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Stress and sleep quality in high school Brazilian adolescents

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ABSTRACT

OBJECTIVE: The objective of the present study is to analyze the effect of stress on sleep quality in a group adolescents. METHOD: Two high schools in Alfenas, southern Minas Gerais State, Brazil, were chosen to participa in the study. The sample consisted of both genders (n=160) with 65.63% females. The age range of participants w 15 to18 years. The Pittsburgh Sleep Quality Index (PSQI) was applied for collection of data to quantify sleep quali The Lipp Inventory of Stress Symptoms that objectively identifies symptoms of stress was applied. RESULTS: It w observed that 23.53% of stressed students and 45.33% of unstressed ones sleep well; 76.47% of stressed pupils a 54.67% of those unstressed do not sleep well. With regard to school performance, a mean of 0.65 was found for stress students and 0.60 for those without stress, Mann-Whitney (p=0.0596). CONCLUSION: Stress contributed to raisi the percentage of poor sleepers, as well as increasing mean school performance.

Key words: sleep, sleep disorders, stress, sleep deprivation, psychological symptoms.

INTRODUCTION

Adolescence marks the peak of the individual's biopsychosocial maturation, the time in which physical transformations acquire a fundamental importance for this group. With the arrival of puberty, the individual finds himself in the midst of hormonal, functional, affective and social changes. The adolescent's social transition into adulthood requires the symbolic development of their way of life. The necessity of adaptation to new social roles and the accompanying physical structure that acquires the adult form characterizes a period of tensions, conflicts and imbalance demanding efforts for adaptation. Major use of energy is required for adjustment or to surmount these stressful emotions. This produces attrition on the organism, as it has the necessary amount of energy to remain in homeostasis. Whenever a person goes through a change, a certain amount of this energy (Pereira and Tricoli 2003, Steiger 2002, Capald 2005).

Human development itself is a source of since in each of the individual's evolutionary stag are new and stressful situations that he must learn with. These conditions initiate with the child's sity to learn abilities during the early years, mov later to the physical and cognitive changes of cence (Pereira and Tricoli 2003). Each stage of opment is an improvement over the previous one same time, each is characterized by different qua functions.

As a response to stress, it should be mention the secretion of cortisol increases in the circulati this hormone has been implicated in the suppres REM sleep, increase of superficial sleep, and diffi falling and remaining asleep (Adam et al. 1986,

The important weight-height development, depending on the growth hormone (GH) is essential for this stage of life (Pereira and Tricoli 2003). The hormone is produced in the hypophysis and its secretion is affected by various external stimuli that increase the capacity to induce sleep just as do nutrition and physical activity. The secretion of GH in adolescence is characterized by major secretion in amplitude and frequency during the hours of deep sleep. Of the total amount of GH secreted by the hypophysis during the day, 80% is liberated in one or two large pulses, immediately during the early periods of stages 3 and 4 of sleep each night (Rogers et al. 2001).

Physical growth can also be jeopardized by sleep disorders that prevent normal secretion of the GH. Because they affect GH specifically secreted during sleep, poor sleep can delay sexual maturity. Academic achievement, mood, and sociability can also be compromised by a lack of sleep subsequently impacting education and future opportunities (Kerin et al. 1996). Insomnia can aggravate emotional symptoms provoking psychological disorders and preventing the psychological development necessary for this stage (Friedman et al. 1999, Fallone et al. 2001, Aserinsky and Kleitman 2003).

Hence, the goal of this study is to verify whether stress influences sleep quality of adolescents, starting with the premise that sleep quality is an important component for development. This is part of a larger research project evaluating child and adolescent sleep disorders that will be published elsewhere (Reimão and Lemmi 1991, Neves and Reimão 2007).

METHOD

This is a descriptive transverse study favoring the quantitative method, evaluating sleep quality, and stress among adolescents.

This study was performed in Alfenas, a city with a population of about 80 thousand inhabitants, situated in southern Minas Gerais State, Brazil. Two high schools participated, one public and one private, situated in the downtown area. The public school (111 students) conducted morning and afternoon classes with the pupils The population in this study consists of 160 adolescents of both sexes, ranging in ages from 15 to 18 years.

Included in this study were high school students with ages ranging from 15 to 18 years that were registered in both schools; students who volunteered for the study and who brought the Informed Consent form signed by their legal guardian.

