

# Sleep quality of working and physically inactive adolescents

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**Abstract:** Introduction: Sleep is a physiological need that restores the physical and psychological conditions worn during the waking state. A good sleep quality is directly linked to the healthy development, especially for adolescents. Objective: This study aimed to analyze the associations between sleep quality with occupational status and physical activity of adolescents from Amazonas. Method: This is a cross-sectional, school-based epidemiological study conducted with 2,517 adolescents (1,411 girls and 1,106 boys) with a mean age of 16.6 (SD = 1.2) years, from public schools in Amazonas. The adolescents answered a self-administered questionnaire containing information on sleep quality (dependent variable), gender, age group, scholar shift, family income, occupational status and physical activity. The association between the exploratory variables and the sleep quality was verified by means of binary logistic regression. The analysis was adjusted by all variables, including sociodemographic variables. Results: The prevalence of low sleep quality was 20.3%. Working adolescents were 69.0% more likely to have poor sleep quality, and those who were physically inactive had a 66.0% chance when compared to their respective peers who did not work and were physically active. Conclusion: Two out of ten adolescents presented poor sleep quality. The development of feasible interventions and public policies aimed at improving the sleep quality in adolescents should consider the occupational activities and physical inactivity.

**Keywords:** *Adolescence, Exercise, Sleep, Work.*

## Qualidade do sono de adolescentes que trabalham e não praticam atividade física

**Resumo:** Introdução: O sono é uma necessidade fisiológica que, entre suas funções, busca restaurar as condições física e psicológica do organismo desgastadas durante o estado de vigília. Um sono de boa qualidade está diretamente ligado ao desenvolvimento saudável, especialmente dos adolescentes. Objetivo: O objetivo deste estudo foi analisar as associações entre a qualidade do sono com a situação ocupacional e a atividade física em adolescentes do Amazonas. Método: Trata-se de um estudo epidemiológico, transversal, de base escolar, conduzido em 2.517 adolescentes (1.411 moças e 1.106 rapazes), com média de idade de 16,6 (DP = 1,2) anos, de escolas públicas do Amazonas. Os adolescentes responderam a um questionário autoperenchível contendo informações sobre a qualidade do sono (variável dependente), variáveis sociodemográficas (sexo, faixa etária, turno escolar e renda familiar), situação ocupacional e atividade física. A associação entre a situação ocupacional e atividade física com a qualidade do sono foi testada por meio de regressão logística binária. A análise foi ajustada por todas as variáveis, mais as sociodemográficas. Resultados: A prevalência de baixa qualidade do sono foi de 20,3%. Os adolescentes que trabalhavam tiveram 69% mais chances de terem baixa qualidade do sono, e os que eram inativos fisicamente, 66%, quando comparados com seus respectivos pares que não trabalhavam e eram ativos fisicamente. Conclusão: Dois em cada dez adolescentes apresentaram baixa qualidade do sono. O desenvolvimento de intervenções e de políticas públicas exequíveis voltadas à melhora da qualidade do sono em adolescentes deve considerar o exercício de atividades ocupacionais e a inatividade física.

**Palavras-chave:** *Adolescência, Exercício, Sono, Trabalho.*

## 1 Introduction

Chronic sleep deprivation during adolescence is increasing and associated with a number of health impairments (CHAPUT; DUTIL, 2016). A low quality of sleep in this age group has been associated with increased stress (LY; MCGRATH; GOUIN, 2015), higher prevalence of obesity (BEL et al., 2013), low academic performance (CHAPUT; DUTIL, 2016), excessive daily sleepiness (FISCHER et al., 2015), as well as psychological distress, including feelings of loneliness, depression and anxiety that are considered risk factors for the healthy development of adolescents (XU et al., 2012).

Worldwide data on sleep involving 690,747 children and adolescents from 20 countries showed a secular decline in sleep quality and duration, especially on school days (MATRICCIANI; OLDS; PETKOV, 2012). While the last National School Health Survey (PENSE), published by the Brazilian Institute of Geography and Statistics (IBGE) revealed that 11.3% of adolescents have problems with sleep in Brazil (INSTITUTO..., 2016) regional surveys found poor sleep quality prevalences of three to four times greater (DRABOVICZ et al., 2012; HOEFELMANN et al., 2013, 2014), suggesting that the problem is more prevalent in some regions and it requires attention.

