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NIGHTLY USE OF COMPUTER BY ADOLESCENTS

Its effect on quality of sleep

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ABSTRACT - *Objective*: To analyze the influence of nocturnal use of computer and their effect on sleep quality, in a group of adolescents. *Method*: Two middle schools were chosen for the research. The sample consisted of adolescents n=160 (55M; 105F), with ages ranging from 15 to 18 years. Questionnaire about computer use with the objective of obtaining information regarding the time and number of hours of nocturnal computer use, were applied for collection of data. They included the Pittsburgh Sleep Quality Index (PSQI), utilized to quantfy sleep quality; student report cards were used to note student's absences and grades were used. *Results*: The Multiple Logistic Regression test indicated that nocturnal computer use impairs good sleep (p=0.0062). *Conclusion*: Irregular sleep patterns associated with nightly computer use deteriorate sleep quality.

KEY WORDS: sleep, sleep disorder, adolescent, computer.

Uso noturno de computador por adolescentes: seu efeito na qualidade de sono

RESUMO - *Objetivo*: Analisar a influência do uso noturno de computador na qualidade de sono, em um grupo de adolescentes. *Método*: Foram escolhidas duas instituições educacionais de ensino médio. A amostra tomada foi composta de adolescentes (n=160), (55 M; 105 F); a faixa etária estudada foi de 15 a 18 anos. Para a coleta de dados aplicou-se: Questionário para uso do computador, com a finalidade de coletar informações sobre o horário e a quantidade de horas do uso do computador durante as noites; Índice de Qualidade de Sono de Pittsburgh (IQSP) utilizado para quantificar a qualidade do sono; e os boletins dos alunos por meio dos quais foram recolhidas as faltas e as notas dos alunos. *Resultados*: Pela Regressão Logística Múltipla, observou-se que o uso do computador é um fator que compromete o dormir bem (p=0,0062). *Conclusão*: Padrões irregulares de sono associados ao uso noturno de computador estão associados à deterioração da qualidade do sono.

PALAVRAS-CHAVE: sono, distúrbio do sono, adolescente, computador.

The ballance between endogenous and exogenous factors is remarkably relevant for biological rhythms, and it can be impaired by environmental changes and consequently provoke a series of disturbances such as sleep disorders, indisposition, gastro-intestinal changes[1], mood fluctuations, irritability, tension, confusion, anxiety and reduced performance in tasks that require attention and concentration[2]. The sleep-wakefulness cycle is a circadian rhythm that, under natural conditions oscillates over a 24-hour period. The interchange of day-night (light-dark), school hours, work hours, leisure time, family activities, are exogenous factors that synchronize sleep-wakefulness[3]. Besides this environmental synchronization, the sleep-wakefulness cycle originates and is regulated endogenously by a neural structure located in the hypothalamus, it is the supraquiasmatic nucleus, considered the master circadian biological clock for mamals[4,5]. Optional hours, that prevent us from sleeping at habitual hours, considerably affect psychophysiological balance. The clinical adverse effects of the interruption of circadian rhythms, such as night-shift work include severe impairment during wakefulness[1]. Sleep is an important factor of synchronization between internal fluctuations and environmental cycles. In humans, the best example of organism and environmental synchronization is the sleep/wake cycle, regulated by light and dark. According to their nature and social organization, human are active during the day, their physical functions are es-

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pecially oriented for daytime activities and are related to the biological rhythm[1,4] .