MATERIAL

1 – Pittsburgh Sleep Quality Index – PSQI (Buysse et al. 1989)

The PSQI instrument is utilized to quantify sleep quality, is properly standardized for retrospective use and applied in Portuguese, and is reliable and employed internationally. The PSQI was validated in Portuguese by A.N. Bertolazi, unpublished data.

The PSQI evaluates sleep quality during the last month and is composed of 19 (nineteen) self-evaluating items whose overall score ranges from 0 to 20 (zero to twenty), in which the lower the score, the better the sleep quality. Good sleepers were those who obtained a score of less than 5 (five), and poor sleepers were those with scores higher than 5 (five).

The PSQI evaluates the items: subjective sleep quality, latency of sleep, duration of sleep, habitual efficiency of sleep, disturbances of sleep, use of drugs and daytime sleepiness.

2 – Lipp's Inventory of Stress symptoms – Lipp's Inventory (Lipp 2000)

The scope of the Lipp's Inventory is to objectively identify the symptoms of stress presented by the subject, registering the existing type of symptom, whether somatic or psychological, and the stage it is in (the alert stage; resistance; close to exhaustion; and exhaustion). Presented in a four fold model, this inventory was validated by Lipp (Lipp 2000) and has been utilized for studies and clinical inves-

ETHICAL ASPECTS

The study does not expose the participants to any risks. The parents or guardians of the pupils in the investigation were informed of the objectives as well as the study methods by the Informed Consent Form.

The project n° 152/2004 initiating the study was approved by the Ethics Committee of the Medical Sciences Division (CEP/FCM) of the State University of Campinas (UNICAMP), obeying all the provisions of Resolution 196/96 and supplements, and was approved at the Ordinary Meeting of the CEP/FCM, on July 20, 2004.

STATISTICAL METHOD

The data obtained in this investigation was tabulated, organized and stored on an Excel electronic spreadsheet program. The data were submitted to statistical analysis by the Research Division of the Medical Sciences Department of the UNICAMP. The descriptive analysis was performed by measurements of position and dispersion for continuous variables and tables of frequencies for categorical variables. The Chi-square Test (χ^2) or Fisher Exact Test was utilized when necessary to confirm association or to compare proportions. The Mann-Whitney Test was employed for comparison of continuous measurements between the two groups. The level of significance for all analyses was set at 5%.

RESULTS

Regarding gender, 65.63% of the interviewees were females and 34.38% were males.

The ages of the interviewees were distributed as follows: 43.13% were 15; 33.75% were 16; 16.88% were 17, and 6.25% were 18 years old.

Concerning the predominance of stressful symptoms, 15.29% displayed chiefly physical symptoms; 10.59% chiefly physical and psychological symptoms, and 74.12% a predominance of psychological symptoms.

Symptoms of stress were not presented by 46.88% of the sample, and 53.13% demonstrated symptoms of stress.

In the classification of stages of stress, 1.18% pre-

In dealing with the relative frequency (%) o
based on the score of subjective quality of sleep,
plication of the Fisher test demonstrated that 14.1
der stress and 33.33% without stress rated thei
as very good; 61.16% with stress and 56.00% v
stress rated their sleep as good; 17.65% with str
6.67% without stress rated their sleep as poor;
with stress and 4.00% without stress rated their s
very poor (p=0.0108).

In the relative frequency (%) of stress, acc
to the stress related to the sleep latency score,
plication of the Fisher test demonstrated that
with stress and 28.00% without stress fell asleep
than 15 minutes; 40.00% with stress and 36.00%
out stress within 16 to 30 minutes; 31.46% with
and 28.00% without stress take from 31 to 60 m
14.12% with stress and 8.00% without stress tak
than 60 minutes (p-value=0.1445).

In the relative frequency (%) of stress rel
the sleep duration score, it was noted that 52.94%
with stress and 61.34% were without stress and r
duration of sleep of over 7h; 30.59% with str
37.33% without stress displayed sleep duration b
6 and 7h; 9.41% with stress and 0.00% withou
presented sleep duration between 5 and 6h; 7.06
stress and 1.33% without stress related sleep dura
less than 5h, (p-value=0.0072).

Relative frequency (%) of stress related to
bitual sleep efficiency score applying the Fisher t
played that 89.41% with stress and 84.00% v
stress presented a habitual sleep efficiency score
than 85%; 5.88% with stress and 12.00% withou
presented a habitual sleep efficiency score betwe
and 84%; 4.71% with stress and 4.00% withou
displayed a habitual sleep efficiency score betwe
and 74% and less than 65% (p-value=0.3931).