As a non-pharmacological treatment for this problem, researchers have recommended the daily practice of physical activity (PA) because it has beneficial mechanisms for sleep hygiene, improving its quality (CHENNAOUI et al., 2015; HALE; GUAN, 2015; LI et al., 2016; CHAPUT; DUTIL, 2016). However, research on sleep quality and PA in adolescents is still incipient in Brazil (LEGNANI et al., 2015). Also, another issue that may be related to sleep quality is the occupational situation of adolescents (PEREIRA et al., 2011; LUZ et al., 2012), who are occupying each day more space in the labor market after school shift due to the interest in achieving their financial independence. Although there is legislation that allows adolescents (14 to 19 years old) to enter the labor market as young apprentices (BRASIL, 2005), it is not possible to say whether the exercise of this function is detrimental to the quality of their sleep.

In the Northern region of the country, especially in Amazonas, besides the low number of research conducted with the adolescent population, studies on sleep quality from the perspective of PA and occupational situation have not yet been delineated.

It is also worth noting that this region is considered to be one of the most economically disadvantaged Brazilian regions and, because it is located in the middle of great rivers that make living conditions difficult, many young people seek to earn work earlier.

Therefore, there is still a discussion about the need for public health agencies to invest in the development of sleep-related guidelines, since sleep is one of the mediators of global health that requires attention both directed toward PA and nutrition (CHAPUT; DUTIL, 2016). In view of these arguments and the need to fill the gaps regarding PA and the occupational situation on sleep in the adolescent population, it is relevant to develop studies that reinforce the need to monitor sleep patterns to argue in favor of the increase of directives that guide the population to the engagement in behaviors favorable to healthy sleep. In view of these assumptions, this study aimed to analyze the associations between sleep quality and occupational status and PA in adolescents from Amazonas.

## 2 Methods

### 2.1 Population and sample

This is an epidemiological study, with a cross-sectional design, linked to the macro project "Lifestyle and Health Indicators of High School Students in Amazonas" held in 2011, approved by the Research Ethics Committee with Human Beings of the Federal University of Amazonas (CAAE-0302.0115.000-11).

The study population consisted of school adolescents of both genders, aged 14 to 19 years old, enrolled in state public schools in five cities of Amazonas (São Gabriel da Cachoeira, Presidente Figueiredo, Parintins, Manaus, and Itacoatiara). These cities were chosen intentionally because of their geographic location, since they are cities around rivers, being the access more viable to the other cities of Amazonas.

According to the State Department of Education, 88,562 students were enrolled in the five cities in 2011. From this finite population, the sample selection process was defined. In the city of Manaus, sample selection occurred as follows: a) proportional by education districts (n=6); b) stratified by state public schools, with volume (large: 500 students or more, medium size: from 201 to 499 students and small: up to 200 students); and c) by cluster of shifts, classes and school year, in which all students present in the room at the time of collection were invited to

participate in the study. In São Gabriel da Cachoeira, Parintins and Presidente Figueiredo, considering the low number of schools, the selections “b” and “c” were used. In the city of Presidente Figueiredo, a census was conducted in the only two schools, and all students were invited to participate in the study.

The size of the required sample was calculated by establishing an estimated prevalence of 50% (unknown outcome), 95% confidence level, sampling error of five percentage points, and a delineation effect of 1.5 (LUIZ; MAGNANINI, 2000). There were 10% added to reduce the occurrence of possible losses/refusals, reaching the sample size in each of the cities (São Gabriel da Cachoeira = 423, Presidente Figueiredo = 264, Parintins = 587, Itacoatiara = 580, Manaus = 631), totaling in all cities a sample of 2,485 students. Due to the conglomerate sampling process, in which all those present in the classroom on the day of data collection were invited to be part of the research, the number of participants exceeded the estimated number, totaling 3,267 students (São Gabriel da Cachoeira = 450, Presidente Figueiredo = 249, Parintins = 575, Manaus = 1,413, Itacoatiara = 580). The questionnaires of 382 participants were lost during the displacement between cities, which occurred through the extensive rivers of the region, and another 368 participants were excluded because they were outside the age group established for the study.

