

Associations Between Health Compromising Behaviors and Sleep Patterns in Portuguese Adolescents

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Abstract

Introduction: The pattern of sleep plays an important role in protecting the adolescents' health. The main objective of this research is to determine the relationship between sufficient sleep (≥ 8 hours of sleep per night on school days) and health-risk behaviours in Portuguese adolescents.

Methods: 5,050 participants with an average age of 13.98 (DP ± 1.85), 52.3% of which were female. The instrument used was the Health Behaviour in School-aged Children 2010 (HBSC) questionnaire. The associations were studied by applying χ^2 tests and the multivariate logistic regression models.

Results: A significant percentage of adolescents (39%) get less than 8 hours sleep on weekdays. Sufficient sleep (≥ 8 h) is associated with younger age: adolescents between the ages of 13 and 15 (OR=0.549, $p < .05$) and those aged 16 or older (OR=0.291, $p < .05$) sleep less, as well as with less consumption of tobacco (OR=0.728, $p < .05$) and alcohol (OR=0.837, $p < .05$), a lower level of sadness (OR=0.786, $p < .05$) and a lower tendency to use the computer for 3 hours or more a day (OR=0.829, $p < .05$).

Conclusion: The adolescents' pattern of sleep is an important feature in adolescents lifestyles being associated to a large range of health and health compromising behaviours.

Key words: Sleep; Risk behaviours; Health; Adolescents; BMI; Physical activity

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INTRODUCTION

Even though the importance of sleep to overall health has received the attention of several researchers over the last few years, this is still a subject that needs further investigation.

It seems obvious that the sleep-wake cycles are fundamental to the human circadian rhythm, and interrupting them can have consequences for behaviour and overall performance (Reilly & Edwards, 2007). The amount of sleep children and adolescents get every night is an important indicator of their health and well-being, and it is recommended that they sleep between 8 and 10 hours daily. According to Gonçalves et al (2010), 81.9% of the Portuguese youngsters sleep between 8 and 9 hours, even though a considerable percentage (18.1%) sleep an inadequate number of hours. The authors also observed that girls and younger subjects are those who sleep more.

Sleep is vital to memory consolidation and learning, and sleep deprivation provokes a compensatory response, by increasing the need to sleep (Fischer, Wilhelm, & Born, 2007). As a result of sleep disturbances, the subjects feel less invigorated the next morning. Therefore, the individual experiences become more demanding, which implies investing extra effort in order to be able to maintain a good performance (Akerstedt *et al.*, 2002). In adolescents, sleep influences the physical and emotional well-being, substantial changes in the biological and psychosocial domains, as well as the interaction between the physical and psychosocial domains (Dahl & Lewin, 2002). A significant negative association between deficits in sleep and health has been found as a consequence

of behaviours related to: how life is valued, health responsibility, healthy food habits, and effective stress management (Chen, Wang & Jeng, 2006).

The scarcity of data does not allow us to fully understand the duration of sleep over time; however the available data suggests that the duration of sleep periods has decreased over the years. (Cizza, Skarulis, & Mignot, 2005; Spiegel, Knutson, Leproult, *et al.*, 2005). Research has also shown that the average amount of sleep per night decreases throughout adolescence, from 10 hours a night, at the beginning of adolescence, to 7 hours, at the end of this life stage. Significant bedtime changes occur by age 13, whereas the establishment of an ideal wake-up time starts around the age of 14 (Tonetti, Fabbri, & Natale, 2008).

The gradual increase in the time spent watching television (TV) is also associated with the risk of daytime sleepiness in boys and girls, while computer use and video games were only found in boys (Gaina *et al.*, 2007). Van Den Bulk (2004) noted that sedentary behaviour, such as watching TV, playing computer games and surfing on the Internet, were negatively associated with the number of hours of sleep. The research carried out by Owens *et al.* (1999) reports that TV can have an impact on sleep behaviours, due to the following aspects: it postpones bedtime (therefore decreasing the duration of sleep); it replaces activities that promote good quality sleep; it triggers difficulties in falling asleep or middle-of-the-night awakening, connected with the anxiety motivated by the overstimulation caused by TV programmes.

