

ORIGINAL ARTICLE

Sleeping Position, Expression of Anger and Subjective Sleep Quality in University Students

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ABSTRACT

Objective: To analyze the subjective quality of sleep and the expression of anger according to the position adopted during sleep.

Methods: Using an ex-post facto design and an incidental sampling procedure, 729 university students participated in the study, 63% of which were women. The subjective quality of sleep was assessed using the Pittsburgh Sleep Quality Index (PSQI) and anger was measured using the State-Trait Anger Expression Inventory-2 (STAXI-2). One question was used to determine the body position: "Normally, what position do you adopt when sleeping? [Right Lateral Decubitus (RLD), Left Lateral Decubitus (LLD), Supine Decubitus (SUD), or Prone Decubitus (PD)]."

Results: Of our sample, 42.4% reported sleeping in the RLD position, 29.2% in LLD, 10.6% in SUD and 17.8% in PD. Women tended to sleep in RLD and not in SUD, while in men there is a tendency to sleep in the SUD position and not in RLD ($\chi^2_{(3,729)}=15.119$, $p=.002$). People who reported sleeping in RLD appeared to have poorer quality of sleep compared with the group that reported sleeping in LLD. Those who adopt the PD position show the highest scores on the scales measuring Feelings of Anger, Trait-Anger, Temperament of Anger, Index of Expression of Anger, and External Expression of Anger.

Conclusion: The data appear to support the existence of relationships between the posture adopted during sleep, the subjective quality of sleep and emotional states. In future research it will be necessary to apply methodologies with greater control of the variables along with objective measures of body position.

Keywords: anger, sleeping position, subjective quality of sleep, college students

INTRODUCTION

Body position and motor activity have been related to sleep (Horne, Franco, Adamson, Groswasser, & Kahn, 2002; Lorrain, & De Koninck, 1998). There have been a number of studies analysing the influence of body position, particularly the dorsal position, on snoring and

sleep apnea throughout the life cycle (Pereira, Rathi, Fatakia, Haque, & Castriotta, 2008; Willinger, Ko, Hoffman, Kessler, & Corwin, 2003), leading to the design of preventive and therapeutic strategies based on it (Van Maanen & de Vries, 2014; Van Maanen et al., 2013).

In healthy people, there appears to be a preference for body position at bedtime that affects the characteristics present during sleep, as would be the case where nocturnal paresthesias are manifest (Roth-Bettlach et al., 2017). For both women and men, sleeping in the right lateral decubitus position occurs more frequently than sleeping in the left lateral decubitus position, and whilst there are no differences in the frequency of changes in position, the supine type is more common than the lateral type (Ichijo & Akita, 2017).

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The literature is scarce in terms of studies that analyze the influence of adopted body position and sleep quality (Agargun, Boysan, & Hanoglu, 2004; De Koninck, Gagnon, & Lallier, 1983; Gordon, Grimmer, & Trott, 2004; Nojiri, Okumura, & Ito, 2014; Yu, 2012). The first work to relate sleeping body posture (right side versus left side) to the presence of nightmares or dreams of emotional content and subjective sleep quality, as measured by the Pittsburgh Sleep Quality Index (PSQI) (Agargun et al. 2004), showed that the presence of nightmares was significantly higher in people who slept on the left side (40.9%) compared with those who slept on the right side (14.6%). Positive emotions and a sense of security in the presence of nightmares were more common in those who slept in the right lateral decubitus position, whilst the total score on the PSQI was significantly lower in people who slept on the right side than in those who slept on the left side (Agargun et al., 2004).

In addition, De Koninck et al., (1983) have previously shown that individuals having poor sleep quality spend more time on their backs and with their heads straight in comparison with good sleepers. Subsequently, Yu (2012) reported that the prone position was positively associated with high scores on neuroticism and emotional instability, as well as with the narrative content of disturbing dreams (being locked up, drowning, and unable to move).

