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Original Article

Gender, socioeconomic, and ethnic differences in sleep patterns in school-aged children

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ABSTRACT

Objectives: Age-related changes in sleep behavior are well described in children, yet the effect of gender, socioeconomic status (SES), and ethnicity is less clear. These factors are important when developing culturally and socially appropriate guidelines for healthy sleep. The objective of our study was to examine the effects of age, gender, SES, and ethnicity on sleep patterns in school-aged children.
Methods: A cross-sectional survey was conducted through primary schools in Adelaide, South Australia. Parents reported demographic information and sleep patterns for school and non-school days for 1845 children aged 5 to 10 years.
Results: 48% of the cohort were boys (mean age, 7.7 ± 1.7 y), 85% were Caucasian, and there was an equal distribution across defined SES bands. Sleep duration reduced with age and was shorter on non-school than school nights as a result of later bedtimes. Boys, children from low SES areas, and non-Caucasian children reported shorter sleep times than girls, children from high SES areas, and Caucasian children, respectively. Non-Caucasian children from low SES areas reported the shortest sleep opportunity.
Conclusions: The results from our study suggest that in addition to biological mechanisms, sleep behaviors are culturally and socially driven and should be considered when developing recommendations for healthy sleep in children.

1. Introduction

Current recommendations for healthy sleep focus on optimal sleep length and the popular paradigm regarding sleep in school-aged children is that "one size fits all." However, evidence suggests that, although the need for sleep is driven by biological processes [1] sleep behaviors are influenced by a range of social and cultural factors. Thus describing usual sleep patterns in children is actually complex and the need for culturally sensitive and up-to-date data are paramount to providing effective recommendations of healthy sleep.

The best described factor influencing sleep from infancy to early adulthood is the age-related change associated with reduced sleep length and circadian shift to later bed and rise times [2]. Other but less well described factors include gender, socioeconomic status (SES), and ethnicity. Exploration of gender differences in sleep behavior suggest that girls report longer time in bed (TIB) than boys, a difference which may be explained by earlier bedtimes [3,4] and later wake times [5], or a combination of both [6]. Sleep length is also reported to vary with SES, with children from low SES areas reporting later bedtimes, and hence shorter total sleep times compared to high SES areas [7,8]. There also has been a recent rise in interest in the cultural influences on sleep behavior, with later bedtimes and shorter sleep durations reported in children from predominantly Asian countries compared to those from predominantly Caucasian countries [9,10]. This difference appears to persist following migration of Asian children to Australia [11]. In addition, cultural differences are evident in sleep scheduling over school vs non-school nights, which may be attributed to amounts of assigned homework [5,12] or television and Internet habits [13,14]. However, although there is increasing understanding of sleep practices across countries, the cross-cultural sleep literature within countries is limited. Given the increasingly diverse mix of ethnic groups in several countries around the world, this information would help to better target information about sleep practice to specific populations.

Because sleep duration has been identified as a factor in optimal daytime functioning in children [15,16], extending our current knowledge of the interaction effects of age, gender, SES, and

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cultural practices on sleep-wake behaviors is essential. These factors are important considerations when providing targeted recommendations concerning healthy sleep habits in children. A recent review of sleep education programs in Western countries revealed that these programs resulted in little change in sleep behavior [17]. Although this lack of change could be due to the methodological issues embedded within the studies, it may also be that the lack of knowledge of the variation in sleep behaviors across different ethnic and social environments hinders the success of such programs. As such, development of effective education tools is difficult, as our understanding of optimal sleeping practices is still deficient.

The aim of our study was to examine the interactive effects of age, gender, SES, and cultural differences in sleep patterns in a large cohort of children aged 5 to 10 years.

2. Methods

2.1. Participants

Participants were recruited to participate in the South Australian Paediatric Sleep Survey (SAPSS) through 23 government and nine non-government primary schools within Adelaide, South Australia (population, 1.1 million [18]), using a multistage, stratified, random sampling design. Questionnaires were distributed to all students (n = 7186) in grades 1 through 5 to take home to parents. A second distribution and newsletter reminder were sent 2–4 weeks after initial distribution. Questionnaires were returned to the school or by reply-paid envelopes directly to the researcher.

A total of 1904 (26.5%) questionnaires were returned. Fifty-nine participants were excluded: 41 were outside the age range, seven provided no date of birth, six had more than 20% missing data, and five had a chronic medical condition affecting sleep. The final sample consisted of 1845 children. The study was approved by the relevant educational, academic, and administering institutions' Human Research Ethics Committees.