## 2.2 Collection procedures

The research was conducted during 2011 and the data collection took place during Physical Education classes, in the classroom, on days and times established before the agreement with the managers of the schools. The students received information on the importance of the research and on a voluntary participation. The Free and Informed Consent Form (TCLE) was given to be signed by the legal guardian of the student, authorizing his participation in the study. A self-administered questionnaire was applied by a team of researchers trained to perform the data collection. The students who accepted to participate voluntarily, who delivered the TCLE and who signed the Term of Assent on the day of the collection were included in the study.

## 2.3 Study variables

The questionnaire Behaviors of Catarinenses Adolescents (COMPAC) was used in this study (SILVA et al., 2013). Sleep quality (dependent variable)

was assessed by the following question: “*How often do you think you sleep well?*”. The items of answers were arranged in a 5-point Likert scale, corresponding to: “1 - always”, “2 - often”, “3 - sometimes”, “4 - hardly ever” and “5 - never”. For the purposes of analysis, sleep quality was dichotomized in high (always, often) and low (sometimes, hardly ever, never) (HOEFELMANN et al., 2014).

Data on gender (male and female), age range (14-15, 16-17 and 18-19 years old), school shift (morning, evening and evening), occupational status (working and not working), and monthly family income, considering the minimum wage in force in 2011 (R\$ 545.00 or US\$ 326.35) and the income of all residents who contributed to its maintenance were collected. The income information was obtained through the following question: “*What is the monthly income of your family?*”, having as answer alternatives: a) *up to 2 wages*; b) *3 to 5 salaries*; c) *from 6 to 10 wages or more*.

PA was estimated by two questions: one regarding frequency, “*During a normal (typical) week, on how many days do you engage in moderate to vigorous physical activity (physical activity at leisure, work and travel)?*” containing eight alternatives for response, ranging from zero to seven days; and one for duration, “*During a normal (typical) week, how much time do you engage in moderate to vigorous physical activity (physical activity at leisure, work, and travel)?*” as answers, students had four alternatives: a) I do not practice; b) less than 30 minutes per day; c) 30 to 59 minutes per day; and d) 60 minutes or more per day (SILVA et al., 2013). Adolescents who did not practice any PA were considered physically inactive; insufficiently active those who practiced some PA per week less than 60 minutes per day; and physically active those who performed PA for 60 minutes or more per day on all days of the week (WORLD..., 2010).

## 2.4 Statistical analysis

The data were analyzed in the statistical program The Statistical Package for the Social Sciences (SPSS, version 20.0) with a significance level of 5%. Initially, descriptive analyses were carried out by frequency measurements (absolute and relative). Inferential analyses were performed using the chi-square and binary logistic regression (gross and adjusted), estimating Odds Ratio (OR) and confidence intervals (CI). The chi-square test for trend was used to verify the association between sleep quality and gender. In the bivariate analysis, the association between the

variables occupational situation and PA was tested in isolation with poor sleep quality. In the multiple analysis, all variables were included in the model, adjusted by sociodemographic variables (gender, age group, school shift and family income).

## 2.5 Results

The study sample was 2,517 adolescents, with a mean age of 16.6 (SD = 1.2) years old, most of them female (56.1%). The general characteristics of the participants were described in relation to the variables investigated in the study and presented in Table 1.

The proportions of adolescents with low sleep quality (20.3%, CI = 18.2-21.8) were presented in Figure 1. There was no significant difference in prevalence among boys (19.9% CI = 18.4-21.3) and girls (20.7%; CI = 19.1-22.1) ( $p = 0.619$ ).

Regarding factors associated with poor sleep quality, it was verified in the bivariate analysis that the occupational situation and the PA were associated with the outcome. After adjustment of the variables inserted in the model, it was verified that both variables remained associated with the low sleep quality. Working adolescents were 69% more likely to have poor sleep quality than their

non-working peers, while those who were physically inactive had a 66% higher chance of having poor sleep quality compared to those who were physically active (Table 2).

