

# The relation between sleep quality, psychopathology, gender, and severity of aggressive behavior among psychiatric patients

*A relação entre a qualidade do sono, a psicopatologia, o gênero e a gravidade do comportamento agressivo entre pacientes psiquiátricos*

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## ABSTRACT

**Objective:** The objectives of this study were to ascertain whether sleeping problems affect aggression levels in adult offenders undergoing inpatient psychiatric treatment and exploring the phenomenon in terms of differences in gender, crime severity, and psychopathology.

**Methods:** We used a sample of 70 adult male and female offenders, inpatients of a forensic psychiatry hospital, to whom we applied the Pittsburgh Sleep Quality Index (PSQI), which evaluates the subjective sleep quality, latency, duration, habitual subjective sleep efficiency, sleep disturbances, use of sleeping medication, and impairing daytime sleepiness in the preceding 30 days, and the Aggression Questionnaire (AQ), which measures physical and verbal aggressiveness, hostility, and anger. **Results:** A positive correlation between sleep quality and level of aggression was found ( $r = .254, p < .05; r^2 = .065$ ). There were no significant correlation between sleep quality and crime severity ( $X^2 = 1,984, p = .371$ ). When controlled by gender, women showed significantly worse sleep quality than men ( $Z = -2,243, p = .025$ ) but no significant difference in aggression level ( $Z = -1,806, p = .071$ ). There were no significant difference in either sleep quality or aggression level among individuals diagnosed with different kinds of psychopathology ( $X^2 = 4,366, p = .359$ ) ( $X^2 = 2,248, p = .690$ ). **Conclusion:** The results show a relationship between sleep quality and aggression level, but the relationship is correlated to neither crime severity nor psychopathology.

**Keywords:** aggression, crime, gender, psychopathology, sleep.

## RESUMO

**Objetivos:** Os objetivos deste estudo foram verificar se os problemas de sono afetam os níveis de agressividade em criminosos adultos sob tratamento psiquiátrico e explorar o fenômeno em termos de diferenças de sexo, gravidade do crime e psicopatologia. **Método:** Utilizamos uma amostra de 70 ofensores adultos de ambos os sexos, pacientes num hospital psiquiátrico, a quem aplicamos o Pittsburgh Sleep Quality Index (PSQI), que avalia a qualidade subjetiva do sono, a latência, duração, eficiência subjetiva habitual do sono, a utilização de medicação para dormir e a sonolência diurna nos 30 dias anteriores, e o Aggression Questionnaire (AQ), que mede a agressividade física e verbal, a hostilidade e a raiva. **Resultados:** Foi encontrada correlação positiva entre a qualidade do sono e os níveis de agressividade ( $r = .254, p < .05; r^2 = .065$ ). Não existiu correlação significativa entre a qualidade do sono e a gravidade do crime ( $X^2 = 1,984, p = .371$ ). Quando se controlou o

gênero, as mulheres apresentaram uma significativa menor qualidade do sono do que os homens ( $Z = -2,243, p = .025$ ), mas não demonstraram diferenças significativas no nível de agressividade ( $Z = -1,806, p = .071$ ). Não houve diferenças significativas quer na qualidade do sono quer nos níveis de agressividade entre indivíduos diagnosticados com diferentes tipos de psicopatologia ( $X^2 = 4,366, p = .359$ ) ( $X^2 = 2,248, p = .690$ ). **Conclusão:** Os resultados mostram uma relação entre a qualidade do sono e os níveis de agressividade, mas essa relação não está relacionada com a severidade do crime, nem com a psicopatologia.

**Descritores:** agressão, crime, psicopatologia, sexo, sono.

## INTRODUCTION

Sleeping is an unconscious state that can be interrupted by endogenous and exogenous stimuli. Although there is no clarity about its evolutionary origin, sleeping is associated with neurophysiological processes like long-term memory consolidation and neurotransmission which are disrupted when sleep is perturbed experimentally<sup>(1)</sup>. Sleeping is connected to two distinct brain activity patterns that can be neurophysiologically distinguished, namely slow-wave sleep (SWS) also known as non-Rapid Eye Movement sleep (nREM) and fast-wave sleep (FWS) also known as Rapid Eye Movement Sleep (REM), paradoxical or active sleep<sup>(2)</sup>. Sleep is not a linear process, since when individuals fall asleep they go through a series of distinguishable nREM phases (stages-I to IV) after which REM sleep starts.

