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Sleep habits, daytime sleepiness and sleep quality of high school teachers

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Abstract

The aim of this study was to characterize the sleep-wake cycle, daytime sleepiness and sleep quality of high school teachers. Ninety-eight high school teachers participated in this study. They were asked to complete the Health and Sleep, Horne & Ostberg, Epworth Sleepiness Scale and Pittsburgh Sleep Quality Index questionnaires and to keep a 14-day sleep diary. This study showed that high-school teachers wake up on average 1 h 12 min earlier (ANOVA; $p < 0.05$) and go to bed on average 34 min earlier (ANOVA; $p < 0.05$) during the week than on the weekend. This results in an average of 42 min less time in bed (ANOVA; $p < 0.05$) on weekdays and characterizes partial sleep deprivation. Moreover, 46% and 51% of teachers were diagnosed with excessive daytime sleepiness and poor sleep quality (χ^2 ; $p > 0.05$), respectively. Therefore, high-school teachers show characteristics of partial sleep deprivation that may contribute to excessive daytime sleepiness and poor sleep quality. This situation may compromise health and quality of life, in addition to teaching performance that can affect the education of their students.

Keywords: sleep-wake cycle, sleepiness, high-school teacher, sleep quality.

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Introduction

The sleep-wake cycle (SWC) is very important in any social environment. A study carried out in São Paulo with Brazilian adults observed that during the years of 1987, 1995 and 2007 there was an increase in sleep complaints and a reduction in sleep duration from ~7.45–9.00 in 1987 to ~7.31–8.61 in 2007. Moreover, there was a significant decrease in total sleep time during these years on the weekend (Santos-Silva et al. 2010). In 2009, a study that investigated the prevalence of sleep complaints in a sample of 2,110 subjects from 150 different cities showed a high prevalence of sleep complaints in the Brazilian general population affecting approximately 79.2 million people and was similar among all Brazilian regions (Bittencourt et al., 2009). At present, sleep disorders affect a high proportion of the population and are known to be correlated with decreased performance and well-being, increased sleepiness and fatigue.

Additionally, school settings deserve special attention as they house children and adolescents who suffer from excessive sleepiness, fatigue and mood changes (Epstein, Chillag, & Lavie, 1998; Roberts, Roberts, & Chen, 2001; Acebo & Carskadon, 2002; Sadeh, 2007; Moore & Meltzer, 2008; Ng, Ng, & Chan, 2009), which compromise school performance and learning (Wolfson & Carskadon, 1998; Giannotti & Cortesi, 2002; Paavonen et al., 2009).

In the school setting, it can also be observed that the socioeconomic status of Brazilian teachers does not favor a good quality of life. Therefore, the teachers attempt to compensate for their low salaries by teaching different shifts at multiple schools. This may lead to longer working hours in relation to other professional occupations because they start their daily work activities much earlier in the day and conclude their working day much later.

A number of Brazilian authors have found that teachers are subjected to high work demands both within and outside the classroom (Delcor et al., 2004; Gasparine, Barreto, & Assunção, 2006; Jardim, Barreto, & Assunção, 2007). Moreover, these professionals face the constant challenge of updating their teaching methodology, and some seek to upgrade their qualifications through specialization courses (Gasparine et al., 2006; Jardim et al., 2007).

All the obligations and pressures imposed on teachers compromise their personal life, leaving them

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with little leisure or family time (Nagai, Tsuchiya, Touloupoulou, & Takei, 2007; Penteadó & Pereira, 2007). This contributes to the emergence of sleep-related complaints such as sleep dissatisfaction (Vedovato & Monteiro, 2008), drowsiness and insomnia (Araújo, Sena, Viana, & Araújo, 2005; Penteadó & Pereira, 2007). A study of mental health-related complaints in the state of Bahia showed that 22.6% of teachers complained of sleepiness and 14.1% complained of insomnia (Araújo et al., 2005). Public school teachers who participated in two investigations in the city of São Paulo reported sleeping an average 6.8 h and 6 h daily (Ferreira et al., 2008; Vedovato & Monteiro, 2008).

