing *sleep-unrelated activities in bed* (57.2%), and dedicate *lack of time to relax before sleep* (55.7%).

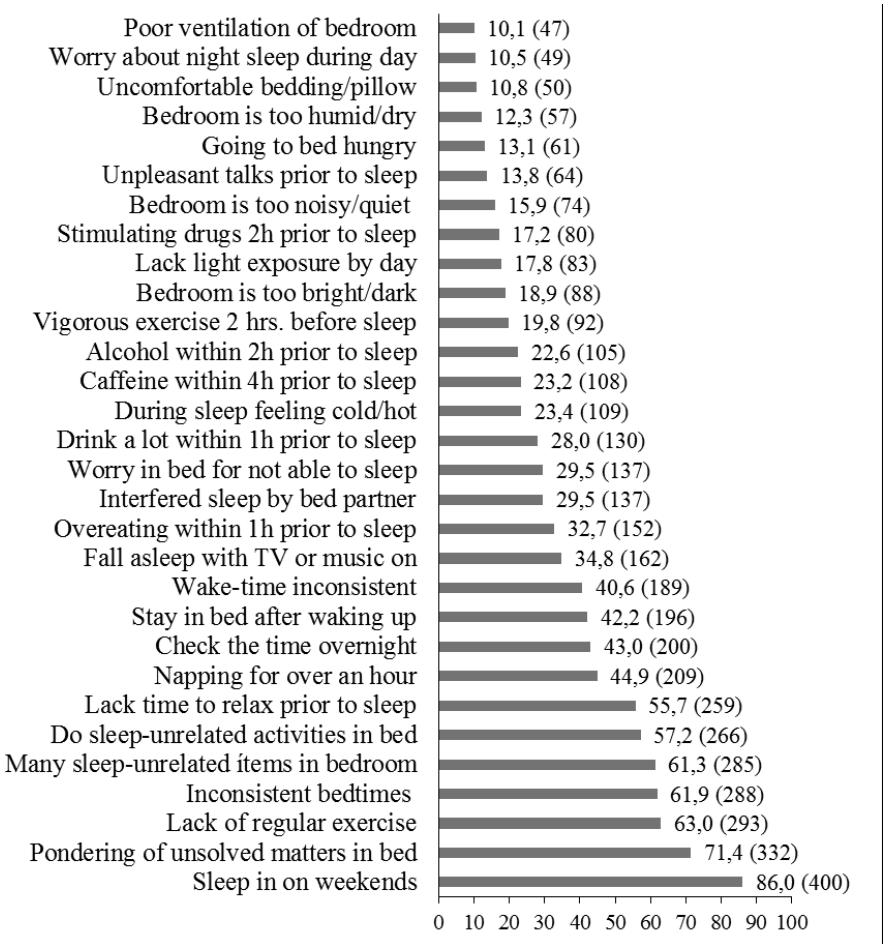

Figure 2. Percentage of participants (n) who more frequently performed the 30 maladaptive sleep hygiene behaviors according to SHPS scores ≥ 3.

On the other hand, Table 2 shows median frequencies of sleep hygiene practices performed by GQSs and PQSs. Total SHPS scores were significantly higher ($Z = –7.719$; $p < .01$) in the PSQ group ($M = 68$; IQR = 62–74) than in the GSQ group ($M = 61$; IQR = 55–68), with a moderate effect size ($r = .36$).

In order to compare the median of each SHPS behavior between GQSs and PQSs, Bonferroni adjustment was made considering the 30 SHPS guidelines (critical value of $\alpha = .0017$). PQSs had significant higher scores than GQSs in 8 of the 30 sleep hygiene practices, of which five showed a medium effect size ($r \geq .2$): *worry in bed about not being able to fall asleep* ($Z = –8.417$), *check the time in the middle of the night* ($Z = –6.908$), *worry about night-time sleep during the day* ($Z = –6.685$), *pondering unresolved matters while lying in bed* ($Z = –5.928$), and *have inconsistent or irregular bedtimes* ($Z = –4.236$). The remaining three

maladaptive guidelines yielded small effect sizes ($r < .2$): *feeling cold or hot during sleep* ($Z = –4.086$), *do sleep-unrelated activities in bed* ($Z = –3.498$), and *sleep is interfered by a bed partner* ($Z = –3.383$).

