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Published in:
Journal of School Nursing

DOI:
10.1177/1059840512444133

2012

Link to publication

Citation for published version (APA):
Garmy, P., Nyberg, P., & Jakobsson, U. (2012). Sleep and Television and Computer Habits of Swedish School-Age Children. *Journal of School Nursing*, *28*(6), 469-476. https://doi.org/10.1177/1059840512444133

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The Journal of School Nursing
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The Journal of School Nursing 2012 28: 469 originally published online 3 April 2012
DOI: 10.1177/1059840512444133

The online version of this article can be found at:
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The Journal of School Nursing
28(6) 469-476
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DOI: 10.1177/1059840512444133
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Sleep and Television and Computer Habits of Swedish School-Age Children

Pernilla Garmy, RN, MMS, PhD student[1], Per Nyberg, PhD[2], and Ulf Jakobsson, PhD[3]

Abstract

The aim of this study was to investigate sleep, television and computer habits and enjoyment and feelings of tiredness in school of school-age children and adolescents in Sweden. An instrument found to be valid and reliable here was distributed to 3,011 children aged 6, 7, 10, 14, and 16 years. Those sleeping less than the median length of time reported a significantly lower degree of enjoyment of school. Short sleep was found to be associated with having a bedroom TV, spending more than 2 hr a day at the TV or the computer, being tired in school, and having difficulties both in waking up and in sleeping. Discussing sleep and media habits with schoolchildren and their parents regarding matters of optimal sleep and of how media habits affect sleep and learning is seen to be an important task of the school health service.

Keywords

sleep length, television, computer, school-aged children, adolescents, school health service

Background

Sleep problems in children are indicators of risk of emotional and behavioral difficulties in adolescence and adulthood (Gregory & Sadeh, 2011). Since the late 1980s, sleep problems in children and adolescents have tripled (Bremberg, 2006; Luntamo, Sourander, Santalahti, Aromaa, & Helenius, 2011). Studies show that for schoolchildren, watching TV before bedtime has a negative impact on sleep and that having TV in the bedroom contributes to sleep problems (Owens et al., 1999). The brightness of a television or computer screen can interfere with melatonin release and disturb the sleep–wake cycle (Higuchi, Motohashi, Liu, Ahara, & Kaneko, 2003). Television and computer games affect not only children's sleep but also their learning and memory ability (Dworak, Schierl, Bruns, & Strüder, 2007).

Sleep-related behaviors and sleep problems in children involve a complex interaction between biological, psychological, developmental, environmental, and social factors (Dement, Roth, & Kryger, 2005). It is often difficult to determine the relative importance of a single factor (Owens, 2005). Also, it is unlikely that any single, universally applicable "right way" (or time or place) to sleep will be discovered, despite the biology of sleep architecture and the factors regulating sleep having a certain universality. Children's sleep problems impact on their health, their learning and school performance, and their quality of life, as well as on the family as a whole (Owens, 2005). Laboratory studies have shown that a child's need of sleep defined as the amount of sleep achieved when a child is given 10 hr of nocturnal time in bed, does not change substantially during adolescence (10–17 years), it being about 8.5–9.25 hr in length (Carskadon & Acebo, 2002). Self-reported short length of sleep, erratic sleep–wake schedules, late times of going to bed and getting up, and poor quality of sleep are negatively associated with academic performance in adolescents (Taras & Potts-Datema, 2005). There has been a relative lack of investigation of sleep patterns in Swedish schoolchildren in recent years, despite the importance of such studies for obtaining a better understanding of the sleep-related decrease in school performance in Swedish schoolchildren.

All schools in Sweden for children and adolescents are required to have access to a school nurse and a school physician. It is common that the school nurse is situated at the school more or less every day a week, whereas the school physician visits the school generally once or twice a month, depending upon the size of the school. The recommendation of the Swedish Association of School Nurses is that a school nurse should not be responsible for more than 400 pupils, but the numbers of pupils involved are in many areas twice as

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large. The school health service provides not only opportunities for spontaneous visits but also an individual health visit at least once every 3 years, when in addition to the pupil's height, weight, spine, and vision being checked, the pupil is also given the opportunity to talk with the school nurse about matters of health and lifestyle (Clausson, 2008).

Aim

The primary aim of the present study was to investigate sleep duration, television and computer habits, difficulties in sleeping, and the effects all of these have on enjoyment of school and on feelings of tiredness in school in children and adolescents. The secondary aim was to explore associations between television and computer habits and sleep problems.