Literature articles on the working conditions and health of teachers focus primarily on the effects of work on mental health, such as stress and burnout syndrome (Pinotti, 2006; Carlotto & Palazzo, 2006; Nagai et al., 2007; Jin, Yeung, Tang, & Low, 2008). The latter is characterized by emotional fatigue, depersonalization and reduced self-esteem, which are a result of stressful experiences related to excessive workloads, demoralization, disappointment and lack of professional stimulation. Thus, it especially affects workers with considerable social contact such as those in the education and medical fields. Considering the prevalence of sleep-related complaints among teachers, this study aimed to evaluate the sleep/wake habits including information on the sleep/wake cycle (SWC) to broaden the knowledge of its impacts on the teaching profession.

Methods

Subjects

Study participants consisted of 98 high-school teachers (57 men and 41 women) recruited from 10 schools. Five public and five private high schools from the southern zone of Natal/RN were randomly drawn to participate in the study. The city is divided into four geographic zones (north, south, east and west). The present investigation studied teachers from the south zone due to its proximity to the laboratory, which facilitated the distribution of the questionnaires by the researchers. The area contains 10 public and 10 private high schools according to the 2007 census conducted by the Secretary of Education and the Culture of Rio Grande do Norte.

Procedure

This study was approved by the Onofre Lopes Hospital Ethics Committee (Protocol 273/08). The next step was to contact the pedagogical team to schedule a meeting with the teachers. The study objective and methodology were explained at the first meeting, after which teachers provided written informed consent. A total of 128 professionals agreed to participate in the study. Among those who agreed to participate, the following were excluded: (1) trainees, (2) those who taught physical

education given that most teaching activity occurs outside the classroom, (3) those with a clinical diagnosis of a sleep disorder or other health-related problems that could compromise the data collection and (4) those who did not complete the questionnaires. Thus, 98 teachers were included in the study.

Data collection was divided into two stages: 1) first stage—the participants completed the Health and Sleep questionnaire (Mathias, Sanchez, & Andrade, 2006), Horne & Ostberg questionnaire–HO (Horne & Ostberg, 1976), Epworth Sleepiness Scale–ESS (Johns, 1991) and the Pittsburgh Sleep Quality Index–PSQI (Bussey, Reynolds, Monk, Berman, & Kupfer, 1989), which were given to teachers and were collected at a later date to avoid resistance and to obtain greater adherence. The general individual sleep habits of the teachers were assessed using the Health and Sleep questionnaire. The characterization of individuals according to chronotype (morning, evening and intermediate) was assessed using HO. Daytime sleepiness levels and sleep quality were assessed using the ESS and PSQI, respectively. The ESS evaluates daytime sleepiness levels in both clinical cases and research protocols based on information about daily situations in which individuals are more prone to fall asleep. The scale contains eight questions, each worth between 0 and 3 points for a total score of 0 to 24 points. Scores <10 indicate low sleepiness and those ≥10 suggest excessive sleepiness. The PSQI evaluates seven components whose scores range from 0 to 3. These components are subjective sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disorders, use of sleep medication and daytime dysfunction. The set of components add up to a score varying between 0 and 21 where 0 to 5 indicates good sleep quality and >5 indicates poor sleep quality. 2) Second stage—the teachers kept a sleep diary during a 14-day period, which assessed the daily information on bedtimes and wake-up times of each individual, how individuals wake up, and nap times.