Although science does not know with certainty the function of sleep, indirect indication about its function has been gathered from sleep-deprivation experiments. Among these correlates are increased aggression and antisocial behavior<sup>(3)</sup>. This relationship was verified in laboratory studies with animals<sup>(4)</sup> since in humans this relationship is poorly understood<sup>(5)</sup>. One of the first and few studies applied to humans suggested a potential link between aggression and impulsiveness and the duration and frequency of the superficial sleep stages (nREM stages I and II<sup>(6)</sup>). Similarly, after sleep deprivation, individuals have been shown to

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score significantly higher in tests of aggression<sup>(7)</sup>. In the forensic context, one study<sup>(8)</sup> concluded that violent adult offenders had more nocturnal awakenings and less sleep efficiency than non-offenders. This fact seems to point to the correlation between aggression levels and with sleep problems.

Several factors are known that can affect sleep quality, e.g., medications<sup>(9)</sup>, stress<sup>(10)</sup>, psychopathology<sup>(11)</sup>, heart disease<sup>(12)</sup>, and respiratory disease<sup>(13)</sup>. Furthermore, the prevalence of sleep disorders among psychiatric patients is three times higher than among the general population, and two times higher among patients affected by other medical conditions<sup>(14)</sup>. Additionally, individuals with psychiatric problems tend to show aggressive behavior more often than average people<sup>(15)</sup>. Finally, sleeping problems have been associated with increased suicidal ideation<sup>(16)</sup> and suicide attempts<sup>(17)</sup>. Aggression, on the other hand, is a risk factor for the development of cerebrovascular disease<sup>(18)</sup>, highlighting the relationship between mind and health.

Sleep problems correlate therefore with aggression level, health problems, and behavior, and aggression in turn is correlated with crime and violence<sup>(19)</sup>. On the other hand, a large proportion of the population suffers from sleeping problems<sup>(20)</sup>. Only few studies have documented and quantified, however, the relationship between sleeping problems and latent or acted-upon aggression. The work presented below studies this correlation among patients of a forensic-psychiatric hospital. It looks for a possible relationship between sleeping problems and latent or acted-upon aggression, including variables like crime severity, gender, and psychopathological profile.

## METHODS

### Design

The investigation followed a between-subjects design. The ethical requirements were met by informing the participants about the nature of the research in order to ensure a free and informed participation. None of the patients that met the criteria for this study (forensic psychiatric inpatients with a psychopathological diagnosis recently involved in aggressive behavior) refused to participate.

### Participants

We used a non-probabilistic random sample consisting of 70 forensic psychiatric inpatients ( $n = 70$ ), 57 males (81.4%) and 13 females (18.6%), with ages between 21 and 77 years ( $M = 47.6$ ;  $SD = 14.5$ ). Exclusion criteria were pregnancy, physical disability and more than one psychopathological diagnose. Regarding psychopathological diagnose, 44 (62.9%) participants had a psychotic disorder, 13 (18.6%) had a developmental disorder, six (8.6%) had a mood or anxiety disorder, four (5.7%) had a substance abuse and three (4.3%) had a personality disorder. With regard to the severity of crime, 18 participants (24.7%) had been institutionalized after non-serious crimes (e.g., aggression), 31 (44.3%) after medium-serious crimes (e.g., sexual abuse) and 21 (30%) after very serious crimes (e.g., murder). Participants characteristics are described in Table 1.