According to Hughes e Rogers (2004), the practice of physical activity (PA) in adults was significantly correlated with their quality of sleep as adolescents. Based on cross-sectional studies with children and adults, (Chaput, Brunet, & Tremblay, 2006; Sekine *et al.*, 2002) found a dose-response relationship between short sleep duration and overweight, which was directly related to self-reported physical inactivity. Nevertheless, in physically active prepubescent boys, the overall spontaneous PA practised daily is positively associated with the amount of awake hours (Eiholzer *et al.*, 2008). On the other hand, Padez, Mourão, Moreira, e Rosado (2009) consider that the children who practise more PA sleep more hours a night than sedentary kids.

Chronic partial sleep deprivation also clearly induces symptoms of fatigue (Dinges *et al.*, 1997). This fatigue may result in the decrease of PA (Taheri, 2006). In fact, cross-sectional studies with children show that short sleep duration can be associated with increased TV viewing and reduced participation in organized sports (Locard *et al.*, 1992; von Kries, Toschke, Wurmser, Sauerwald, & Koletzko, 2002).

According to Xu *et al.* (2011) the factors that contribute to bad quality sleep include: youngsters with a higher level of education; those who live in rural areas; and those who show poorer health perception and higher levels of depression and anxiety.

Many adolescents exhibit chronic sleep deprivation due to social and recreational factors, academic pressure, as well as biological changes in their sleep-wake cycles. Insufficient sleep is also a symptom and the corollary of various mental disorders, including higher degrees of depression (National Sleep Foundation, 2006). In addition, this phenomenon is reported to occur more likely in youngsters who smoke, consume marijuana, have frequent sexual activity, seriously consider suicide, feel sad or desperate, get involved in physical violence, are physically inactive, use the computer 3 or more hours a day, and abuse soft-drinks (McKnight-Eily *et al.*, 2011).

The main objective of this study is to determine the relationship between sufficient sleep (≥ 8 hours of sleep per night on school days) and health-risk behaviours in Portuguese adolescents.

Methodology

The present study used data from a research conducted in Portugal, in 2010, within the scope of the Health Behaviour in School-Aged Children (HBSC) programme (Matos *et al.*, 2010; Currie, Samdal, & Boyce, 2001). The HBSC is a cross-sectional study that takes place in 44 countries, with the cooperation of the World Health Organization. The ultimate goal is to enhance the knowledge of youth health and well-being, their health behaviours, and their social contexts. Based on a questionnaire with the same questions to all participant countries, the study is carried out every four years, making it possible to compare the indicators between countries and to understand their evolution within each country.

Participants

3,494 individuals attending schools in continental Portugal, chosen randomly from a national list organized by region, participated in this study. The class was the unit of analysis chosen. This is a significant sample of 8th and 10th grade students who attend regular education in continental Portugal. In what gender is concerned, 53.6% (1,872) of the participants were female and 46.4% (1,622), male. The average age was 14.93 (\pm DP 1.3). As regards the school year, 45.6% attended the 8th grade, and 54.4%, the 10th.

Instrument

For each Health Behaviour in School-aged Children (HBSC) study, the international questionnaire is designed through collaborative research involving the researchers of the different countries. The questionnaire “Behaviour and Health in School-aged Children” (“Comportamento e Saúde em jovens em idade escolar”), used in this study, was adopted in the international HBSC study in 2010 (Currie, Samdal, & Boyce, 2001).

All the questions followed the format specified in the protocol (Currie, *et al.*, 2001), including demographic questions (age, gender, socioeconomic status), and questions on: food, hygiene, and sleep habits; body image;

the practice of physical activity; spare time occupations and new technologies; substance use; violence; family and home environment; friendships and peer relations; school and school environment; health and well-being; sexual behaviour.

This study was subject to a panel of experts from the Consulting Board for the Social Adventure Team (“Equipa Aventura Social”) and had the approval of the Ethics Commission, the National Commission for Data Protection, and the Ministry of Education. The schools also requested the informed consent of parents or legal guardians.

VARIABLES

The question: “Averagely, how many hours do you sleep per night, during the week?” was used to estimate the amount of sleep of the Portuguese adolescents. Results were dichotomized into insufficient (< 8 hours of sleep) and sufficient sleep (≥ 8 hours of sleep).