When sleep has been assessed through questionnaires-subjective quality-and actigraphy-objective quality-the absence of a correlation between both measurements is striking (Nojiri et al., 2014). In older patients, the quality of objective sleep is poor, but the subjective quality of sleep is much better, whereas young people show good objective quality of sleep, but low subjective quality of sleep (Nojiri et al., 2014).

Moreover, it has been possible to observe how emotional states prior to sleep affect both sleep and the modulation of sympathetic activity during sleep (Delannoy, Mandai, Honoré, Kobayashi, & Sequeira, 2015). People who express negative daytime emotions such as anxiety and irritability, often have poor sleep quality (Brissette & Cohen, 2002; Mezick et al., 2009; Ong, Carde, Gross, & Manber, 2011) and other problems such as insomnia (Akerstedt, Kecklund, & Axelsson, 2007;

Lundh & Broman, 2000).

However, the relationship between sleep quality and anger has not been well studied (Arbinaga, 2017; Engin, Keskin, Dulgerler, & Bilge, 2010; Kamphuis & Lancel, 2015; Shin et al., 2005; Stoia-Caraballo et al. al., 2008). Anger is identified as activation and a tendency to attack, and arises as a reaction to a threat, coercion or damage, frustration, or differential treatment (Fernández, 2008). When anger is intense and sustained over time it can have effects on health (Chida & Steptoe, 2009). A distinction has been made between state-anger and trait-anger (Spielberger, Jacobs, Russel, & Crane, 1983) and due to its negative influence on health (Delannoy et al., 2015) it is important to take into account the way in which it is expressed: either as anger-in -or internalized- or as anger-out -or externalized- (Gerin, Davidson, Christenfeld, Goyal, & Schwartz, 2006; Ramsay, McDermott, & Bray, 2001). The control of emotional expression helps to reduce its impact on sleep (Diestel, Rivkin, & Schmitl, 2015) and other health problems (Caska et al., 2009; Eng, Fitzmaurice, Kubzansky, Rimm, & Kawachi, 2003; Kitayama et al., 2015). Thus, it has been observed that an inadequate emotional reaction to daily stressful events is usually characterized by a lower sleep spindle density (Dang-Vu et al., 2015), as well as alterations in the duration and development of REM sleep (Lai, Chen, Kuo, Chen, & Yang, 2016).

This set of findings suggests that the perceived quality of sleep may have some kind of relationship with the body posture adopted during sleep. In addition, it is possible that sleep disturbances affect emotional reactivity, and are influenced by emotional reactions. In this regard, given the effect of controlling emotional expression and emotional states on the quality of sleep, along with the impact of these factors on general health (Chida & Steptoe, 2009), particularly the ability to control the negative emotion of anger (Arbinaga, 2017), the aim of the current work was to analyze the relationship that may exist between the position adopted during sleep (Supine Decubitus -SUD-, Prone Decubitus -PD-, Left Lateral Decubitus -LLD- and Right Lateral Decubitus -RLD-) the subjective quality of sleep, and the expression of anger in university students.

Taking the work of Agargun et al. (2004) and Yu (2017) as a starting point, the following hypotheses are proposed. Hypothesis 1) people who claim to adopt the LLD posture will report worse subjective quality of sleep than those who sleep in the RLD position; Hypothesis 2) those who adopt the RLD position will obtain the lowest score on the anger scales; and Hypothesis 3) those who adopt the PD position will obtain the highest score on the anger scales.

METHOD

Design and procedure

Using an ex post facto design, an incidental sampling procedure was used to select students from various University Degree courses. All the participants completed the informed consent and the tests were administered in a designated classroom during a period in which there were no exams. The study was approved by the university's bioethics committee and followed the recommendations of the Declaration of Helsinki (1975-2000).

Participants

A sample of 729 university students participated in the study, of which 63% ($n = 459$) were women. The average age of the sample was 22.31 years ($SD = 3.282$) (Min = 19 years and Max = 36 years). Men had an average age of 23.16 years ($SD = 3.397$) and women 21.82 years ($SD = 3.111$), with significant differences between them ($t = 5.403$, $p < .001$).