In the relative frequency (%) of stress relate
sleep disturbances score, application of the Fish
displayed that 2.33% with stress and 5.33% v
stress did not present any sleep disturbance; 56.47
stress and 78.67% without stress manifested occ
sleep disturbances; 37.65% with stress and

In the relative frequency (%) of stress related to the use of sleep medication score, the application of the Fisher test, revealed that 91.76% were stressed, 96.00% were not stressed and not use any medication to sleep; 8.24% with stress and 4.00% without stress used sleep medication (p-value=0.3380).

In the relative frequency (%) of stress related to the daytime sleepiness score, application of the Fisher test revealed that 9.42% with stress and 20.00% without stress did not demonstrate difficulties in performing daily tasks and did not feel sleepy during the day; 42.35% with stress and 57.34% without stress presented difficulties in performing daily tasks and mild sleepiness during the day, less than once a week; 32.94% with stress and 21.33% without stress reported difficulties in performing daily tasks and moderate sleepiness during the day, once or twice per week; 15.29% with stress and 1.33% without stress reported difficulties in performing daily tasks and much sleepiness during the day, three or more times per week (p-value=0.0013).

DISCUSSION

In this research, the PSQI has enabled us to observe that the students with stress were classified as poorer sleepers (Table I). Individuals who presented stress, revealed outstanding averages in the following components: subjective qualities, duration of sleep, sleep disturbances and daytime sleepiness.

TABLE I
Absolute and relative frequency (%) of stress based on the assertion of sleeping well or not.

Stress	Yes		No	
	N	%	N	%
Good sleep				
Yes	20	23.53	34	45.33
No	65	76.47	41	54.67
Total	85	100.00	75	100.00

p-value=0.0024*. The application of the χ^2 test led to the conclusion that there was a statistically significant difference between the proportion of students that stated to be poor sleepers and suffer from stress, and those who do not sleep well and do not suffer from stress; there

Authors have associated insufficient sleep with stress, but their studies differed from our study in which the symptoms of stress were evaluated by the Lipp's Inventory. Their research focused on the relationship among stress, levels of cortisol and sleep. As a result, these authors found decreased sleep time, increased latency of sleep and changes in cortisol levels in the poor sleepers. In response to stress, the circulating cortisol levels increased and resulted in changes in sleep patterns (Adam et al. 1986, Steiger 2002, Vgontzas et al. 2003, Capaldi et al. 2005).

Among the significant data enabling us to compare these with findings in the literature, are the data pertaining to stress and daytime sleepiness. It was detected that the proportion of students with stress manifesting daytime sleepiness was greater compared to pupils without stress. The data here presented support the studies of Capaldi et al. (2005), with 31 participants, who addressed the effects of stress on sleep in children and adolescents ranging in age from 10 to 17 years. An evaluation of sleep habits was undertaken using a self-reporting scale, with six sub-scales projected to evaluate the range of sleep, including sleep habits, quality of sleep, and sleep-related emotional and behavioral problems. Unlike our study, they utilized measurements of saliva that evaluate the cortisol level induced by stress in children and adolescents. In partial correlations and analyses of multiple regression that examine associations between measurements of sleep and levels of stress, there was a tendency to report the problems of sleep/wake rhythm, behavior, and a tendency to investigate the association between daytime sleepiness and the effect of stress.

Our sample is also in agreement with the study of Mantz et al. (2000), in which daytime sleepiness was reported by 38% of adolescents who demonstrated stress. When the question of sleep disorders related to stress was analyzed, significantly higher percentages in the group with stress were observed. The data suggest that stress can become a contributing element for sleep disturbances in the studied group.

The study here presented agrees with that of Healey et al. (1981) who studied chronic adult insomniacs

TABLE II
Absolute and relative frequency (%) of stress symptoms based on the assertion of sleeping well or not.