**Table 1.** Socio-demographic, clinical and criminal characteristics of the participants ( $n = 70$ ).

Variable	N	%	M	SD
Age	70	100	47.6	14.5
Gender				
Male	57	81.4		
Female	13	18.6		
Diagnosis				
Psychotic disorder	44	62.9		
Development disorder	13	18.6		
Mood or anxiety disorder	6	8.6		
Substance abuse	4	5.7		
Personality disorder	3	4.3		
Crime severity				
Non-serious crimes	18	24.7		
Medium-serious crimes	31	44.3		
Very serious crimes	21	30		

## Measures

The Pittsburg Sleep Quality Index (PSQI)<sup>(21)</sup> was used to quantify sleep quality, by evaluating seven aspects: subjective sleep quality, sleep latency, duration, habitual subjective sleep efficiency, sleep disturbances, use of sleeping medication, and impairing daytime sleepiness in the preceding 30 days. The final score ranges between 0 and 21 points, with an overall score less than 5 meaning a poor quality of sleep. In this study we found an internal consistency of .68 (cronbach's alpha). To assess the level of aggression we used the Aggression Questionnaire (AQ)<sup>(22)</sup>, which consists of 29 items that measure various aspects of aggressiveness: physical and verbal aggressiveness, hostility, and anger. The final score ranges between 29 and 145 points, and the higher the score recorded, the greater the level of aggression displayed by the subject, being 66 the cutoff value which separates low from high aggression levels. In the present study, we found internal consistency values of .89 (cronbach's alpha).

## Statistics

The statistical analysis was descriptive at first, with analysis of the absolute and relative frequencies of the socio-demographic variables in order to characterize the sample. The statistical analysis used in the hypothesis tests have started with the verification, for every hypothesis, of the parametric statistic assumptions, thru the normality and homogeneity of variance. If normality in the data distribution was presented we used parametric bivariate statistics, such as Pearson's correlations. If not, we used non-parametric statistics to evaluate the relation between the variables, such as Spearman's rho correlations.

## RESULTS

In the analysis of sleep quality, measured by the PSQI, we found that the sleep quality in the sample is poor, with an average result of 9,56. It appears that the vast majority of

participants, specifically 62 (88.6%) had a poor sleep quality ( $M = 10.37$ ;  $SD = 3.21$ ), with only eight participants (11.4%) showing good quality of sleep ( $M = 3.25$ ;  $SD = 1.17$ ). In the analysis of aggression levels, measured by the AQ, we found high values in the sample, with an average of 79.24 points. In fact, the majority of participants, specifically 44 (62.9%), showed high aggression levels ( $M = 91.57$ ;  $SD = 11.3$ ), with only 26 participants (37.1%) showing low aggression levels ( $M = 58.38$ ;  $SD = 5.82$ ). These results are described in Table 2.

**Table 2.** Descriptive statistical analysis of the sleep quality, measured by the PSQI, and the aggression levels, measured by the AQ, of the participants ( $n = 70$ ).

Measures	N	%	Mean	SD	Min	Max
PSQI	70	100	9.56	3.80	1	17
Good sleep quality (0-5)	8	11.4	3.25	1.17	1	4
Bad sleep quality (5-21)	62	88.6	10.37	3.21	5	17
AQ	70	100	79.24	18.78	46	112
Low aggression levels (29-65)	26	37.1	58.38	5.82	46	65
High aggression levels (66-145)	44	62.9	91.57	11.3	70	112

### Relationship between sleep quality and aggression levels

To test for association between sleep quality and the level of aggression, and since exploratory data analysis showed that the sample violated the assumptions for parametric statistical analysis we used the Spearman's rho correlation coefficient. This showed a low positive correlation between sleep quality and level of aggression ( $r = .254$ ,  $p < .05$   $r^2 = .065$ ), where higher total PSQI scores associated with higher level of aggression.

### Relationship between sleep quality and severity of crime

To test if the participants with lower sleep quality had committed more serious crimes, we used a Kruskal-Wallis test to compare sleep quality between the groups. We found no significant differences in sleep quality ( $X^2 = 1.984$ ,  $p = .371$ ).

