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High and low use of electronic media during nighttime before going to sleep: A comparative study between adolescents attending a morning or afternoon school shift

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ABSTRACT

This study compared the effects of time spent on electronic media devices during nighttime before going to sleep on the sleep-wake cycle, daytime sleepiness, and chronotype in 568 Mexican students (288 girls, mean age = 14.08) attending a double school shift system (287 from morning shift and 281 from afternoon shift). Students completed anonymous self-report questionnaires. Results suggest that high exposure to an electronic media device may have an impact on their sleep-wake cycle, regardless of their school shift. Adolescents from the afternoon shift reported more time spent on devices. Those from the morning shift reported daytime sleepiness with the use of MP3 player, and from the afternoon shift with the use of computer, MP3 player, and television. Both school shifts reported an intermediate chronotype with all electronic media devices, but the afternoon shift with a tendency towards eveningness with the use of the computer, smartphone, and MP3 player.

1. Introduction

During adolescence, the school schedule is the most damaging environmental constraint to sleep habits (Gradisar, Gardner, & Dohnt, 2011; Owens, Drobnich, Baylor, & Lewin, 2014). Sleep duration is reduced during weekdays because adolescents have to get up early in the morning to attend school. In addition, a phase delay occurs in the sleep-wake cycle, making it difficult to fall asleep early (Carskadon, 2011). Therefore, many adolescents present with less time in bed and delayed bedtimes throughout the week. On the other hand, the preference to perform a greater number of activities in the morning or at night is attributed to interindividual differences in the timing of circadian rhythms (chronotype), conceived as a continuum between two extremes (Natale & Cicogna, 2002). Morning types (M-types) prefer to get up and go to bed early, evening types (E-types) prefer later bedtimes and waking times, and intermediate types (I-types) prefer times that are between early and late. The majority of the population falls into the latter category (Adan et al., 2012). During puberty, a preference for evening hours appears, as a consequence of the maturation processes typical of puberty (Hagenauer, Perryman, Lee, & Carskadon, 2009). Nevertheless, the many changes in the adolescent's relational and social spheres, such as school demands, new social opportunities, and a decrease in parental supervision can moderate this preference also (Díaz-Morales, Escribano, Jankowski, Vollmer, & Randler, 2014).

In recent decades, the use and accessibility of electronic media devices, such as computers, smartphones, MP3 players, television, and video game consoles have increased significantly in the lifestyles of adolescents (Borlase, Gander, & Gibson, 2013). Moreover, there is a large body of evidence relating the use of these electronic devices to sleep disturbances. In particular, past studies have

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reported late bedtimes and shorter time in bed in adolescents (Eggermont & Van den Bulck, 2006; Higuchi, Moteshashi, Liu, & Maeda, 2005; Hysing et al., 2015; King et al., 2013; Munezawa et al., 2011; Nuutinen, Ray, & Roos, 2013; Oka, Suzuki, & Inoue, 2008; Owens, Maxim, McGuinn, Nobile, & Msall, 1999; Reynolds et al., 2015; Shochat, Flint-Bretler, & Tzischinsky, 2010; Van den Bulck, 2007; Weaver, Gradisar, Dohnt, Lovato, & Douglas, 2010). However, recent studies have not found an association between electronic media devices and daytime sleepiness (Custers & Van den Bulck, 2012; Fossum, Nordness, Storemark, Bjorvatn, & Pallesen, 2014).

Studies related to chronotype and media devices reported a preference towards eveningness with the use of smartphones and video game consoles in adolescents (Bruni et al., 2015; Demirhan, Randler, & Horzum, 2016; Fossum, Nordnes, Storemark, Bjorvatn, & Pallesen, 2014; Harada, Morikuni, Yoshi, Yamashita, & Takeuchi, 2002; Krejci et al., 2011). Further, recent studies have indicated that evening types reported greater computer game and internet addiction than morning types (Randler, Horzum, & Vollmer, 2014; Vollmer, Randler, Horzum, & Ayas, 2014).

Overall, the use of electronic media devices has a negative consequence on the sleep-wake cycle of adolescents. Nevertheless, the aforementioned studies have analyzed adolescents regularly attending classes on a fixed morning school shift.