Method

Procedure

The study design was a cross-sectional survey. The plan of the study was reviewed by the Advisory Committee on Research Ethics in Health Education (VEN 34-09) at Lund University. Approval of the study was also obtained from the head principal and from the head physician of the schools involved. The school nurses were informed both in writing and orally that they should be sensitive in their approach and not try to persuade any of the potential respondents to participate, leaving the matter entirely up to the respondents themselves. The respondents were told that participation was voluntary, those who participated and their parents giving their informed consent, and that there were no right or wrong answers, that it was a question of what they themselves thought.

The sampling frame consisted of all children in the city of Lund (a municipality in southern Sweden of about 100,000 inhabitants) in the primary school class for children aged 6, and in Grades 1, 4, 8, and 10 ($n = 4{,}692$). All children in these categories are to be offered an individual health care visit at the school health service. About 17% of the populace of Lund at the time of the study were persons born abroad. The unemployment rate of the parents was 2.4%, 1.6% of the city's populace receiving welfare payments. Some 6% of the adult populace had only compulsory education, 26% secondary-school education, and 63% post-secondary-school education. About 82% of the children aged 6 had parents who lived together, the figures for the age levels of 13 and 17 being 70% and 63%, respectively (Svärd & Nilsson, 2009).

During the school year of 2008–2009, the school nurses were requested to distribute, during the individual health care visit, a test instrument (a sleep questionnaire), previously assessed as being valid and reliable (Garmy, Jakobsson, & Nyberg, 2012). At the first health visit for children in the primary school class for children aged 6 and for

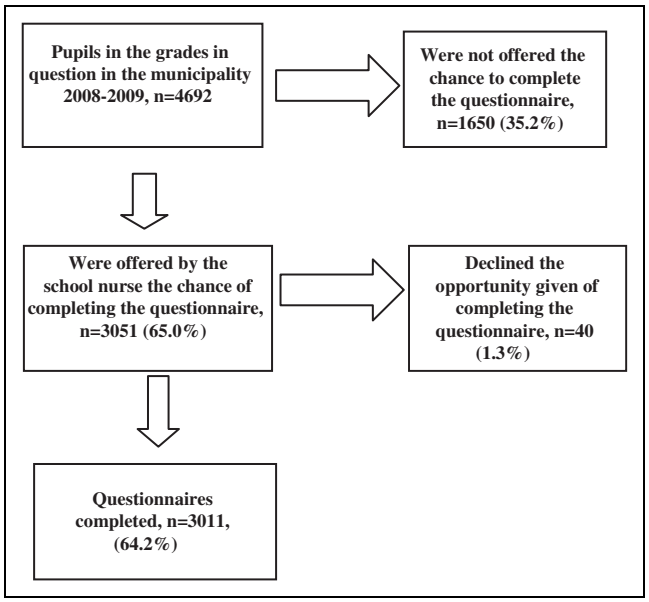

Figure 1. Flowchart.

those in first grade, who were aged 7, the parents completed the questionnaire, whereas during the health care visits for Grades 4, 8, and 10 the pupils completed it. The school nurses ($n = 32$) distributed the questionnaires to 64.9% of the children in the grades in question and to their parents (see the flowchart in Figure 1). The reasons for the questionnaires not being distributed as planned to all of the children were (1) not all them coming to the health care visit that was offered, (2) the school nurse not having the time needed to offer all of the children a health visit that year, (3) the school nurse forgetting to offer the child and the parents the questionnaire, (4) shortage of time generally, and (5) misunderstandings regarding the length of time the study was to take place. Only 1.3% ($n = 40$) of the respondents who were given the possibility of responding to the questionnaire declined doing so. The reasons for failure to complete the questionnaire when it had been given out were those of low motivation and lack of time. A total of 3011 (64%) questionnaires were completed, 569 of these being for the primary school class for children aged six or for those in grade 1, 634 for grade 4, 782 for grade 8 and 1026 for grade 10.