Instruments

Subjective Sleep Quality was assessed using the Pittsburgh Sleep Quality Index (PSQI; Buysse, Reynolds et al., 1989) in the Spanish version developed by Macías and Royuela (1996), whose predictive validity using a cut-off point of 5 (> 5 worse quality of sleep) showed a sensitivity of 89.6% and a specificity of 86.5%. The 19 items analyzed the following sleep quality factors: Component 1. Subjective Sleep Quality, Component 2. Sleep Latency, Component 3. Sleep Duration, Component 4. Sleep Efficiency, Component 5. Sleep Disturbance, Component

6. Use of Sleeping Medication, and Component 7. Daytime dysfunction. A total score of PSQI (0-21) is obtained, where higher scores indicate worse sleep quality. In addition, we collected data on the reported number of hours of sleep and the total hours spent in bed.

To assess anger, the State-Trait Anger Expression Inventory-2 (STAXI-2) (Spielberger, 1999) in its Spanish version (Miguel-Tobal, Casado, Cano-Vindel & Spielberger, 2001) was employed. A total score for State-Anger (SA) is obtained, with three subscales: Feelings of Anger (SA/F), Verbal Expression of Anger (SA/V) and Physical Expression of anger (SA/P). A total score for Trait-Anger (TA) was obtained with two subscales: Anger Temperament (TA/T) and Anger Reaction (TA/R). Finally, the instrument used a scale for the (AEI) with four subscales: External Expression-Anger (Exp/Ext), Internal Expression-Anger (Exp/Int), External Control-Anger (C/Ext) and Internal Control-Anger (C/Int). A Cronbach's alpha of .89 was reported for SA, of .82 for TA, and of .69 for the AEI (Miguel-Tobal, et al., 2001).

Assessment of the adopted body posture was conducted by means of the following question: "Usually, which posture do you adopt when sleeping? [Right Side, Left Side, Face-up, or Face-down, which are equivalent to RLD, LLD, SUD, and PD]."

Statistical Analyses

Statistical analyzes were performed with the SPSS Statistics 23 (IBM). Descriptive tests were conducted (M, SD). The Student's t test, and its effect size with Cohen's d , (small = 0.2-0.3, medium = around 0.5, and large = ≥ 0.8) was used in the comparison by gender of the quality of sleep and the expression of anger. The χ^2 , and its effect sizes (Phi, Cramer's V), were used in the analysis of categorical variables, calculating the OR for each of them. The Snedecor F and Tukey post hoc tests were used in the corresponding ANOVA and their effect sizes (η_p^2).

RESULTS

The Cronbach's alpha obtained for the Pittsburgh Sleep Quality Index (PSQI) was acceptable ($\alpha = .735$).

With respect to the total score on the PSQI, it was observed that 53.8% of the sample obtained values higher than 5 points, which indicates poor sleep quality. Regarding the gender of the sample, 57.7% of the women (compared with 47.2% of men) reported having poor quality of sleep, indicating that women present a higher risk of poor sleep quality with an OR = 1.524 and a 95%CI [1.125-2.063] (Phi = .101) compared with men ($\chi^2_{(1,725)} = 7.453, p = .006$).

In addition, the Cronbach's alpha obtained for the three scales of the STAXI-2 are quite acceptable (Trait-Anger: $\alpha = .828$; State-Anger: $\alpha = .915$; AEI: $\alpha = .739$). It is observed that on Trait-Anger women obtain higher

scores ($M = 21.69, SD = 5.402$) than men ($M = 19.96, SD = 5.031$) which was significant ($t = 4.300, p < .001$) and with a small effect size ($d = 0.33$). On the AEI scale, it is also the women ($M = 31.013, SD = 10.581$) who score more than men ($M = 28.719, SD = 9.385$) which is also significant ($t = 2.946, p < .001$) with a small effect size ($d = 0.23$). However, on the State-Anger scale no differences were found ($t = .907, p = .368$) between women ($M = 18.36, SD = 5.641$) and men ($M = 18.77, SD = 6.355$).