Temporal adaptation consists of harmonizing the stages of species rhythms with those of environmental cycles. This implies that the stages of physiological and behavioral rhythms are associated to more beneficial stages of the environmental cycle for survival of the species[1]. The biological rhythm is important to maintain a schedule of hours for sleeping, studying, working, leisure and meals. According to Fischer et al, 1993 when behavior is not adjusted to the biological rhythm, a temporal disorder results. Connor et al.[6] believe there is a strong relationship between quality of sleep and quality of wakefulness, that is, not sleeping or sleepig poorly leads to difficulties to accomplish the activities that require marked alertness. Social patterns dictate in adolescents that disrespect sleep schedules[7-9.] In the health field sleep in a factor that cooperates toward human survival. At the same time, modern understanding about the main standarsds of life quality, besides nutritional care and physical activities, currently include concern with our sleep period. One of the most immediate results of poor quality sleep, of lack of sleep is the drop in the next day's performance[4,10] . It is a challange for contemporary adolescents to maintain regularity of the sleep-wakefulness cycle, satisfy their sleep and at the same time to meet school and social demands[9,11-13]. Lack of sleep can range from somatic changes, cognitive and affective disorders to automobile accidents[6,14] . The technological era has caused transformations on contemporary culture due to the introduction of television and more recently microcomputers into the home. Since the mid eighties, and with the growth of the Internet and its outstanding position in the media, the habit of "surfing the web" at night has gained popularity and followers, among young people and particularly adolescents who become easy prey of surfing groups[15]. Adolescents "surf the web" almost the entire night ignoring the need for regular hours of sleep necessary for good physical and psychological development. Not sleeping or sleeping few hours at night than the required hours can lead to impairments during wakefulness[7,8,16,17,18]. The later include daytime sleepiness, that can result in moodiness, low self-esteem, slow reasoning, memory impairment, poor school performance, and personal and automobile accidents[19-21] .

The objective of the present research is to analyze the influence of nightly use of computer by adolescents on sleep quality. It is part of a larger research evaluating childrens' and adolescents' sleep pattterns and disorders that will be published elsewhere[22-26] .

METHOD

Initially, information about the investigation was sent to the school administration for permission to collect data from the institutions. After authorization by the schools, the project was sent to the Ethics in Research Committee of the Medical Sciences School of UNICAMP, and was approved and confirmed at the Reunion on July 20, 2004.

The present study consists of 160 adolescents (55M; 105F) ranging in age from 15 to 18 years who volunteered to participate in the study and whose gardians signed a Free and Informed Consent form. These adolescents were high school students of the "*Colegio Estadual Dr. Emilio da Silveira*" and of "*Colegio Dr. Roque Tamburini*", located in the city of Alfenas. Excluded from the study were first and second years students under 15 or over 18 years of age and those who failed to deliver an Informed Consent signed by their gardian.

The data were obtained by filling out the "Questionnaire For the Use of the Computer", applied to collect information about the time and number of hours of nocturnal computer use; the Pittsburgh Sleep Quality Index (PSQI). The latter index[27], measures the quality of sleep and is appropriately standardized for retrospective use, is validated in Portuguese, and is reliable and utilized internationally. The PSQI assesses the quality of sleep over the last month and consists of nineteen items of self-evaluation, its global score ranges from 0 to 20, the lower score the better quality of sleep. Subjects with good sleep quality (good sleepers) are those with scores under five, and those with poor sleep quality display scores over five (poor sleepers). During the period from August to November 2004, the schools supplied students' report cards to verify absences and grades.

The descriptive statistical analysis was performed by measurements of position and dispersion for continuos variables and frequency tables for categorical variables[28]. In order to confirm association or to compare proportions the Chi-square test or the Fisher exact test were utilized when necessary. The Mann-Whitney test and the Kruskal-Wallis test were employed for comparison of continuous or ordered measurements, the former between two groups and the latter among three or more groups.

RESULTS

Regarding nocturnal use of the computer, 35% do not use it at night (NUC) and 65% use it at night (UC). Notice that the computer is used predominantly at night, either on weeknights from 18 o'clock to 6 o o'clock in the morning (75.96%), or on weekends, from 17 o'clock to 3 o'clock in the morning (90;38%). Analysis of the data reveals that females are the predominant users of the computer at night (62.50% versus (37.50% of males, and the age group is mainly 15 (45.19%) and 16 years of age (33.65%). Application of the Mann-Whitney test (p=0.0022) exibited an average over-all score of the PSQI of 5.0 for the students who do not use the computer at night and 6.2 for those who do. Thus we can state that the popula-

Table 1. Nightly computer use by adolescents and daytime sleepiness.