Statistical analyses

χ^2 test was applied to analyze aspects inherent to the general characterization of sleep habits, distribution of teacher chronotype, frequency of individuals who take naps, distribution of naps on weekdays and weekends, daytime sleepiness levels and sleep quality. Repeated measures ANOVA ($n = 70$) was used to determine if the SWC changed on different days of the week. Bedtimes, wake-up times and the amount of time spent in bed depending on day of the week were considered repeated measures. The SWC irregularity for bedtime and wake-up time was analyzed by the sleep irregularity index that was calculated, respectively, from the standard deviation of bedtimes and wake-up times during the 14 days of record (weekdays plus weekend). Mean onset, end times and nap duration were compared between weekdays and weekends using the Student *t*-test. Results

were analyzed using Statistica™ (StatSoft®) software; significance level was set at 5% for all analyses.

Results

The mean age of the teachers was 39 ± 9 years. Most were married (60%, $n = 61$, $\chi^2 = 6.64$; $p < 0.09$) and had children (65%, $n = 62$, $\chi^2 = 10.18$; $p < 0.05$). Half the teachers engaged in physical activity (51%, $n = 47$, $\chi^2 = 0.01$; $p > 0.05$) and had a workload between 24 and 42 h/week. However, 25% ($n = 24$) had a workload ≥ 42 h ($\chi^2 = 12.51$; $p < 0.05$). The majority of teachers taught in one or two schools (71%, $n = 69$, $\chi^2 = 16.65$; $p < 0.05$) and worked two or three shifts (77%, $n = 75$, $\chi^2 = 28.1$; $p < 0.05$); they did not teach university entrance preparation courses, which have higher workloads than regular courses. The number of years teaching was between 10 and 19 years for 42% ($n = 40$) of the teachers ($\chi^2 = 3.19$; $p > 0.05$), and 15% ($n = 13$) had another profession ($\chi^2 = 48.67$; $p < 0.05$). The percentage of teachers with an undergraduate degree and specialization was 45% ($n = 43$) and 47% ($n = 45$), respectively ($\chi^2 = 73.34$; $p < 0.05$).

Teachers generally considered their sleeping location good (91%, $n = 86$, $\chi^2 = 65.69$; $p < 0.05$). The most reported problem in the month prior to completing the questionnaire was daytime sleepiness, which was reported with a prevalence of three times to every day of the week ($\chi^2 = 18.73$; $p < 0.05$). Most teachers woke up during the week using an alarm clock (59%, $n = 55$), whereas they woke up naturally on the weekends (85%, $n = 78$, $\chi^2 = 448.45$; $p < 0.05$). According to chronotype, most teachers were classified as intermediate type (55%, $n = 51$) followed by morning type (38%, $n = 35$, $\chi^2 = 117.74$; $p < 0.05$).

High-school teachers had different bedtimes and wake-up times between weekdays and weekends. During the week, teachers went to bed on average 34 min earlier (ANOVA $F_{(6,455)} = 4.73$; $p < 0.05$, Table 1) and woke up on average 1 h 12 min earlier ($F_{(6,452)} = 25.40$; $p < 0.05$, Table 1), spending an average of 42

min less in bed ($F_{(6,452)} = 7.04$; $p < 0.05$, Table 1) than on the weekend. The post-test revealed that teachers woke up earlier on Saturday than on Sunday and that time spent in bed on Sunday was longer than on any other day of the week (post-test for unequal samples, $p < 0.05$). Irregularity in the wake-up times and bedtimes were 57 ± 30 min and 53 ± 27 min, respectively.

On weekends, the most frequently reported reasons for the teacher's wake-up times were working hours (75%, $n = 71$) and extra classroom activities (21%, $n = 20$, class preparation, homework and exam corrections). Moreover, 17% ($n = 16$) of teachers reported waking up at a certain time because they no longer felt sleepy. Domestic chores were the reason given by teachers who exhibited no differences between weekdays (19%, $n = 18$) and the weekend (22%, $n = 21$). The main reason reported on weekends was not being sleepy (45%, $n = 43$). However, other justifications were often given such as extra classroom activities (14%, $n = 13$), leisure (14%, $n = 13$) and religious activities (12%, $n = 11$, χ^2 ; $p < 0.05$, Figure 1A).