A few health-risk behaviours among those in the global HBSC survey were here analysed: being currently on a diet or on any weight loss programme; not having done any PA to the point of accelerating the heart rate and getting short of breath, for at least 60 minutes a day for 5 consecutive days, during the period of 7 days prior to this study; smoking ≥ 1 day for the last 30 days prior to this study; consuming alcohol ≥ 1 day for the last 30 days prior to this study; consuming marijuana (grass; hashish) ≥ 1 day for the last 30 days prior to this study; having a body mass index of ≥ 25kg/m²; feeling sad ≥ frequently during the last week before the application of the questionnaire; feeling lonely ≥ frequently during the last week prior to the application of the questionnaire; watching TV ≥ 3 hours a day on a normal school day; playing computer games ≥ 3 hours a day; using the computer ≥ 3 hours a day; suffering ≥ 1 lesion that required medical or nursing assistance, in the last 12 months.

Demographic variables (gender and age) were also included.

Statistical analysis

The SPSS version 16 for Windows (SPSS, Chicago IL, USA) was used. At an initial stage, the descriptive analysis of the variables was conducted, and later, a chi-square test (χ^2) was applied, aiming to determine the main differences in the variables under study. In order to determine relevant differences between variables, the value $\geq |1.9|$ of adjusted residual was considered. Then the analysis focussed on the attempt to explain the adolescents’ AT when travelling to school, by resorting to multivariate logistic regression models.

RESULTS

The descriptive results are presented in Table 1. The Table shows that 52.3% of the individuals are female,

and 39.3% are between ages 13 and 15. You can also see that 38.6% of these adolescents say they sleep less than 8 hours a night on weekdays. The percentage of youngsters who do not practise PA within recommended standards every week (70.4%) seems quite relevant. Besides, 10% say they have food restrictions. Alcohol was the substance most commonly mentioned (35.3%) and drugs were the least (3.5%). What is more, 18.5% of these youngsters suffer from overweight and obesity. On the other hand, 41.3% of these adolescents say they were sad in the last week, whilst 25.8% mentioned having felt lonely. Taking as reference the last twelve months, 38.4% answered that they suffered lesions requiring medical or nursing treatment. In what concerns the sedentary habits covered in this study, watching TV was the one which more people mentioned (42.5%), followed by computer use (28.8%), and the lowest percentage went to computer games (20.3%).

Table 1
Descriptive Analysis of the Demographic Questions, Sleep and Health-Risk Behaviours in the Study Sample (N=5050) – Health Behaviour in School-Aged Children – Portugal

| Characteristics | % | N |
|---|------|------|
| Gender | | |
| Female | 52.3 | 2643 |
| Male | 47.7 | 2407 |
| Age | | |
| ≤ 12 | 24 | 1177 |
| 13-15 | 39.3 | 1927 |
| ≥ 16 | 36.7 | 1796 |
| Insufficient sleep (< 8 hours of sleep per night during the week) | 38.6 | 1852 |
| Health-risk behaviours | | |
| Is on a diet ^a | 10 | 503 |
| Does not practise PA 60 min. ≥ 5 to 7 days a week ^b | 70.4 | 3519 |
| Smoking ^c | 14.5 | 731 |
| Alcohol consumption ^d | 35.3 | 1752 |
| Drugs consumption ^e | 3.5 | 173 |
| Overweight and obesity ^f | 18.5 | 838 |
| Feeling sad ^g | 41.3 | 2086 |
| Feeling lonely ^h | 25.8 | 1235 |
| Watching TV ≥ 3 h/day ⁱ | 42.5 | 2071 |
| Playing computer games ≥ 3 h/day ^j | 20.3 | 990 |
| Computer use ≥ 3 h/day ^l | 28.8 | 1401 |
| Suffered lesions ^m | 38.4 | 1912 |

Notes: ^a if they were on a diet or on any weight loss programme; ^b if they didn’t do any PA to the point of accelerating the heart rate and getting short of breath, for at least 60 minutes a day for 5 consecutive days, during the period of 7 days prior to this study; ^c smoking ≥ 1 day for the last 30 days prior to this study; ^d consuming alcohol ≥ 1 day for the last 30 days prior to this study; ^e consuming marijuana (grass; hashish) ≥ 1 day for the last 30 days prior to this study; ^f youngsters who have a body mass index of ≥ 25kg/m²; ^{g,h} during the last week before the application of the questionnaire; ^{i,j,l} on a normal school day; ^m suffered ≥ 1 lesion that required medical or nursing assistance, in the last 12 months.