Table 2
Median (IQR) differences of Sleep Hygiene Practices between Good-Quality Sleepers (GQS) and Poor-Quality Sleepers (PQS).

SHPS Guidelines	GQS $n = 245$ median (IQR)	PQS $n = 220$ median (IQR)	Z^a	r^b
SHPS global score	61 (55–68)	68 (62–74)	-7.72**	.36
Sleep scheduling				
Sleep in on weekends	3 (3–4)	4 (3–4)	-1.13	.05
Lack of regular exercise	3 (2–4)	3 (2–4)	-1.15	.05
Inconsistent bedtimes	3 (2–3)	3 (2–4)	-4.24†	.20
Stay in bed after waking up	2 (2–3)	2 (2–3)	-1.30	.06
Napping for over an hour	2 (2–3)	2 (2–3)	-0.08	0
Wake-time inconsistent	2 (2–3)	2 (2–3)	-2.51*	.12
Lack light exposure by day	2 (1–2)	2 (1–2)	-1.52	.07
Arousal-related behaviors				
Pondering unsolved matters in bed	3 (2–3)	3 (3–4)	-5.93†	.28
Lack time to relax prior to sleep	3 (2–4)	3 (2–4)	-2.67**	.12
Do sleep-unrelated activities in bed	3 (2–3)	3 (2–4)	-3.50†	.16
Check the time overnight	2 (1–3)	3 (2–3)	-6.91†	.32
Fall asleep with media on	1 (1–3)	2 (1–3)	-2.61*	.12
Worry in bed about not being able to sleep	2 (1–2)	2 (2–3)	-8.42†	.39
Unpleasant talks prior to sleep	2 (1–2)	2 (2–2)	-2.51*	.12
Vigorous exercise prior to sleep	1 (1–2)	1 (1–2)	-0.42	.02
Worry about night sleep during day	1 (1–1)	2 (1–2)	-6.69†	.31
Food and Drinks				
Overeating within 1h prior to sleep	2 (1–3)	2 (2–3)	-3.09**	.14
Drink a lot within 1h prior to sleep	2 (1–3)	2 (2–3)	-1.20	.06
Alcohol within 2h prior to sleep	2 (1–2)	2 (1–2)	-0.50	.02
Caffeine within 4h prior to sleep	2 (1–2)	2 (1–2)	-0.42	.02
Going to bed hungry	1 (1–2)	2 (1–2)	-2.77	.13
Stimulating drugs 2h prior to sleep	1 (1–1)	1 (1–2)	-0.92	.04
Sleep environment				
Many sleep-unrelated items in bedroom	3 (1–5)	4 (2–5)	-2.84**	.13
During sleep feeling cold/hot	2 (1–2)	2 (1–3)	-4.09†	.19
Sleep interfered by bed partner	2 (1–2)	2 (1–3)	-3.38†	.16
Bedroom is too bright/dark	1 (1–2)	1 (1–2)	-1.57	.07
Bedroom is too noisy/quiet	1 (1–2)	2 (1–2)	-2.98**	.14
Bedroom is too humid/dry	1 (1–2)	1 (1–2)	-1.65	.08
Uncomfortable bedding/pillow	1 (1–2)	1 (1–2)	-2.05*	.10
Poor ventilation of bedroom	1 (1–1)	1 (1–2)	-2.75**	.13

[a] Mann-Whitney *U* non-parametric test and *p* value; [b] Rosenthal effect size

†Significant at $\alpha = .00017$ (Bonferroni adjusted for the 30 *practices*); *$p < .05$; **$p < .01$

Power of Association of Sleep Hygiene Practices on Sleep Quality

In order to study the strength of association between sleep hygiene guidelines and the quality of sleep, we performed a logistic regression analysis introducing simultaneously the sleep hygiene practices in which groups' scores showed significant differences ($p < .0017$). The regression model was statistically significant predicting poor quality of sleep ($\chi^2 = 139.914$; $p < .01$) with a Nagelkerke R^2 of .347 and a 73.8% of correct cases classified. As Table 3 shows, of the 8 practices introduced in the equation, 6 were statistically significant ($p < .05$), of which 4 remained significant after Bonferroni adjustment (.05/8 practices = .0063): 1) *worry in bed about not being able to fall asleep* (OR = 1.920; CI 95% [1.419–2.598], $p < .006$); 2) *have inconsistent bedtimes* (OR = 1.557; CI 95% [1.205 – 2.011], $p < .006$); 3) *check the time in the middle of the night* (OR = 1.441; CI 95% [1.127–1.844], $p < .006$); and 4) *pondering unresolved matters while lying in bed* (OR = 1.394; CI 95% [1.110–1.751], $p < .006$).