Symptons of stress	Physical		Psychological		Physical and psychological		No stress	
	n	%	n	%	n	%	n	%
Good sleeper								
Yes	07	53.85	13	20.63	00	0.00	34	45.33
No	06	46.15	50	79.37	09	100.00	41	54.67
Total	13	100.00	09	100.00	63	100.00	75	100.00

p-value$<$0.0001. The application of the Fisher test led to the conclusion that the proportion of students that do not sleep well and present physical-psychological and psychological symptoms can be considered statistically significant when compared to the proportion of pupils who sleep well. The proportion of students that do not sleep well and present psychological symptoms compared to the students who do not sleep well and present physical symptoms can also be considered statistically significant.

authors concluded that life-stress events are components related to sleep disorders.

Although differing in age range to the present study, another investigation performed by Morin et al. (2003) also examined the relationship of stress to standard sleep tests in patients specifically with insomnia. The sample consisted of 67 adult participants with an average age of 39.6 years. Among the subjects with insomnia, 40 displayed stress, and 27 did not. The data demonstrated a significant relationship between daily stress and nocturnal sleep.

In our data comparing duration of sleep to stress, the percentages were higher in the group with stress. Therefore, less duration of sleep in the group with stress was observed. The data of this study are in agreement with that of Mantz et al. (2000) who utilized a daily questionnaire, over a ten day period, in a sample with 386 participants between 15 and 20 years of age. The questions were related to the sleep and wake hour and quality of sleep. The results confirmed that insufficient sleep was due to academic stress during the week. The students under stress exhibited poor sleep quality with reduction of sleep time and difficulty in falling asleep (16%).

When good sleep is correlated with predominance of stress symptoms (Table II, a larger number of psychological symptoms in the group of poor sleepers is evident. In this item, our data is close to the one published by the

From the results reported by the USA N
Sleep Foundation (2006), some data suggest that
velopment of puberty may be more strongly ass
with high rates of sleep disorders; the results
significant link between sleep disturbances and
ical, psychological or social difficulties. In sum
this study suggests the importance of evaluating th
ity of sleep, for it may be a way of detecting psyc
ical difficulties in adolescents.

The study here presented corroborates that
driksen et al. (2004) who observed emotional c
in students who slept less. It also confirms the stu
Friedman et al. (1999) who compared a group o
sleepers and of poor sleepers, regarding stressf
ments. They demonstrated that the good sleeper
greater probability of tolerating stressful changes
daily life, whereas, in the group of poor sleepers
stressful factors further aggravate sleep quality.

The present study is also in agreement wit
by Fallone et al. (2001) that show the effect of sle
ness on the emotional state in other ways. Based o
parative studies (Fallone et al. 2001), who analy
effect of sleep deprivation on psychological fun
memory, mental concentration and learning, ide
that, from a psychoanalytical approach, reduce
time is associated with disturbances of the Ego a
sonality, with memory and concentration impairm

TABLE III
Absolute and relative frequency (%) of stress based on the private and public schools.

School	Private		Public		Total
	n	%	n	%	
Stress					
Yes	34	69.39	51	45.95	85
No	15	30.61	60	54.05	75
Total	49	100	111	100	160

p-value=0.0062*. The application of the χ^2 test led to the conclusion that there was a statistically significant difference between the proportion of students' from private and public school who suffer symptoms from stress.

CONCLUSION

Regarding the averages between students with and without stress, the results reveal a high rate of stressful symptoms. A high percentage of those stressed were classified in the resistant stage, and stress is a strong detrimental factor in sleep quality among adolescents.

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RESUMO

OBJETIVO: O objetivo do presente estudo foi analisar a influência do stress sobre a qualidade do sono em um grupo de adolescentes. MÉTODO: Foram escolhidas duas instituições educacionais do ensino médio, na cidade de Alfenas, sul de Minas Gerais, Brasil. A amostra foi composta por ambos os sexos (n=160), com 65,63% do sexo feminino. A faixa etária dos participantes foi de 15 a 18 anos. Para a coleta de dados aplicou-se: Índice de Qualidade de Sono de Pittsburgh (IQSP) utilizado para quantificar a qualidade do sono; o Inventário de Sintomas de Stress para Adultos de Lipp (ISSL) que identifica de modo objetivo a sintomatologia de stress foi aplicado. RESULTADOS: Observou-se que 23,53% dos estressados dormem bem e 45,33% dos não estressados dormem bem; 76,47% dos estressados não dormem bem e 54,67% dos não estressados não dormem bem. Quanto ao rendimento escolar têm-se as médias 0,65 para os alunos estressados e 0,60 para aqueles que não

Palavras-chave: sono, distúrbios do sono, stress, privação do sono, sintomas psicológicos.

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