PC Use	Yes		No	
	n	%	n	%
DS				
0	15	26.79	8*	7.69
1	28	50.00	51	49.04
2	10	17.87	34	32.69
3	3	5.36	11	10.58
Total	56	100	104	100

*(p≤0.05). DS, daytime sleepiness; PC, personal computer; zero, no difficulty or indisposition in accomplishing daily tasks; one, difficulty in performing daily tasks and mild indisposition during the day less than once a week; two, difficulty in accomplishing tasks once or twice a week and moderate indisposition during the day; three, much indisposition felt during the day two or three times per week and difficulties in performing tasks.

Table 2. Nightly computer use by adolescents and sleep duration.

PC Use	Yes		No	
	n	%	n	%
Sleep Dur.				
0	38	67.86	53	50.96
1	12	21.43	42	40.38
2	4	7.14	4	3.85
3	2	3.57	5	4.81
Total	56	100	104	100

p=0.0668. Sleep Dur, sleep duration; PC, personal computer. Sleep duration: zero, duration of sleep, over 7 hrs; one, duration of sleep between 6 and 7 hrs; two, durantion of sleep between 5 and 6 hours; three, duration of sleep less than 5 hours.

Table 3. Nightly computer use by adolescents and sleep latency.

PC Use	Yes		No	
	n	%	n	%
SL				
0	13	23.21	20	19.23
1	23	41.08	38	36.54
2	14	25.00	34	32.69
3	6	10.71	12	11.54
Total	56	100	104	100

p=0.7491. PC, personal computer; SL, sleep latency; zero, fall asleep in less than 15 minutes; one, need 16 to 30 minutes; two, need 31 to 60 minutes; three, need 50 minutos or more to fall asleep.

Table 4. Nightly computer use by adolescents and "good sleeper".

PC Use	Yes		No	
	n	%	n	%
GS				
Yes	27*	50.00	77	72.64
No	27	50.00	29	27.36
Total	54	100	106	100

p≤0.05. GS, good sleeper.

tions differ compared to the scores analyzed. Regarding the question of daily sleepiness and sleep disorders p=0.0041 (Table 1) and the question of good sleep p=0.0045 (Table 4) the data indicated significant differences within the components of the PSQI analyzed. The duration of sleep p=0.0668 is in Table 2, and the latency of sleep p=0.7491 is in Table 3.

Considering academic performance, we can state

that the average is 0.613 for students not using the computer and 0.637 for those using it; application of the Mann-Whitney test (p=0.3347) enables us to note that the population sample of the data analyzed do not differ.

DISCUSSION

The bibliographic references on analysis of quality of sleep and "nocturnal surfing on the web" in a group of high school students are still scarce. The present study displayed major use of the computer by females. A recent survey performed by the National Sleep Foundation[29] showed grater probability of boys using electronic devices such as games and "surfing the web" than among adolescent girls. The dissimilarity observed in this study is important and probably due to socio-cultural differences between the two samples, and under these conditions leading to major use of computer by brazilian adolescents in this sample compared to the American ones[29] .

Analysis of the data displays a major use of the computer at night at irregular hours, even at late hours during the week and on week-ends. This enables us to conclude that adolescents are using the computer indiscriminately. A survey of the literature enabled us to identify our data with that of Bercedo Sanz et al.[30] who found these devices in the rooms of Spanish adolescents on the average as follows: 52.5% television, 57.8% computers, 52% internet and 38.7% videogames. The adolescents habitually "surfed the web" both daily during the week and on weekends. Bercedo Sanz et al.[30], concluded that adolescents should be taught not to abuse of these devices.

Among the factors contributing to the growing abuse of the computer, is its popularity. The analyses led to the rationale that the habit of remaining in front of the computer until late at night is inappropriate because it leads to a delay or even to transfer of sleep from nighttime to daytime, and consequently, chronic sleep deprivation. The light from the computer also affects the production of melatonin directly, generatig phase delay of sleep onset [29].