In many countries, such as Mexico, Brazil, Argentina, Chile, and many others, public schools utilize a double shift school system (Bray, 2008; Linden, 2001; Michaelowa, 2001; Mzee, 1999; Ribeiro, 1986; Saucedo-Ramos, 2005). This type of school operates in two shifts (morning and afternoon), which means that one group of students arrives early in the morning and leaves at mid-day, while a second group arrives at mid-day and leaves late in the evening (Bray, 2008). According to previous studies related to sleep habits, on school days, adolescents from the afternoon shift have reported later bedtimes and longer time in bed than adolescents from the morning shift (Anacleto, Adamowicz, Simões da Costa Pinto, & Louzada, 2014; Arrona-Palacios, García, & Valdez, 2015; Carissimi et al., 2016; Koscec, Radosevic-Vidacek, & Bakotic, 2014; Lazaratou, Dikeos, Anagnostopoulos, Sbokou, & Soldatos, 2005; Martin, Gaudreault, Perron, & Laberge, 2016; Natal et al., 2009; Peixoto, Teixeira, Carskadon, & Louzada, 2009; Valdez, Ramírez, & García, 1996).

On the other hand, it is unclear whether the effects on the sleep-wake cycle are similar or non-existent when using electronic media devices during nighttime before going to sleep in adolescents attending classes in an afternoon school shift. Therefore, the main objective of this study was to compare the effects of time spent on electronic media devices during nighttime before going to sleep on the sleep-wake cycle, daytime sleepiness, and chronotype of adolescents attending a morning or afternoon school shift.

It is expected that adolescents who attend classes in an afternoon shift will spend more time on electronic media devices during nighttime before going to sleep than those in the morning shift. In addition, adolescents from the afternoon shift will not show any changes in their sleep-wake cycle and will not present daytime sleepiness by having a high exposure of electronic media devices during nighttime before going to sleep.

2. Materials and methods

2.1. Participants

The final sample consisted of 568 students (280 were boys and 288 girls) attending a secondary public school in Reynosa, Tamaulipas, located in northeastern Mexico. The mean age of the overall sample was 14.08 ± 0.72 (mean ± SD) years, and the age range was between 13 and 16 years. The morning shift consisted of 287 adolescents, of which 146 were male and 141 female, who attended classes on a school schedule from 07:30 to 13:00 h. The afternoon shift consisted of 281 students, of which 134 were male and 147 female, who attended classes on a school schedule from 13:20 to 19:00 h.

The sample obtained in this study was used for two purposes: first, to determine the difference between sleep-wake habits and circadian preference in Mexican adolescents attending classes during a morning shift or an afternoon shift, which was previously published (Arrona-Palacios et al., 2015); and second, to compare the effects of time spent on electronic media devices during nighttime before going to sleep on the sleep-wake cycle, daytime sleepiness, and chronotype of adolescents attending a morning or afternoon school shift.

The Mexican secondary public school consists of a three-year school program. Students are distributed into six school groups per school year (i.e., 18 school groups in total). The morning shift has a total of 18 school groups and another 18 school groups for the afternoon shift. Therefore, for this cross-sectional study, the school groups from both school shifts were randomly selected. However, is worth noting that when students enter their first year of school, their school shift is assigned according to the results of an admission exam (i.e., higher scores to the morning shift and lower scores to the afternoon shift) (Cárdenas, 2011) rather than being randomly selected. The admission exam is an instrument used to evaluate the knowledge acquired during students' primary education. The recruitment of adolescents was targeted towards obtaining a sample size of 300 from each school shift, comprising 600 questionnaires in total. However, 32 participants (13 from the morning shift and 19 from the afternoon shift) were excluded due to nonresponse or refusal to participate. The measures had an estimated response time of 60 min. Adolescents from the morning shift completed the questionnaires during their school hours of 07:30–13:00 h, and adolescents from the afternoon shift during their school hours of 13:20–19:00 h. Data collection was voluntary, and students received no payment of any kind. Each participant signed a letter of informed consent, as did the parents of participants. The Academic Board from the Faculty of Psychology of the Universidad Autónoma de Nuevo León granted project approval and the study complied with the principles of the Declaration of Helsinki for research on human participants.

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