Of our sample, 42.4% ($n=309$) (36.7% of men and 45.8% of the women) reported to sleep in the RLD position, 29.2% ($n = 213$) (28.9% of men and 29.4% of women) in LLD, 10.6% ($n = 77$) (15.9% of men and 7.4%

Table 1. Adopted sleep position and scores on the Pittsburgh Sleep Quality Index (PSQI) in university students

	Sleep position				$F_{(3,728)}$	p	η_p^2
	RLD (n=309)	LLD (n=213)	SUD (n=77)	PD (n= 130)			
	M±SD	M±SD	M±SD	M±SD			
PSQI-Total	6.66 ± 3.072	5.98±2.913	5.99±3.397	6.08±2.859	2.742	.042	0.012
Hours of sleep	6.76±1.031	6.81±.918	7.03±.938	7.00±1.084	2.749	.042	0.012
Hours spent in bed	7.78±1.150	7.76±.980	7.94±1.081	7.82±.9072	.571	.634	
Component 1.- Subjective sleep quality	1.22±.733	1.05±.784	1.16±.859	1.07±.779	2.512	.057	
Component 2.- Sleep latency	1.44±.952	1.23±.927	1.30±.961	1.41±.851	2.482	.060	
Component 3.- Sleep duration	.85±.661	.78±.603	.73±.621	.75±.561	1.299	.274	
Component 4.- Sleep efficiency	.51±.800	.40±.749	.38±.779	.32±.638	2.210	.086	
Component 5.- Sleep disturbance	1.17±.462	1.14±.434	1.18±.555	1.15±.451	.248	.863	
Component 6.- Use of sleeping medication	.38±.778	.31±.718	.25±.588	.32±.709	1.226	.299	
Component 7.- Day time dysfunction	1.08±.843	1.09±.777	1.00±.858	1.13±.884	.413	.744	

PSQI-TOTAL: Total scores on the Pittsburgh Sleep Quality Index, RLD: Right Lateral Decubitus, LLD: Left Lateral Decubitus, SUD: Supine Decubitus, PD: Prone Decubitus

Table 2. Adopted sleep position and expression of anger scores according to the STAXI-2 in university students

	Sleep position				$F_{(3,728)}$	p	η_p^2
	RLD (n=309)	LLD (n=213)	SUD (n=77)	PD (n= 130)			
	M±SD	M±SD	M±SD	M±SD			
State-Anger	18.47±6.132	17.82±5.556	18.88±4.732	19.49±6.468	2.276	.079	
Feelings	6.58±2.607	6.27±2.236	7.05±2.276	7.05±2.905	3.426	.017	0.014
P. Exp	5.59±1.890	5.49±1.723	5.66±1.401	5.86±2.170	1.108	.345	
V. Exp	6.29±2.514	6.06±2.383	6.17±2.080	6.58±2.661	1.241	.294	
Trait-Anger	20.94±5.265	20.33±5.083	21.21±4.780	22.39±5.960	4.152	.006	0.017
Temperament	8.42±2.967	8.05±2.894	8.73±3.148	9.37±3.804	5.024	.002	0.021
Reaction	12.52±3.347	12.29±3.020	12.48±2.989	13.02±3.300	1.438	.238	
AEI.	30.12±10.350	28.81±9.330	30.74±9.482	32.14±11.363	2.982	.031	0.013
Ext-Exp Anger	11.47±3.191	11.32±2.985	12.13±3.209	12.56±3.758	5.004	.002	0.021
Int-Exp Anger	13.16±3.719	12.70±3.615	13.55±3.474	12.82±3.402	1.365	.252	
External Control	16.48±4.652	16.95±4.369	16.47±4.647	15.58±4.620	2.435	.064	
Internal Control	14.03±4.409	14.27±4.517	14.47±4.333	13.67±4.309	.714	.544	

AEI: Anger Expression Index, PExp: Physical Expression, VExp: Verbal Expression, Ext-Exp Anger: External Expression of anger, Int-Exp Anger.: Internal Expression of anger, RLD: Right lateral Decubitus, LLD: Left Lateral Decubitus, SUD: Supine Decubitus, PD: Prone Decubitus

of women) in SUD and 17.8% (n = 130) (18.5% of men and 17.4% of women) in PD. There were statistically significant differences in the sleeping positions between men and women ($\chi^2_{(3,729)} = 15.119, p = .002$); women tend to sleep in the RLD position as opposed to SUD (Cramer's $V = .144$), while in men there is a tendency to sleep in SUD position rather than the RLD.

