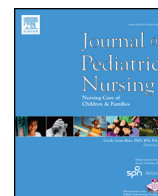




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Insufficient Sleep Is Associated with Obesity and Excessive Screen Time Amongst Ten-Year-Old Children in Sweden

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ABSTRACT

Purpose: This study investigated sleep, television, computer habits, and obesity in school-age children.

Design and methods: This was a cross-sectional self-report survey of 1260 children in grade 4 (mean age, 10.1) living in southern Sweden (49.1% boys). The heights and weights of 1097 (87.1%) of the children were recorded. Descriptive statistics, bivariate analyses, and multiple logistic regression were employed.

Results: The median length of self-reported sleep on weeknights was 9.5 h. Approximately 40% of the children reported receiving <9 h of sleep. The median bedtime was 9 PM (21:00). On weekends, the median bedtime was 1 h later, and they delayed getting up by 1.5 h. The median time spent watching TV and using a computer was 1 h each. The prevalence of being overweight (including obesity) was 18%. Insufficient sleep (<9 h) was associated with being overweight, watching TV, or using a computer for two or more hours each day, difficulty falling asleep, and being tired at school.

Conclusions: School-age children who receive less sleep are more likely to be overweight and report excessive television and computer use. A strong and urgent need exists to highlight the importance of healthy sleep and media habits. It is challenging for pediatric nurses and school nurses to teach children and their families about healthy sleep and media habits.

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Introduction

The number of global public health issues concerning sleep deficiency, media habits, obesity, and emotional problems are increasing (Cain & Gradisar, 2010). Parents, teachers, and pediatric nurses are confronted with challenging questions regarding the best approach to guide children towards a healthy lifestyle (Betz, 2014; Fogg & Johnson, 2015). At many schools, students are provided with computers, and a significant proportion of education is conducted using screens rather than traditional textbooks (Seomun et al., 2013). School-age children commonly use televisions and computers as sleep aids, but these devices have been shown to have the reverse effect (i.e., increased time to fall asleep and shorter sleep duration) (Chahal, Fung, Kuhle, & Veugelers, 2013; Eggermont & Van den Bulck, 2006). There is a link between obesity and altered sleep quality in 10-year-old children (Pacheco et al., 2017). Many children and parents address school nurses with questions regarding sleep and wellbeing (Garmy, Nyberg, &

Jakobsson, 2012). There is a need for more knowledge about insufficient sleep, obesity, and screen time amongst children so that child health professionals can provide relevant advice.

Background

Ten-year-old children are between childhood and puberty; they still need to have a close relationship with their parents, but peers are becoming increasingly important. It is crucial to fit in and to be accepted by peers. The development for children in this age can differ considerably (Goswami, 2011). After the age of 10, the boys and girls start to diverge along different puberty trajectories that might influence sleep (Kryger, Roth, & Dement, 2017).

Over the last century, the duration of sleep amongst children and adolescents has decreased by 1 h (Matricciani, Olds, & Petkov, 2012). The amount of sleep is associated with health-related quality of life (HRQL); specifically, children who sleep more have a better HRQL (Gustafsson et al., 2016). Daytime sleepiness is also associated with a lower HRQL (Gustafsson et al., 2016). The National Sleep Foundation recommends 9 to 11 h of sleep for 6- to 13-year-olds (Hirshkowitz et al., 2015).

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More than one-quarter of Swedish 11-year-olds report difficulties getting to sleep more than once a week (Public Health Agency, 2014).

Insufficient sleep is associated with behavioral and cognitive deficits (Astill, Van der Heijden, Van IJendoorn, & Van Someren, 2012), as well as increased frequency of being overweight (Appelhans et al., 2014; Busto-Zapico, Amigo-Vázquez, Peña-Suárez, & Fernández-Rodríguez, 2014; Chahal et al., 2013; Danielsen, Pallesen, Stormark, Nordhus, & Bjorvatn, 2010; Magee & Hale, 2012), and the latter is a risk factor for metabolic disease in children (Dhuper, Buddhe, & Patel, 2013). The World Health Organization (WHO) study entitled *Health Behaviours in School-Age Children* (Inchley & Currie, 2014) found that 22% of 11-year-olds were obese or overweight.

Associations between screen time and reduced sleep duration, as well as between screen time and increased sleep problems, have been reported (Burke, 2016; Chahal et al., 2013; Hale & Guan, 2015; Johansson, Petrisko, & Chasens, 2016). High levels of screen time are associated with hyperactivity/inattention problems, internalizing problems, impaired well-being, and a lower quality of life (Suchert, Hanewinkel, & Isensee, 2015). Approximately 50% of 11-year-old boys use a computer for e-mail, to access the Internet or for homework for two or more hours on weekdays. These figures are lower amongst girls. Furthermore, approximately two-thirds of boys play games on a computer or console for two or more hours each day (Inchley & Currie, 2014).