The reasons most frequently cited by teachers for bedtimes during the week were working hours (53%, $n = 51$) and extra classroom activities (57%, $n = 55$, class preparation, homework and exam corrections (χ^2 ; $p < 0.05$). Although many teachers report computer use as a reason for bedtimes on both weekdays (35%, $n = 33$) and weekends (26%, $n = 25$), there was a tendency towards greater use during the week (χ^2 ; $p = 0.08$). In addition, domestic chores (14%) and feeling sleepy (13%) were also described, with no differences between weekdays and weekends (χ^2 ; $p > 0.05$, Figure 1B). Other reasons given for bedtimes on the weekend were watching TV (38%, $n = 36$) and parties (19%, $n = 18$, χ^2 ; $p < 0.05$, Figure 1B).

The majority of teachers nap on both weekdays and weekends (Figure 2) and do so more frequently in the afternoons (Figure 2). A subsample of the population was evaluated for the time of day that they napped to obtain a better characterization of the nap times and

Table 1. Bedtimes, wake-up times and time spent in bed (mean \pm SD) by teachers during the week and weekend

	Bedtime	Wake-up time	Time in bed
	Mean \pm SD	Mean \pm SD	Mean \pm SD
Monday	23:18 \pm 01:05	06:04 \pm 00:55	06:45 \pm 01:10
Tuesday	23:22 \pm 00:58	05:59 \pm 00:50	06:37 \pm 01:06
Wednesday	23:19 \pm 00:52	06:00 \pm 00:44	06:40 \pm 00:59
Thursday	23:18 \pm 00:57	06:00 \pm 00:48	06:40 \pm 01:06
Friday	23:20 \pm 01:12	06:16 \pm 00:52	06:56 \pm 01:11
Saturday	23:56 \pm 01:06 ^a	07:04 \pm 01:05 ^{a,b}	07:10 \pm 01:06 ^a
Sunday	23:50 \pm 01:32 ^a	07:28 \pm 01:28 ^{a,b}	07:42 \pm 01:29 ^{a,c}

^aIndicates difference between weekday and weekend.

^bIndicates difference between Saturday and Sunday.

^cIndicates difference between Sunday and every other day.
ANOVA, $p < 0.05$.