2.2. Measures

2.2.1. South Australian Paediatric Sleep Survey

The SAPSS was conducted from February to November 2007 to assess sleep habits, prevalence of sleep disorders, and behavioral correlates in Australian children aged 5–10 years. A parent-report questionnaire was constructed, which consisted of five sections, including demographics, sleep, daily activity, behavior, and general health. The sleep component of this questionnaire has since been validated [19]. Demographics, sleep habits, and behavior are reported herein.

2.2.2. Demographics

Parents recorded the child's date of birth, gender, and ethnic group. Parents indicated their child's ethnicity through a forced choice scale of Caucasian, Indigenous, Asian, African, Polynesian, Caribbean, and other. The SES was determined using the Australian Bureau of Statistics Socioeconomic Indexes for Areas 2006 based on postal code [20]. This index provides a summary score, which is related to a number of key variables, including household income, education, occupation, and ethnicity. The index has a national mean (standard deviation) of 1000 (100) and is expressed as a raw score, rank, percentile, and decile. The lower the index value the greater the disadvantage for the residential area. Respondents were classified into three groups of socioeconomic disadvantage according to the Statistics Socioeconomic Indexes for Areas index of deciles: low (rank, 1–3), mid (rank, 4–7), and high (rank, 8–10).

2.2.3. Sleep

Seven sleep parameters were collected for school and non-school periods: usual, earliest, and latest bedtime; average wake after sleep onset; and usual, earliest, and latest rise time. Parents were asked to provide lights-out time as a predicate of sleep onset. As it is impossible to accurately determine total sleep times without the use of objective measures and because using lights-out time for sleep onset is likely to underestimate the time taken to fall asleep, sleep period time (SPT), i.e., the time available for sleep, was used as the measure of sleep duration. TIB was calculated as the difference between bedtime and rise time, while SPT was calculated as the difference between reported time of lights-out and rise time, less wake after sleep onset. Approximately 5% of reported lights-out times were before reported bedtime and were subsequently removed from SPT analysis. School nights were Sunday to Thursday and non-school nights were Friday and Saturday. School mornings were Monday to Friday and non-school mornings were Saturday and Sunday. Napping behaviors were recorded but were not reported as <5% of the cohort napped. Preliminary analyses revealed no differences between nappers and non-nappers on any nocturnal sleep parameter.

2.3. Statistical analysis

All data were checked for normality. Outliers were identified and removed (<2% of entries). Usual bedtime, rise time, TIB, and SPT showed normal distribution after removal of outliers. Due to inadequate cell size in individual ethnic groupings, ethnic group was dichotomized into Caucasian and non-Caucasian. Age was dichotomized into younger (5–7 y; n = 1070) and older (8–10 y; n = 775) groups for multivariate analysis, as the initial analysis

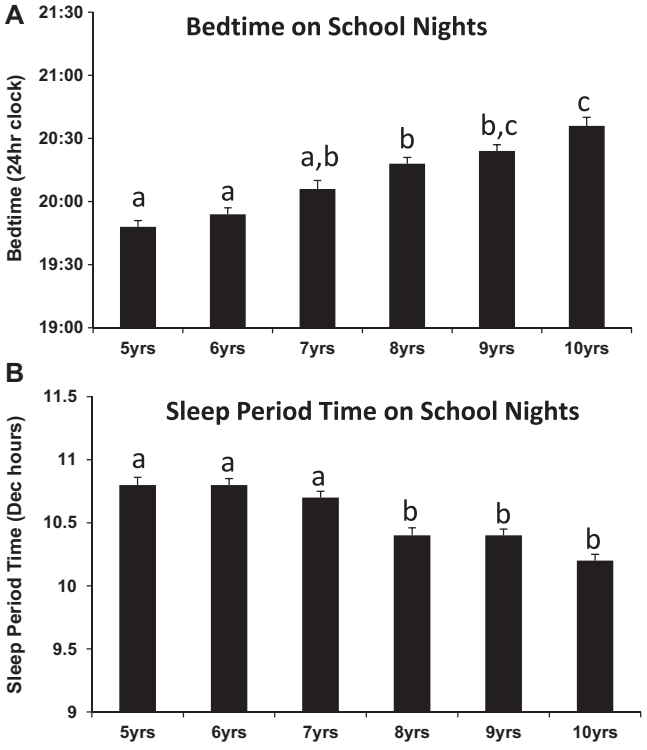

Fig. 1. Linear increase in bedtime (A) and decrease in sleep period time (B) on school nights in children from ages 5 to 10 years. The letters on top of the bars indicate significant differences. When the letters are different, a significant difference in group comparison exists. When they are the same, differences did not meet Bonferroni corrections or no differences were found. Significance was set at $P \leqslant .002$ by Bonferroni correction.