When considering the answers given by the students on the sleep quality test according to the position adopted during sleep (Table 1), differences were observed in the total PSQI score ($F_{(3,728)} = 2.742, p = .042$) with a small effect size $\eta_p^2 = 0.012$ and in the reported total hours of sleep ($F_{(3,728)} = 2.749, p = .042$) with $\eta_p^2 = 0.012$. In the case of the total score, there is a marginal tendency for those who sleep in the RLD position to have worse sleep quality than those that adopt the LLD position ($p = .056$). Further, in terms of the total hours of sleep, no differences were detected between the RLD and DP positions ($p = .095$).

Table 2 displays the scores on the expression of anger according to adopted sleeping position. Tukey post hoc test revealed that on the subscale of Feelings of Anger there were differences between the LLD and PD groups ($p = .027$); whilst on the Trait-Anger scale scores there were differences between the PD and RLD ($p = .044$) and LLD groups ($p = .003$), whilst on the Temperament subscale the PD group differs from the RLD ($p = .020$) and LLD group ($p = .001$). On the Anger Expression Index the PD group differed from the LLD group ($p = .018$). Finally, on the External Expression of Anger the PD group differs from the RLD ($p = .007$) and LLD ($p = .003$) groups.

DISCUSSION

The current study attempted to analyze the possible relationship between the adopted sleeping position (Supine Decubitus -SUD, Prone Decubitus -PD, Left Lateral Decubitus -LLD, and Right Lateral Decubitus -RLD), the subjective quality of sleep, and the expression of anger in university students.

With respect to the working hypotheses proposed, it appears that Hypothesis 1, where it was expected that "people who claim to adopt the LLD position have a

poorer subjective quality of sleep than those who adopt the RLD position" was not supported by the data. It was observed that those who sleep in RLD position have poorer perceived sleep quality than those who adopt the LLD position.

Hypothesis 2, where it was predicted that "those who adopt the RLD position will obtain the lowest scores on the tests of anger" was partially supported by the data, since this group did not differ from the LLD or SUD groups; however, a difference was observed between the RLD and PD position. In this case, the RLD position is not the one that has shown the highest scores on the Anger scales.

Finally, Hypothesis 3 suggested that "those who adopt the PD position will obtain the highest scores on the anger scales". The results appear to support this hypothesis since it was shown that those who adopt the PD position show the highest scores on the Feelings of Anger, Trait-Anger, Temperament of Anger, Anger Expression index and External Expression of Anger; these scores differing from both the RLD and LLD groups, but not from the SUD group.

In general, the data show that 42.4% of the sample reported to adopt the RLD position, 29.2% the LLD, 10.6% the SUD and 17.8% the PD. These results are in agreement with the findings of Ichijo and Akita (2017) with regard to the preference for the RLD position. Previous work had failed to find any differences between men and women in terms of their preferred sleeping position (Ichijo & Akita, 2017). However, here we have observed that among university students there are gender-related differences in the adopted sleep positions. In particular, women tend to sleep in the RLD position and not the SUD position, while in men there is a tendency to sleep in SUD position and not the RLD. These results, showing that women are inclined to select the RLD posture, appears to indicate poor sleep quality, which is in line with the findings of studies that have highlighted a higher number of sleep-associated problems in females (Arbinaga, 2017; Engin et al., 2010; Diestel et al., 2015; Kamphuis & Lancel, 2015; Stoia-Caraballo et al., 2008).