## 3 Discussion

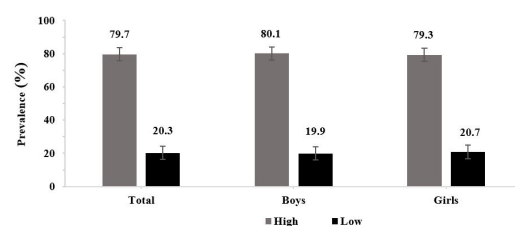
This is one of the first studies conducted on sleep quality in Brazilian adolescents, especially in Amazonas, which investigated their association with occupational status and PA. The prevalence of low quality of sleep found in the adolescents in Amazonas (20.3%) was lower than in studies conducted in adolescents from Belo Horizonte/MG (41%) Florianópolis/SC (45.8%) (HOEFELMANN et al., 2014), and in a study conducted in several cities of Santa Catarina State (34.5%) (HOEFELMANN et al., 2013). However, lower prevalences although modest were found in Chinese adolescents (18.8%) (LIU et al., 2008) and Germans (16.6%) (LOESSL et al., 2008). Such discrepancies may be linked to factors such as the plurality of instruments used to classify sleep quality between the studies (HALE; GUAN, 2015) and the researchers' focus on pathologies associated with sleep quality (LY; MCGRATH; GOUIN, 2015; YIP, 2015).

Possibly, the low quality of sleep reported by adolescents is explained by factors such as the accelerated and stressful rhythm of modern life, which tends to favor the development of psychological manifestations, such as anxiety, depression, and loneliness (XU et al., 2012); the conflicting environmental conditions, which seem to impair biological processes and, consequently, sleep (BENAVENTE et al., 2014); and the lower economic level (FELDEN, 2015), which supposedly favors a disorganized home conducive to situations involving noise, hindering sleep (JARRIN; MCGRATH; QUON, 2014). Also, this population has become hostage to the exaggerated use of electronic media, which tends to trigger a hypervigilant attitude (in a

**Table 1.** General characteristics of adolescents in public schools. Amazonas, 2011.

| Variable                      | n     | (%)  |
|-------------------------------|-------|------|
| <b>Gender</b>                 |       |      |
| Male                          | 1.106 | 43.9 |
| Female                        | 1.411 | 56.1 |
| <b>Age group (years old)</b>  |       |      |
| 14-15                         | 519   | 20.6 |
| 16-17                         | 1.413 | 56.1 |
| 18-19                         | 585   | 23.2 |
| <b>School shift</b>           |       |      |
| Morning                       | 723   | 28.7 |
| Afternoon                     | 1.317 | 52.3 |
| Evening                       | 577   | 19.0 |
| <b>Family income (wages)</b>  |       |      |
| Up to 2                       | 1.612 | 64.0 |
| From 3 to 5                   | 710   | 28.2 |
| From 6 to 10 or more          | 195   | 7.7  |
| <b>Occupational situation</b> |       |      |
| Not working                   | 2.061 | 81.9 |
| Working                       | 456   | 18.1 |
| <b>Physical activity</b>      |       |      |
| Physically inactive           | 536   | 21.3 |
| Insufficiently active         | 1.805 | 71.7 |
| Physically active             | 176   | 7.0  |

n = absolute frequency; % = relative frequency.



**Figure 1.** Sleep quality of adolescents from public schools. Amazonas, 2011. Chi-square test.

**Table 2.** Prevalence and factors associated with poor sleep quality in public school adolescents. Amazonas, 2011.

| Variable                      | Prevalence<br>n (%) | Poor sleep quality   |                          |
|-------------------------------|---------------------|----------------------|--------------------------|
|                               |                     | Gross<br>OR (CI 95%) | Adjusted<br>OR (CI 95%)* |
| <b>Occupational situation</b> |                     |                      |                          |
| Working                       | 378 (29.4)          | 1.61 (1.47-2.33)     | <b>1.69 (1.32-2.16)</b>  |
| Not working                   | 134 (18.3)          | 1                    | 1                        |
| <b>Physical activity</b>      |                     |                      |                          |
| Physically inactive           | 129 (24.1)          | 1.83 (1.15-2.90)     | <b>1.66 (1.03-2.67)</b>  |
| Insufficiently active         | 357 (19.8)          | 1.42 (0.92-2.19)     | 1.39 (0.89-2.17)         |
| Physically active             | 26 (14.8)           | 1                    | 1                        |

OR = *Odds Ratio*; CI95% = Confidence Interval of 95%; \*Adjusted for all variables, including gender, age group, school shift, and family income.

constant state of alert) when using this equipment, provoking frequent nocturnal awakenings and, consequently, causing damages to the quality of the sleep (WHITE; BUBOLTZ; IGOU, 2011).