Due to the delay in falling asleep and dislocation of hours to begin and end sleep resulting from nocturnal computer use, the results directly reflect on daily behavior. Studies[31] reported in the literature have concluded that exchenging sleep at night by sleep during the day, even in the presence of a resonable amont of sleep over a 24-hour period, is not enough to produce a good neurobehavioral preformance compared to a night's sleep[14] .

The data referring to daytime sleepiness and sleep disorders (Table 1), display significant statistical differences, so that the nocturnal computer users attain higher indexes of DS and SD compared to non-users of computers. This shows a major impairment of the nocturnal "surfers" regarding SD and DS, and an approximation with the study of Joo et al.[32]. The objective of their study was to determine the presence of excessive daytime sleepiness (EDS) and its association with sleep habits, sleep problems and scholastic performance in South Korean High School students. Their study was composed of 3871 students (2703 males and 1168 females, with average age of 16.8 and 16.9 years respectively) (range 15-18 years) and in a general analysis the prevalence of EDS was observed in 15.9% of the sample[32] .

In the analysis referring to duration of sleep (Table 2), the data provides evidence that nightime computer users are subject to sleep deprivation. Comparing our data with that of Van Dongen et al. [14,] on restricting hours of sleep to 8hs, 6hs, and 4hs, per day over a 14 day period, in response to limitation of sleep we were able to identify cognitive deficits and daytime sleepiness.

In the investigation presented, the data referring to sleep latency (Table 3), led to the observation of a major difficulty in falling asleep related to nocturnal computer users. The data herein presented partly agrees with Randazzo et al.[33], who verified that insomnia is the most prevalent among the sleep dirosrders, with subjective complaints of dissatisfaction with sleep, including reduction of duration and poor quality of sleep. The adolescents affected typically have difficulty in falling asleep and maintaining a normal sleep pattern and prefer to sleep later (between two and six hours) and also to wake up later (between 10 and 13 hours).

It was oserved that the average global score of the PSQI was higher among the students "surfing the web" at night. Therefore regarding the question of good sleep (Table 4) we noted that nocturnal computer users demonstrated poorer sleep quality. These highly significant data point to te risk of deterioration of sleep quality due to nocturnal abuse of the computer. Two studies in the literature approximate the one presented that of Van Den[31] aiming to relate the presence of television sets and computers connected to the internet in childrens' rooms, adolescents with bedtime schedules, time spent in bed, and drowsiness. They found that adolescents with a computer and connected to the internet, reported more exhaustion, they spent more time "surfing the web",

and went to sleep significantly later during the week and on weekends. They woke up much later during the week and on weekends. In conclusion, the interest on the use of these means of communication are not limited to television, the computer and internet use, they are also related to sleep behavior and seem to be negatively related to sleep patterns. Similarly, the recent survey by the American National Sleep Foundation[29] reveals that adolescents appear to be careless about bedtime and the reasons are due to activities before going to bed such as television viewing (76%), "surfing the web" (44%) and speaking on the telephone(40%). A percentage (55%) of them admit delaying their bedtime because of the time schedule of TV programs or in order to use the internet at night[29] .

In conclusion, by means of indexes, this study suggests that nightime use of the computer directly affects poor sleep quality and high indexes observed in the components of daytime sleepiness and sleep disorders. It is necessary to emphasize the need for a careful evaluation of the exposure of adolescents and their habits of remaining for many hours at the night on the computer before it causes severe impairment to their health. The results of this study were obtained by evaluating a small number of adolescents, therefore limiting generalization to the results. However, this situation probably exists among other adolescents "surfing the web" at night and who are submitted to conditions of modern life, similar to that of the adolescents in the sample. Considering that the indexes of sleep quality become worse in nocturnal computer users, the sleep deficit can severely impair them. This suggests the need to examine this habit, of "surfing the web" at night and even until down. Meanwhile, sleep continues to be fundamental for reestablishing physical and emotional balance. Thus, the results of this study support the challange to promote good health. More attention should be paid to sleep cycles that are so essential for physical and psychic develpment of adolescents.

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