Table 3
Predictive power of the sleep hygiene behaviors that were significant in the intergroup comparison analysis on Sleep Quality (N = 465)

Guidelines	*B*[a]	*SE*[b]	Wald[c]	OR[d]	CI (95%)[e]	*p*[f]
Inconsistent bedtimes	.44	0.13	11.47	1.56	1.20–2.01	.001[†]
Pondering unsolved matters in bed	.33	0.12	8.15	1.39	1.11–1.75	.004[†]
Do sleep-unrelated activities in bed	.18	0.10	3.95	1.20	1.00–1.44	.047*
Check the time overnight	.37	0.13	8.46	1.44	1.13–1.84	.004[†]
Worry in bed about not being able to sleep	.65	0.15	17.91	1.92	1.42–2.60	.001[†]
Worry about night sleep during day	.37	0.18	4.41	1.45	1.02–2.06	.036*
During sleep feeling cold/hot	.28	0.14	3.80	1.32	1,00–1.74	.051
Interfered sleep by bed partner	.31	0.12	6.74	1.37	1.08–1.73	.009**

Note. Omnibus test statistic ($\chi^2 = 139.914$; $df = 8$; $p < .01$); 73.8% of the cases correctly predicted; $R^2_{\text{Nagelkerke}} = .347$.

[a]Coefficent for the binary logistic equation; [b]Standard error; [c]Wald test, relevance for the model; [d]Odds Ratio; [e]Associated probability (*p* value); [f]Coeficient interval;

[†]Significant at α = .006 (Bonferroni adjusted for the 8 *practices*); *$p < .05$; **$p < .01$;

Discussion

Approximately 50% of participants reported poor quality of sleep according to PSQI scores. This percentage is slightly higher than that observed in previous studies performed in the Spanish population (38.2%; Madrid-Valero et al., 2017), which supports the hypothesis about the increase in sleep problems (Léger et al., 2008). Although nearly half of the sample reported poor sleep quality, only 11.6% rated their overall sleep as bad, which could suggest that perception of poor quality of sleep is undervalued or underestimated.

Considering recommendations about the duration of sleep needed to preserve health, the average number of hours of sleep in the sample was insufficient (Buysse, 2014). Likewise, difficulties in initiating or maintaining sleep were slightly higher compared to other non-clinical populations (Madrid-Valero et al., 2017). In accordance with other studies, these findings indicate that a large percentage of healthy individuals experience inadequate sleep, which supports the hypothesis that sleep problems are emerging as a public health issue (Adams et al., 2017; Ford et al., 2015).

Results of this study also suggested that having inadequate sleep is associated with maladaptive sleep hygiene. Participants that more frequently perform these bedtime behaviors showed significant higher PSQI scores than good sleepers. These findings concur with previous studies with non-clinical population where participants with inappropriate sleep hygiene had more night awakenings, took longer to fall asleep and showed greater sleepiness during daytime (Chen et al., 2010; Morita et al., 2012).

Certain maladaptive bedtime habits yielded stronger association with poor sleep. Intergroup comparisons between GQSs and PQSs showed major differences in arousal-related behaviors prior to sleep in comparison with other comportments. This could indicate that healthy individuals that have more thoughts, worries and activity prior to sleep could be prompting sleep problems. Similarly, having an irregular bedtime schedule showed strong association with poor sleep, as seen in previous studies where people that more frequently had irregular sleep schedule reported sleeping less and having longer sleep latency (Härmä et al., 2018; Kang & Chen, 2009). In addition, significant mean differences were also found in other sleep hygiene behaviors between PQSs and GQSs, but the effect sizes were small ($r < .2$). These behaviors, such as keeping an appropriate bedroom temperature or using the bed to sleep only, need to also be taken into account in order to improve sleep quality as recommended in other studies (Irish et al., 2015).