### Gender and the association of sleep quality and levels of aggression

To test for differences in sleep quality and aggression level between sexes, we used a Mann-Whitney U test and compared both gender regarding sleep quality and aggression. Sleep quality was statistically significantly different ( $Z = -2.243$ ,  $p = .025$ ) between groups, with women showing worst quality, whereas aggression level was not statistically significantly different ( $Z = -1.806$ ,  $p = .071$ ).

### Impact of psychopathology diagnosis in the quality of sleep and levels of aggression

To test for differences in quality of sleep and level of aggression between the various types of psychopathological diagnoses of the participants we used the Kruskal-Wallis test to compare the groups formed according to psychopathology.

There were no significant differences between these groups in sleep quality ( $X^2 = 4.366$ ,  $p = .359$ ) and in level of aggression ( $X^2 = 2.248$ ,  $p = .690$ ).

## DISCUSSION

Our results confirm in adult offenders previous results with younger offenders<sup>(5)</sup> showing a relationship between sleep quality and aggression level. This correlation does not establish a directional causal link between both phenomena. In this sense, high levels of aggression may be the result of sleeping problems just as much as sleeping problems can be due to high levels of aggression.

Given the forensic-psychiatric context in which this study was carried-out, one would have expected that the participants who committed more severe crimes would show worse sleep quality and higher levels of aggression. However, this was not the case, as indicated by the absence of significant correlation between gravity of crime and worse sleep quality or higher aggression levels in our sample. Notwithstanding this, women data disclose an important fact. Several studies<sup>(23)</sup> have shown higher aggression levels in men, based on the hormonal and physiological differences between sexes. However, we found no statistically significant difference in levels of aggression between men and women. This indicates an increased aggressiveness in this last group, which may be correlated to their worsened sleep quality.

Regarding psychopathology, our results confirm the idea that psychiatric disorders, regardless of the type, correlate with decreased quality of sleep<sup>(11)</sup> and increased levels of aggressiveness<sup>(19)</sup>. However, we did not find a significantly higher correlation between any of the specific types of psychiatric disorders represented in our sample and the quality of sleep or the level of aggression shown by the participants. This may be due to the fact that the magnitude of changes in quality of sleep and levels of aggression are low.

The bad sleep quality of the participants, as evidenced by the overall results below the cutoff point that defines the normal sleep in the PSQI, may be associated also to their living in a forensic-psychiatric environment. In fact, the prison-like context with deprivation of freedom and control of inmates typical of that environment can worsen sleep quality<sup>(5)</sup> and increase aggressiveness<sup>(24)</sup>. Substance abuse, psychiatric treatment, social maladjustment and institutionalization can also lead to aggression in this environment<sup>(19)</sup>. Other important factor is related to pharmacological treatment. Due to their psychopathological diagnosis all the participants were medicated. This fact could affect the results since medication can either affect sleep quality or levels of aggression in the participants<sup>(19)</sup>.

Some limitations of this research were the fact that we used self-response instruments in which subjectivity affects the results. The results could also be affected by the social desirability bias commonly associated with such instruments. Also, we haven't used a normal control group in order to compare our results. By comparing with normal subjects, patients with aggress-

sive behavior could present with different sleep quality results. On the other hand, many questions and hypothesis emerged and should be considered for future research. In the first hypothesis, the present investigation intended to study only the relation between sleeping problems and levels of aggression, without setting any causal links. The inclusion of experimental findings will help clarify such causal links. Similarly, it appears important to investigate other factors that may influence the observed relationship. In conclusion, our work is a first step towards the investigation on a topic whose scientific study is still undeveloped, quantifies an important phenomenon related to this topic, and prompts new hypotheses for further scientific research on this topic. Although this, the obtained results suggest opportunities for clinical intervention. Sleep problems and high levels of aggression are associated with medical and psychiatric disorders that can greatly reduce the quality of life and well-being of patients. Similarly, the results suggest precautionary and palliative measures to modify institutionalization conditions, since factors such as an improved relationship between professionals and patients, milder institutional arrangements and milder limits on patient privacy can reduce inmate frustration, decrease their levels of aggression, and enhance their quality of sleep<sup>(25)</sup>.

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