No major differences were found between genders in what concerns the amount of sleep on school days (Table 2). It is among the younger individuals – 12-year-olds and younger – that the lowest values for insufficient sleep are found (5.3%), while the oldest students – 16 and older – show the highest percentage (19.3%). Being on a diet is mentioned by those who get sufficient sleep (5.5%). On

the other hand, those who sleep less show higher values of consumption of all the substances covered by the study. The adolescents who feel lonely (14.2%) and sad (24.5%) say they sleep more and those who use the computer more than 3 hours a day on weekdays show higher values for insufficient sleep (16.3%). There were no meaningful differences in the other variables of the study.

Table 2
 χ^2 Inferential Analysis and Explanatory Logistic Regression of the Portuguese Adolescents' Hours of Sleep

| Studied items | < 8 h of sleep | ≥ 8 h of sleep | Adjusted OR (≥8 h ref.) | (95% CL) | P-value |
|---|----------------|----------------|-------------------------|--------------------|-------------|
| | % | % | | | |
| Female (ref.) | 18.4 | 29.1 | 0.967 | (0.83-1.12) | .667 |
| ≤ 12 years old (ref.) | 5.3 * | 18.4 * | | | |
| 13-15 years old | 13.6 * | 25.7 * | 0.547 | (0.46-0.66) | .000 |
| ≥ 16 years old | 19.3 * | 17.6 * | 0.291 | (0.24-0.35) | .000 |
| Is on a diet ^a | 4.3 * | 5.5 * | 0.906 | (0.71-1.15) | .662 |
| Does not practise 60 min. physical activity ≥ 5 to 7 days a week ^b | 27.5 | 43 | 1.037 | (0.88-1.21) | .662 |
| Smoking ^c | 7.9 * | 6.8 * | 0.728 | (0.58-0.91) | .006 |
| Alcohol consumption ^d | 18.7 * | 16.2 * | 0.837 | (0.71-0.98) | .027 |
| Drugs consumption ^e | 2 * | 1.6 * | 1.218 | (0.85-1.92) | .231 |
| Overweight and obesity ^f | 7.1 | 10.9 | 0.974 | (0.81-1.17) | .782 |
| Feeling sad ^g | 18.8 * | 24.5 * | 0.786 | (0.66-0.92) | .004 |
| Feeling lonely ^h | 11.4 * | 14.2 * | 0.893 | (0.74-1.07) | .233 |
| Watching TV ≥ 3 h/day ⁱ | 16.5 | 26.2 | 0.976 | (0.84-1.13) | .746 |
| Playing computer games ≥ 3 h/day ^j | 8.2 | 12 | 0.922 | (0.82-1.21) | .937 |
| Computer use ≥ 3 h/day ^k | 16.3 * | 12.3 * | 0.829 | (0.7-0.98) | .029 |
| Suffered injuries ^m | 15.8 * | 22.8 * | 1.027 | (0.88-1.18) | .720 |

Notes: IC indicates the confidence intervals; OR for *odds ratio*; R^2_N : indicates the value of *Nagelkerke*; χ^2_{HL} indicates the value of *Hosmer and Lemeshow* test; * X^2 significant values for $p < 0.05$; Adjusted residuals $\geq |1.9|$ are considered significant (**in bold**); ^a if they were on a diet or on any weight loss programme; ^b if they didn't do any PA to the point of accelerating the heart rate and getting short of breath, for at least 60 ^c smoking ≥ 1 day for the last 30 days prior to this study; ^d consuming alcohol ≥ 1 day for the last 30 days prior to this study; ^e consuming marijuana (grass; hashish) ≥ 1 day for the last 30 days prior to this study; ^f youngsters who have a body mass index of $\geq 25\text{kg/m}^2$; ^g during the last week before the application of the questionnaire; ^h on a normal school day; ^m suffered ≥ 1 lesion that required medical or nursing assistance, in the last 12 months

Table 2 also exhibits the adjusted *odds ratio* values of the statistical multivariate logistic regression in order to display the variables associated with sufficient sleep (≥ 8 hours/day). In this light it is possible to determine that, as these adolescents grow older, they have less and less probability of getting enough sleep, as can be evidenced considering the age group between 13 and 15 ($\text{OR}=0.549$, $p < .05$) and those who are 16 and older ($\text{OR}=0.291$, $p < .05$). Smoking reduces the probability of getting sufficient sleep by 27.2% ($\text{OR}=0.728$, $p < .05$) and alcohol consumption decreases this probability by 16.3% ($\text{OR}=0.837$, $p < .05$). Feeling sad is connected to a decrease of 21.4% of probability ($\text{OR}=0.786$, $p < .05$). This negative association with lack of enough sleep is also apparent

($\text{OR}=0.829$, $p < .05$) among those who use the computer 3 or more hours a day..