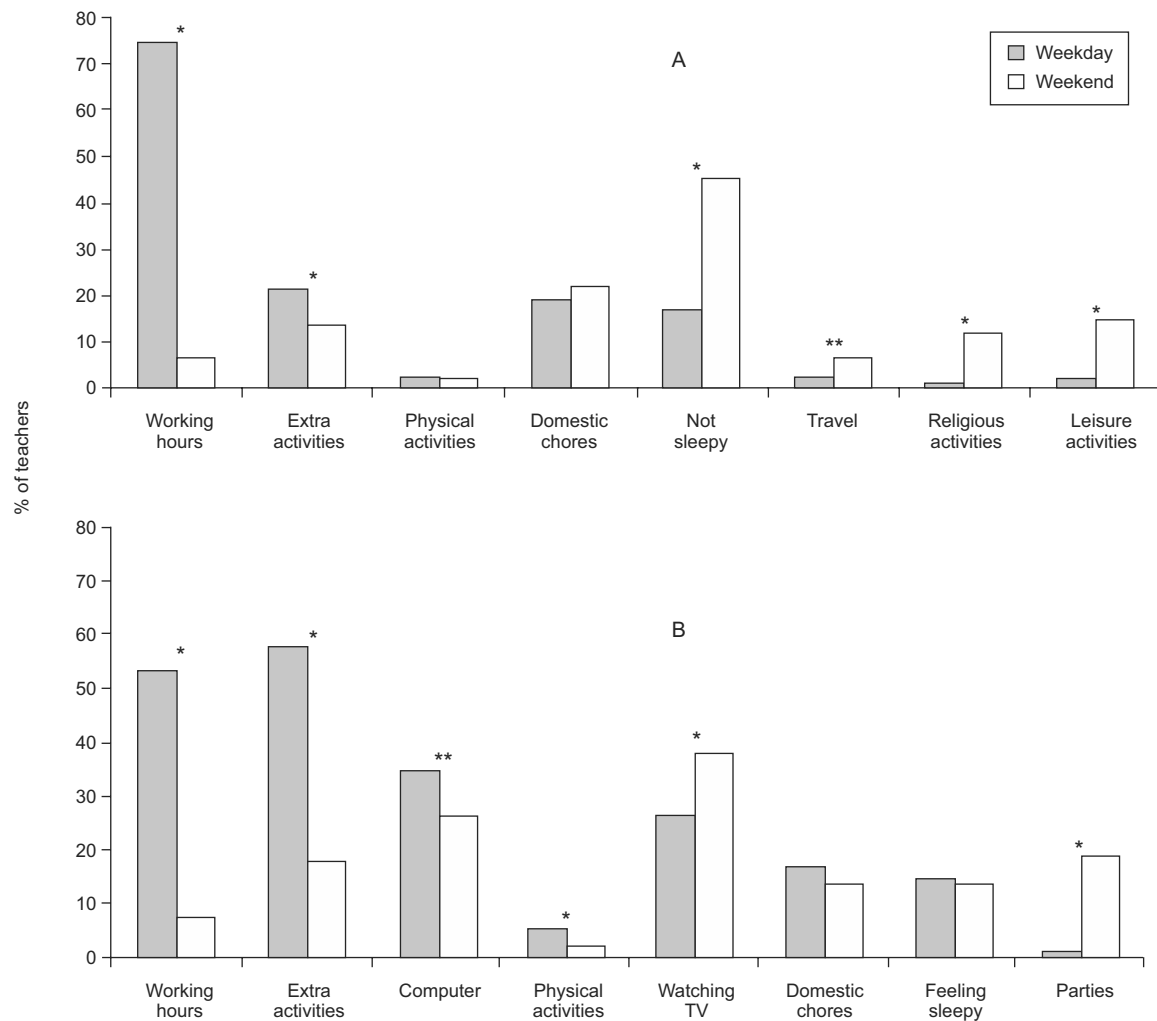


Figure 1. Reasons given by teachers for wake-up time (A) and bedtime (B) on weekdays and weekends. * χ^2 ; $p < 0.05$. ** χ^2 ; $p = 0.08$.

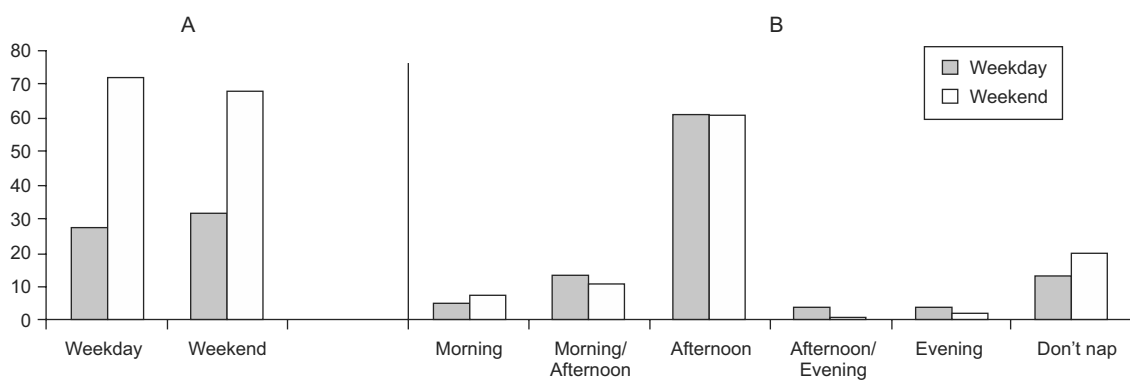


Figure 2. Percentage of teachers that nap on weekdays and weekends (A) and distribution of naps throughout the day, during the week and on weekends (B). χ^2 ; $p > 0.05$.