Measurement

The development and the psychometric evaluation of the instrument for measuring sleep length and television and computer habits are described elsewhere (Garmy et al., 2012). Included in the questionnaire (see Appendix A) were questions about the time for beginning to get ready for bed, for going to bed, and the length of sleep on weeknights and on weekends. There were also questions about enjoying school (very much, fairly well, or not very much), feelings of being tired in school (every day, often, seldom, or never),

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Table 1. Length of Sleep of Schoolchildren 6–16 years of Age in the First Primary School Class and in School Grades 1, 4, 8, and 10, and their Television and Computer Habits, Feelings of being Tired, Feeling of Enjoying School, and Difficulties in Falling Asleep and in Waking Up (n = 3,011)

	First primary school class and school Grade 1 (age 6–7 years) n = 569	School Grade 4 (age 10 years) n = 634	School Grade 8 (age 14 years) n = 782	School Grade 10 (age 16 years) n = 1,026
Median length of sleep in hours on weeknights (IQR)	10 (.5)	9.5 (1.0)	8 (1.2)	7.5 (1.0)
Median length of sleep in hours on weekends (IQR)	10 (1.0)	10 (1.5)	10 (2.0)	10 (1.0)
Median time spent getting ready for bed (IQR)	19:30 (45 min)	20:30 (60 min)	21:30 (60 min)	22:00 (90 min)
Median bedtime (IQR)	20:00 (30 min)	21:00 (45 min)	22:30 (60 min)	23:00 (45 min)
Median time in hours watching TV (IQR)	1.0 (.5)	1.0 (1.0)	1.5 (1.5)	1.5 (1.0)
Median time in hours at the computer (IQR)	0.5 (.5)	1.0 (1.0)	2.0 (2.0)	2.0 (2.0)
Having TV in the bedroom	117 (20.7%)	199 (31.5%)	382 (48.7%)	603 (58.8%)
Two hours or more watching TV each day	112 (21.4%)	178 (28.9%)	304 (44.1%)	412 (40.7%)
Two hours or more at the computer each day	10 (1.9%)	124 (20.2%)	412 (53.0%)	623 (61.6%)
Often having difficulties falling asleep	50 (8.9%)	108 (17.1%)	140 (17.9%)	192 (18.8%)
Enjoying school very much	432 (76.5%)	460 (73.0%)	457 (58.3%)	747 (73.3%)
Often being tired in school	14 (2.5%)	117 (18.5%)	320 (40.8%)	453 (44.3%)
Often having difficulties waking up	106 (18.9%)	245 (38.8%)	451 (57.7%)	549 (53.7%)

sleeping difficulties (every day, often, seldom, or never), and difficulties in waking up (every day, often, seldom, or never). There were also questions about having a bedroom TV (yes or no) and time spent watching TV and at the computer (in hours and minutes).

Data Analysis

The children were divided into two groups, those sleeping less than the median length of time for their age group being classified as "short sleepers" and those sleeping for the median length of time or longer as "long sleepers." The reason for this division was to compare the length of sleep of those in one age group with that of those in another. The chi-square test and Fisher's exact test were used to investigate the differences in length of sleep, tiredness, and difficulties both in falling asleep and in waking up, as well as differences in TV and computer habits (Altman, 1991). Multiple logistic regression (enter) was used for analyzing the relationships between factors associated with short length of sleep (Norman & Streiner, 2008). The independent variables were all treated as dichotomous, those of being tired in school, having difficulties in falling asleep, and having difficulties in waking up being counted as 0 when they were reported to occur seldom or never and as 1 when they were reported to occur often or every day, enjoyment of school through enjoying it very much being scored as 0 and enjoying it fairly much or not at all as 1, having a bedroom TV being a true dichotomy (yes 1, no 0). Spending $\geq$2 hr at the computer or $\geq$2 hr watching TV each day was scored as 1 and a lesser length of time as 0. This 2-hr cutoff point has also been used in other research in this area (Sisson, Broyles, Baker, & Katzmarzyk, 2011) and is consistent with the American Academy of Pediatrics' (2001) recommendation to limit TV time to no more than 2 hr/day. The Hosmer and Lemeshow goodness-of-fit test and the Nagelkerke R^2 test were used to evaluate the quality of the regression model, p values of $\leq$.05 being considered statistically significant. All the statistical analyses were performed using SPSS, version 17.0.

Results

Table 1 presents the length of sleep of the schoolchildren aged 6–16 in the first primary school class and in Grades 1, 4, 8, and 10, as well as their television and computer habits, their feelings of being tired and of enjoying school, and their difficulties in falling asleep and in waking up.