Thus, the global trend shows that children's sleep time is decreasing (Matricciani et al., 2012; Norell-Clarke & Hagquist, 2017), whilst screen time and obesity are increasing (Inchley & Currie, 2014). To develop child health care interventions, there is a need to investigate and document the current status of childhood sleep, screen time, and obesity. The current study investigated the sleep, television/computer habits, and obesity of school-aged children in Sweden.

Methods

Participants and Setting

This cross-sectional study included children in grade 4 (mean age \pm standard deviation [SD]: 10.1 ± 0.39 years). Guardians/parents provided written informed consent for their children to answer a questionnaire regarding sleep and lifestyle; child height and weight were also measured. The inclusion criteria were all students in grade 4 during the 2011–2012 and 2012–2013 academic years in a municipality of southern Sweden with approximately 110,000 inhabitants. The school nurse gave the students the questionnaire and written information about the study at school. The students were instructed to give the forms to their parents/guardians. The students completed the questionnaire with a pen and paper at home. Of 2308 total students, 1260 (54.6%) returned the signed consent form and a completed questionnaire (49.1% boys); 1097 had their height and weight measured. The drop-out analysis showed no differences regarding age ($p = 0.427$) or gender ($p = 0.728$) for those not having their height and weight measured. Most of the missing height and weight measurements came from one school ($p < 0.001$). This was because of limited access to school nursing resources at this school at the time of the study. At the time of the study, approximately 18% of the city's population was born in countries other than Sweden. The unemployment rate in the city was 4%, and approximately 2% of the population received financial help from the government. Nearly 6% of the adult population had only a compulsory education, 25% had education at secondary level, and 67% held a post-secondary education. Approximately 82% of the students in the municipality had parents who lived together (Statistics Sweden, 2012). The Regional Ethical Review Board in Lund approved this study (2011/330).

Instrument

The questionnaire regarding the sleep and media habits of school-aged children had been previously tested with regards to this age

group. Its reliability and validity were satisfactory (Garmy, Jakobsson, & Nyberg, 2012). The reliability test-retest showed high levels of agreement for bedtimes (90.4%) and length of sleep (86.8%) (Garmy, Jakobsson, et al., 2012). The questions addressed the time when the child typically began to get ready for bed, when they went to bed, and the length of sleep achieved on weeknights and weekends. The questionnaire also included questions regarding how much the children enjoyed school (very much, fairly well or not very much), feelings of being tired at school (every day, often, seldom or never), sleeping difficulties (every day, often, seldom or never), and difficulties with waking up (every day, often, seldom or never), as well as questions about having a bedroom television (yes or no) and time spent watching television or using the computer (in hours and minutes).

Trained school nurses measured the heights and weights of the students. The students wore light clothing, and the weight was measured to the nearest 0.1 kg on an annually calibrated standard digital scale. Student height without shoes was measured to the nearest 0.1 cm using a manual height board. The body mass index (BMI; kg/m^2) was also calculated. Because children have a dynamic average BMI due to their growth curves, the international age and gender-specific BMI cut-off points for children were used to define overweight and obesity (Cole, Bellizzi, Flegal, & Dietz, 2000). BMIs above percentile values corresponding to an adult BMI of $25 \text{ kg}/\text{m}^2$ were classified as overweight; BMIs corresponding to $30 \text{ kg}/\text{m}^2$ or higher were classified as obese.

Data Analyses

Descriptive statistics were represented as medians and the interquartile range and as percentages in the case of categorical variables. The children were divided into two groups: those with insufficient sleep (< 9 h) according to the recommendation of the National Sleep Foundation (Hirshkowitz et al., 2015) and those sleeping 9 h or more. The cut-off point for time spent at the computer or watching television was 2 h in line with the recommendation from the American Academy of Pediatrics (Bar-On et al., 2001).

Bivariate analyses using the chi-square test were conducted to investigate the differences between boys and girls, as well as between those with and without sufficient sleep. The factors identified from the bivariate analyses as associated with less sleep ($p < 0.05$) were analyzed in a multiple logistic regression. The Hosmer and Lemeshow goodness-of-fit test, as well as the Nagelkerke R^2 test, were used to evaluate the quality of the regression model (Norman & Streiner, 2008). P -values < 0.05 were considered significant. All analyses were performed using IBM SPSS version 23.0.

Results

Sleep Habits

Approximately 40% of the 10-year-old children reported insufficient sleep (i.e., < 9 h) (Table 1). The median length of sleep on weeknights was 9.5 h compared with 10 h on weekends. The median bedtime was 9 PM (21:00), and sleep preparation occurred an hour earlier. On the weekends, the median bedtime was delayed by 1 h compared with weekdays, and there was a 1.5 h delay in rising.

Media Habits

The median times for watching TV and using computers were 1 h each. Almost one in four 10-year-olds had a bedroom TV, and 28% spent at least 2 h each day watching TV, whilst 17% spent two or more hours in front of a computer (Table 1).

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