In the work of Agargun et al. (2004), which examined only the right (RLD) and left (LLD) side sleeping positions, it was found that those who adopted the LLD position reported a greater number of nightmares and emotionally

charged dreams, whilst the RLD position was associated with a lower score on the PSQI test. These results were not supported in the university population studied here, since it was found that the RLD type position is linked to poorer sleep quality.

When analyzing expression of anger, it was confirmed that those who adopt the RLD position generated low values on this measure. These differences, although having only a small effect size, could be taken as support for the claim that positive emotions and feelings of security are associated with sleeping in the RLD position (Agargun et al., 2004).

With respect to the four positions adopted, similar to the work of De Koninck et al., (1983), Gordon et al., (2004) and Yu (2012) but unlike the RLD and LLD positions explored by Agargun et al. (2004) and the inclusion of the SUD position in the work of Ichijo and Akita (2017) their relationships with the expression of anger are analyzed, which revealed differences between them. The participants who sleep in the PD position showed higher scores than those adopting the RLD and LLD positions on the scales of Feelings of Anger, Trait-Anger, Temperament of Anger, Anger Expression Index, and External Expression of Anger. However, the scores on the anger scales of those who adopt the PD position did not differ from those who adopt the SUD position.

These results are in accord with those presented by Yu (2012) who observed that sleeping in the PD position was positively associated with high scores on neuroticism and emotional instability, as well as the presence of sleep disturbance issues (being locked up, drowning, and unable to move).

However, in this work the narrative content of dreams was not examined, and thus one aspect that should be studied in more depth is the possibility that emotions such as anger are associated with disturbing dreams (Taylor, Fireman, & Levin, 2013). Our data have not revealed any differences in the quality of sleep, or in the scores on the scales of anger between people who adopt the PD and the SUD position. However, Yu (2012) did report that people who adopted a PD position showed higher scores than those who sleep in the RLD position with regard to scales that evaluate the disturbing content of dreams.

This is a preliminary study that includes a number of limitations that need to be addressed in future research. Such limitations include the need to combine subjective evaluations of sleep quality with other objective measures (e.g., actigraphy) and to consider the possibility of using evaluations both self-reports and more objective methods (e.g., video recordings) to determine more precisely the position adopted when falling asleep and in each subsequent phase of sleep. However, the self-report method can provide a useful tool for sleep position research, as has been found in previous studies (Gordo et al., 2004; Yu, 2017). Such self-reports for assessing sleeping position present good test-retest reliability and, to some extent, correspond with the sleeping position reported by external evaluators through video recordings (Yu, 2017). However, this method can only provide information on the main position in which the subjects believe they have slept. It should be noted that the body position adopted during sleep is dynamic, and this could imply that a self-reported sleep position does not necessarily agree with an objective observation, particularly for those people who spend relatively similar periods of time in various sleeping positions during a single night (Yu, 2017).

However, it is important to note that the possible mismatch between these two types of evaluation does not necessarily invalidate subjective measures of the sort used here, although it should be acknowledged that these discrepancies could limit the validity of subjective measures, particularly in the clinical field (Yu, 2017). Moreover, in the university context, the time at which the data for the study were collected should be controlled, due to the pressure to which they may be subjected (exam period) and different aspects of sleep should be assessed according to the type of subject studied by the students. Finally, it would be interesting to work with other population groups and improve the use of non-experimental designs, since these make it difficult to infer causal relationships.

The work has provided support for the possibility that there are relationships between sleeping position, the subjective quality of sleep, and the way in which anger is expressed and / or controlled. The present study

contributes to the study of body position when sleeping as well as an understanding of the relationship between body position and anger.

Authorship contribution

F. Arbinaga, I. Tornero-Quiñones and E. Fernández-Ozcorta contributed to all phases and drafting of the final manuscript.

Declaration of transparency

F. Arbinaga, on behalf of the rest of the authors, guarantees the accuracy, transparency, and honesty of the

data and the information contained in the study; that no relevant information has been omitted; and that all discrepancies between authors have been adequately resolved and described.

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Declaration of Interest

The authors report no conflicts of interest. The authors alone are responsible for the content and writing of the paper.

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