durations of most teachers. Thus, only data of teachers who napped between 12:00 h and 18:00 h were analyzed ($n = 36$). The onset times of napping did not differ between weekdays and weekends; however, the end times and durations of the naps were different (t-test; $p < 0.05$, Table 2). During the week, teachers ended their naps earlier and the durations were shorter than on weekends by an average of 30 ± 12 min.

Table 2. Onset, end and duration of naps during the week and on the weekend

Nap time	Week	Weekend
Onset	13:29 \pm 1:10	13:57 \pm 1:30
End	14:36 \pm 1:27*	15:25 \pm 1:38*
Duration	60 \pm 44 *	90 \pm 32*

*Differences between weekdays and weekend.
t-test; $p < 0.05$.

In the total sample, 46% ($n = 44$) and 51% ($n = 47$) of teachers were diagnosed with excessive daytime sleepiness ($\chi^2 = 0.69$; $p > 0.05$) and poor sleep quality ($\chi^2 = 0.047$; $p > 0.05$), respectively. The mean score for the ESS was 8.7 ± 3.5 , and the overall mean score for the PSQI was 6.4 ± 3.0 , which indicated poor sleep quality.

Discussion

Results showed that, during the week, professional activities had a strong influence on the SWC of teachers because 60% reported needing an alarm clock to wake up, whereas on weekends 86% of the teachers woke up naturally. Moreover, most reported waking up on weekdays because of working hours (75%), and some reported that it was due to extra classroom activities (21%). Therefore, irregularities of 53 ± 27 min and 57 ± 30 min were observed in bedtimes and wake-up times, respectively, during the 7 days of the week. It has also been observed in other investigations that adults go to bed and wake up earlier during the week than on the weekend due to the influence of social commitments (Monk, Buysse, Rose, Hall, & Kupfer, 2000; Rosenthal et al., 2001; Wittmann, Dinich, Mellow, & Roenneberg, 2006).

With so many tasks to complete, the mean time spent in bed during the week was 6.7 h per night, less than the mean observed in a Brazilian adult population in 2007 (7.5 h) (Silva et al., 2010). Considering that adult sleep needs in the general population vary between 7 and 8 h, our result suggests that teachers present partial sleep deprivation. This leads to a prolonged amount of time in bed on the weekend. In the present study, teachers remained in bed on an average of 42 min longer, possibly as compensation for the sleep lost during work days. A similar pattern was observed by the National Sleep Foundation (2008) in a population survey of American workers who slept an average of 6.7 h per night during the week and 45 min longer on weekends. In Brazil, research carried out on public school teachers in the former city found that their mean sleep duration was between 6 and 6.8 h/night (Ferreira et al., 2008; Vedovato & Monteiro, 2008). Based on this result, we suggest that teachers from São Paulo exhibited similar sleep durations to the mean obtained in our study during weekdays, irrespective of different population sizes between São Paulo and Natal.

Prolonged time in bed on the weekend differed between Saturday and Sunday; teachers woke up an average 26 min earlier on Saturday than on Sunday, possibly due to the fact that they do not have time during the week to perform domestic chores or extra classroom, religious and leisure activities, which were reasons given for weekend wake-up times.