Regarding factors associated with poor sleep quality, it was observed that the adolescents who worked were more likely to present this outcome. Even with the existence of Brazilian guidelines that regulate work during adolescence (BRASIL, 2005), the literature on this subject is still scarce in the most diverse contexts, which hinders to deepen discussions, including on the quality of sleep, which also needs further investigation. However, it should be noted that the adolescents of this study come from one of the economically less favored regions of Brazil, and therefore many of them are inserted in the labor market for the maintenance of their personal expenses and, possibly, the livelihood of their families.

Regarding this association, it is speculated that adolescents who carry out occupational activities often have to wake up earlier and sleep later due to obligations related to the work-school binomial, with reduced sleep duration. In a longitudinal study conducted in adolescents, researchers found changes in wake/sleep patterns after insertion of adolescents in the labor market, as there was a significant reduction in sleep quality over time, especially in the number of night awakenings (FISCHER et al., 2015). Similarly, it was verified in a previous study that the adolescents who worked had a shorter duration of sleep compared to those who did not work (PEREIRA et al., 2011). It is assumed that this association occurs due to worries about work, which, added to the academic issues, they cause worries that interfere in the quality of sleep of adolescents, especially since it is a population still inexperienced in dealing with adverse situations. Also, it is likely

that these adolescents facing double work-study shift will feel more fatigued and perceive poor quality sleep as if they have not had enough sleep.

Also, inactive adolescents were physically more likely to have poor sleep quality. In a systematic review, Legnani et al. (2015) found that data on sleep habits and PA in adolescents are still scarce and the need for further studies is evident. Although there is a lack of evidence, it seems to be a consensus that regular PA is a protective factor for low quality and low sleep duration in adult people (LI et al., 2016; MANTOVANI et al., 2016). According to Chennaoui et al. (2015), PA has effective mechanisms that provide good sleep quality, but this relationship can be mediated by several factors, such as gender, age, physical fitness, and the PA pattern (intensity, duration, time of day, environment).

Previously speculation has suggested that PA tends to increase energy consumption, secretion of endorphin (the hormone responsible for pleasure sensation), and cause changes in body temperature that may facilitate deeper sleep (YANG et al., 2012). However, this PA-sleep relationship is complex because, in a previous study that analyzed sleep for 16 weeks, it was found that PA performed during the day was not associated with sleep at night, but the quality of sleep at night was a predictor of PA, suggesting that malnourished night seems to reduce daily PA (BARON; REID; ZEE, 2013). This precedent suggests that sleep needs to be better assisted by public policies that invest heavily in PA and healthy eating, since poor quality and low sleep duration may deprive the practice of PA due to fatigue and tiredness and, consequently, motivate sedentary behavior in adolescents, generally associated with the consumption of low-nutrient foods (BEL et al., 2013; CHAPUT; DUTIL, 2016).

This study adds important information to the literature. However, it is not free from limitations that need to be considered when interpreting the results. Some of the limitations highlighted are the employee design, which does not allow causal inferences to be made between the variables investigated, but cross-sectional studies are important to raise hypotheses and suggest better-delineated research. Due to the sample size, objective measures of sleep were not performed. Also, the data presented here cannot be extrapolated to adolescents who do not attend school.

The strengths of the study are the scientific contribution, which still demands research on the quality of sleep in the population of Brazilian adolescents, especially regarding their occupational situation; to the size of the sample, because its representativeness was reached; to the originality of the study, being one of the first to be conducted in adolescents from Amazonas, located in the North region, which still lacks research in several areas of knowledge; and, finally, the results, which can be used for comparison with future research, especially as it is an incipient field of investigation.

## 4 Conclusion

One of the findings of this study verified that two out of ten adolescents reported low sleep quality. Also, the work and habit of not practicing PA were the factors potentially associated with poor sleep quality. Thus, actions aimed at improving sleep quality in adolescents should consider the occupational activities performed during adolescence, as well as the regular practice of PA.

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## Author's Contributions

André de Araújo Pinto and Gaia Salvador Claumann wrote the article and organized the sources used. Érico Pereira Gomes Felden worked on the final critical review of the study. Rita Maria dos Santos Puga Barbosa and Markus Vinicius Nahas idealized the research, organized all the logistics and data collection. Andreia Pelegrini performed the statistical analyses, revised the text and guided the study. All authors approved the final version of the text.