In accordance with these results, regression analysis also indicated that people who more frequently perform behaviors that increase cognitive arousal level before sleep or have irregular bedtimes seem to be more likely to manifest poor sleep than people that don't perform those behaviors or perform them less often. These findings concur with results of other studies where participants with higher stress levels, higher cognitive activity prior to sleep, and more variable sleep schedules experienced more sleep problems (Gunn, Troxel, Hall, & Buysse, 2014; Härmä et al., 2018; Nota, Sharkey, & Coles, 2015). Sleep worries and preoccupations during bedtime have been shown to impair sleep quality and to maintain insomnia (Lancee, Eisma, van Zanten, & Topper, 2017; Takano, Iijima, & Tanno, 2012). Therefore, based on the results of this study it is worth considering potential behavioral strategies such as refocusing-retracting attention from intrusive thoughts (Gellis, Arigo, & Elliott, 2013), or solving stressful problems (Pech & O'Kearney, 2013) that could reduce night concerns, in order to improve treatments' efficacy to reduce sleep disturbances and prevent sleep disorders.

Several limitations should be considered. As this is a cross-sectional study, it is not possible to determine causal relationships between variables However, regression analysis produced a well-fitting model classifying poor sleepers with few maladaptive sleep hygiene practices. Furthermore, the use of self-reported measures can have bias associated, such as central tendency responses due to scales format. These bias were minimized using different questionnaires that assess similar sleep features and selecting a user-friendly survey layout.

In conclusion, aspects such as arousal-related behaviors and excess of concerns during bedtime could disturb the quality of sleep, as well as inconsistent bedtimes. In this sense, it seems necessary to improve sleep quality in the general population in order to prevent sleep disorders and related diseases and this can be done by addressing cognitive activity prior to sleep. Future longitudinal and experimental studies should be performed to corroborate the findings of this study and provide effective sleep hygiene programs.

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Povezanost ponašanja koja se odnose na lošu higijenu spavanja sa kvalitetom spavanja u opštoj populaciji

Clara Sancho-Domingo, José Luis Carballo,
Ainhoa Coloma-Carmona, and Jesús Rodríguez-Marín

Center of Applied Psychology of the Miguel Hernández University of Elche, Spain

Učestalost problema sa spavanjem se globalno povećala u novije vreme, a primena preporuka koje se tiču higijene spavanja dala je nekonzistentne rezultate. Cilj ovog istraživanja je da ispita kvalitet spavanja u nekliničkoj populaciji i njegovu povezanost sa lošom higijenom spavanja. 465 učesnika istraživanja, prosečne starosti 35 godina, (interkvartilni opseg – IQR = 28–44) je popunilo Skalu prakse higijene spavanja (eng. Sleep Hygiene Practices Scale, SHPS) i Pitsburški indeks kvaliteta spavanja (eng. The Pittsburgh Sleep Quality Index; PSQI). Uzorak je podeljen na osobe sa dobrim kvalitetom sna (eng. *good-quality sleepers*; GQS, 52.7%, n = 245) i osobe sa lošim kvalitetom sna (eng. *poor-quality sleepers*; PQS, 47.3%, n = 220). Statistički testovi su pokazali da osobe sa lošim kvalitetom sna imaju značajno više skorove na skali higijene spavanja (M = 61; IQR = 55–68, $p < .01$) u odnosu na osobe sa dobrim kvalitetom sna (M = 68; IQR = 62–74). Rezultati logističke regresije su pokazali da ponašanja koja podrazumevaju kognitivnu pobuđenost i nekonzistentno vreme odlaska na spavanje predviđaju loš kvalitet sna ($R^2 = .35$; $p < .01$). Može se zaključiti da je loš kvalitet sna učestao među zdravim odraslim osobama i da je snažno povezan sa kognitivnom aktivnošću neposredno pred spavanje. Ovo ukazuje da intervencije koje imaju za cilj poboljšanje kvaliteta sna treba da uzmu u obzir strategije koje bi sprečile da osoba pred spavanje usmerava pažnju na brige i probleme.

Ključne reči: higijena spavanja, ponašanja koja podižu budnost, kvalitet spavanja, kognitivna aktivnost, neregularni odlasci na spavanje

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