Some authors noted that reduced sleep during the week caused increased daytime sleepiness (Wolfson & Carskadon, 1998; Acebo & Carskadon, 2002; Sadeh, 2007; Ng et al., 2009). In our study, 46% of teachers were diagnosed with excessive daytime sleepiness based on the ESS (Johns, 1991) and 40% of teachers

reported feeling drowsy during the day according to the Health and Sleep questionnaire. Both findings may be a consequence of reduction in the amount of sleep during the weekdays. However, we cannot discard the possibility of the influence of sleep disorders (e.g., sleep apnea) that were not detected by the exclusion criteria applied, in the prevalence of excessive daytime sleepiness by the ESS. The application of exclusion criteria considered the responses on the questionnaire item related to health problems (for example, insomnia and depression). In spite of this, evaluation of daytime sleepiness using the Health and Sleep questionnaire showed similar results as the Epworth scale. Thus, we suggest that if there were participants with sleep disorders that were not excluded by the criteria used, they do not exert a strong influence on the values obtained with ESS. The percentage of teachers with excessive sleepiness in our study was higher than the findings obtained in other investigations of teacher health complaints (Araújo et al., 2005; Penteado & Pereira, 2009). However, the instruments used in the data were different.

Daytime sleepiness that leads individuals to nap during the middle of the day may be due to a normal reduction in wakefulness (Aschoff, 1994, apud Barone, 2000), a decrease in nighttime sleep (Barone, 2000) or a combination of both. A high nap frequency among teachers occurred both during the week (73%) and on the weekends (67%). Although most naps occurred in the afternoon shift, many were reported at other times of the day, possibly because teachers nap when they are able and not only when they feel sleepy. This may be because they have numerous tasks to fulfill including early afternoon classes around 13:00 h, the usual post-lunch nap time. Furthermore, there was an increase in the duration of naps on weekends, possibly as compensation for reduced sleep time during the week. Reduced sleep time may have negative consequences such as daytime sleepiness, poor sleep quality, cognitive difficulties, mood alterations and attention and learning problems (Dahal, 1999; Liu, Liu, Owens, & Kaplan, 2005; Sousa, Araújo, & Azevedo, 2007) which, in turn, may compromise teaching performance.

Teachers showed similar poor sleep quality (6.4 ± 3.0) to that of shift workers (6.9 ± 3.3), evaluated using the same collection instrument (Almondes & Araújo, 2011). This result is worrisome because shift workers often modify their SWC, whereas their rhythmic physiological functions such as body temperature and hormone production do not change rapidly. These differences in the speed of adjustment cause reduced temporal organization among their biological rhythms and with the environmental light-dark cycle (Minors & Waterhouse, 1981). Therefore, shift workers may need to sleep at times when other biological rhythms are preparing for wakefulness. Additionally, social demands, elevated ambient temperature, noise levels and natural ambient light follow the daytime patterns of society that contribute to a fragmented SWC (Fischer, Teixeira, Borges, Gonçalves, & Ferreira,

2002), reduced sleep duration (Escriba, Perez-Hoyos, & Bolumar, 1992; Fischer et al., 2002), excessive daytime sleepiness, diminished sleep quality and high anxiety levels (Escriba et al., 1992; Campos & Martinho, 2003), among other negative health effects of shift workers (Gaspar, Moreno, & Menna-Barreto, 1998; Boggild & Knutsson, 1999; Scott, 2000; Dorrian et al., 2008). The World Health Organization currently considers shift work a risk factor for developing cancer (Hansen, 2006; Straif et al., 2007; Viswanathan, Hankinson, & Schernhammer, 2007). Although teachers are not in such extreme situations as shift workers, the poor quality of sleep of teachers may be associated with the occupational characteristics of the teaching profession.

A study conducted with students enrolled in health-related courses found that the poorer the sleep quality, the higher the depression levels of individuals (Coelho, Lorenzini, Suda, Rossini, & Reimão, 2010). Although this study did not evaluate psychological variables, poor sleep quality and excessive sleepiness observed in teachers in the present study and the work overload characteristic of this profession may compromise their health and quality of life. This, in turn, could affect teaching performance and student education. We therefore recommend an investigation into strategies that can improve the variables related to the sleep patterns of teachers to increase quality of life and enhance the sleep of these professionals.

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