DISCUSSION

The main objective of this study was to determine the relationship between sufficient sleep (≥ 8 hours of sleep per night on school days) and health-risk behaviours in Portuguese adolescents. The major purpose is to contribute to understand the variables associated with good sleep habits, considering their importance in improving the youngsters' bodies, both physically and intellectually (Boscolo, Sacco, Antunes, Mello, & Tufik, 2007).

As the results of this study show, 61.4% of the adolescents get sufficient sleep, even though this result is low if compared with the 81.9% obtained in the research conducted by Gonçalves, et al (2010). It was also observed that the probability of having enough sleep tends to decrease as adolescents get older, which is confirmed by several researchers (Cizza, *et al.*, 2005; Spiegel, Knutson, Leproult, *et al.*, 2005), and the most relevant changes occur by the age of 13 (Tonetti, *et al.*, 2008).

The consumption of tobacco and alcohol also reduces these youngsters' chances of getting sufficient sleep, as mentioned in the research by McKnight-Eily, et al (2011).

Sadness is also linked to this tendency. According to Ohayon (2005), insufficient sleep and sleep disorders have serious consequences on people's health, mood, learning, performance, and safety, as well as social costs related to a decrease in productivity and quality of life.

The results reveal that there is a negative association between the use of the computer for 3 hours or more and sufficient sleep. Crowley, et al (2007) believe that the lack of sleep results from a combination of biological and environmental factors and the abuse of electronic media, even though their study could only verify that there is a significant relationship between sleep and computer use. On the other hand, Spanish adolescents with short sleep patterns spend more time watching TV, and there is a positive association between the boys' PA and sleep duration. The present study, however, could not find a connection between the adolescents' sleep duration and PA.

The existence of a link between BMI and sleep was not evidenced in this study too; however, several studies have proved that there is a connection between short periods of sleep and obesity (Gupta, Mueller, Chan, & Meininger, 2002; Knutson, 2005). This could be explained by the fact that longer wake periods may mean more opportunities to eat, especially if most of this time is spent on sedentary activities, such as watching TV and using the computer (Patel & Hu, 2008; Sivak, 2006).

One of the limitations of this study has to do with the fact that the questions used did not address only the characterization of sleep patterns, which may have caused interpretation problems to the subjects inquired. Another restraint involves the variables about symptoms and consumption of substances, always conditioned by a high degree of individual subjectivity.

CONCLUSIONS

In conclusion, it seems evident that the adolescents' sufficient sleep patterns are likely to decrease with age, the consumption of alcohol and tobacco, sadness, and using the computer 3 or more hours a day.

The number of young people who show chronic insufficient sleep quality is still growing and it is fundamental to continue researching in order to better

understand this phenomenon. Since it is of the greatest importance to the lives of these youngsters and future adults, it is crucial to implement strategies and policies aiming at the improvement of the amount and quality of sleep, which must be considered within the scope of preventive health care.

Families and Health promoters should therefore be aware of the importance of sleeping enough hours upon adolescent's health.

Health education in schools and in families should include information and guidance about the importance of sleeping enough hours as one of the health habits in need of being implemented and kept from early age especially now that the new technologies of information and communication appears as a "competitor" to a good night sleep, available 24 hours a day.

KEY FINDING

Health education needs to address the issue of sleeping habits because it looks like sleep deprivation / insufficient sleep increase with age along adolescence.

Insufficient sleep is related to psychological distress (feeling sad) and a concomitant increase in substance use (alcohol and tobacco).

Furthermore insufficient sleep is associated with increase screen time.

Further investigation is needed to establish the direction of this association: is insufficient sleep a cause or a consequence of psychological distress, substance use and abusing screen time?

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