Less than 1 in 10 children at the age of 6 or 7 reported having difficulties in falling asleep, while in the other age groups almost every fifth child reported such difficulties. Few children in the youngest age category reported often being tired at school (2.5%), while nearly one in five of the children aged 10 and over 40% of the adolescents experienced this. A majority of the adolescents reported experiencing difficulties in waking up in the morning, the corresponding figure for the children aged 10 being barely 39% and for the children aged 6–7 it being close to 19%. Although most of the schoolchildren and adolescents stated that they enjoyed school very much, the adolescents aged 14 stand out in their enjoying school the least. In all the other age categories, more than 70% reported enjoying school very much, unlike the teens aged 14, where only less than 60% enjoyed school very much.

The median bedtime was 8:00 PM at the age of 6–7, and was finally 11:00 PM at the age of 16. The children started getting ready for bed about ½ to 1 hr before bedtime. The median length of sleep per night was found to be 10 hr at age 6–7, decreasing to 7½ hr by the age of 16. The length of sleep on weekends was 10 hr a night for each of the age

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Table 2. Little Sleep in Relation to Various Lifestyle Factors in Schoolchildren

	Little sleep (< median in the grade in question) $N = 965$ (32.6%)	Longer sleep (≥ median in the grade in question) $N = 1994$ (67.4%)	p Value[a]
Tired in school	390 (40.5%)	503 (25.3%)	< .001
Difficulties falling asleep	248 (25.7%)	233 (11.7%)	< .001
Difficulties waking up	808 (40.6%)	522 (54.1%)	< .001
Having a bedroom TV	476 (49.3%)	806 (40.4%)	< .001
Spending ≥ 2 hr watching TV	522 (54.1%)	808 (40.6%)	< .001
Spending ≥ 2 hr at the computer	471 (49.6%)	681 (34.9%)	< .001
Enjoying school very much	635 (66.1%)	1433 (71.9%)	= .006

[a] Chi-square test.

Table 3. Factors Associated With Short Sleep Duration in Schoolchildren ($n = 3{,}011$) in the Logistic Regression Analysis Carried Out

Variables	Odds ratio	95% CI for OR	p-values
Tired in school	1.46	[1.20, 1.77]	< .001
Difficulties falling asleep	2.30	[1.84, 2.85]	< .001
Difficulties waking up	1.21	[1.01, 1.45]	= .041
Having a bedroom TV	1.25	[1.05, 1.49]	= .011
Spending ≥2 hr watching TV	1.25	[1.05, 1.49]	= .013
Spending ≥2 hr at the computer	1.51	[1.27, 1.81]	< .001
Enjoying school	0.884	[0.40, 1.97]	= .763

Note. Hosmer and Lemeshow goodness-of-fit test, $p = .808$. Nagelkerke $R^2 = .089$.

categories. The youngest group had stable sleeping patterns generally, whereas for children of 10 the length of sleep increased by ½ hr on weekends as compared with weekdays, and for adolescents aged 14 and 16 it increased by 2 and 2½ hr, respectively. The children 6–10 years old estimated the time they spent watching TV as 1 hr a day, whereas the adolescents aged 14–16 estimated that they spent 1½ hr a day watching TV.

The children in each age group were divided into 2 categories in terms of length of sleep: those sleeping less than the median for their grade (short sleep duration) and those sleeping longer. Those sleeping less reported being tired in school more frequently, enjoying school to a lesser extent, having greater difficulties both in sleeping and in waking up, more often having a bedroom TV, and more frequently spending 2 hr or more a day at the TV or at the computer (Table 2).

In the multiple logistic regression analysis carried out, a short sleep duration was found to be significantly related to being tired in school, to having difficulties in falling asleep and in waking up, having a bedroom TV, and spending 2 hr or more watching TV or at the computer (Table 3).

Discussion

Sleeping less was found to be associated with having a bedroom TV, spending more than 2 hr a day watching TV or at the computer, being tired in school, and having difficulties both in waking up and in sleeping (Tables 2 and 3). Those sleeping less than their classmates reported enjoying school to a significantly lesser degree. The findings of our study are consistent with those of other studies that suggest sleep duration in children has declined over the past 50 years. A study reported in the international sleep literature and often used as a reference is Klackenberg's study (1982) of sleep duration in children born in the 1950s, in Sweden. A study in Switzerland of children born in the 1970s (Iglowstein, Jenni, Molinari, & Largo, 2003) showed these children to sleep about half an hour less than those in Sweden studied by Klackenberg 20 years earlier. A later study in Iceland (Thorleifsdottir, Björnsson, Benediktsdottir, Gislason, & Kristbjarnson, 2002) of children born in the 1970s and 1980s showed these children to sleep about 1 hr less than those reported on by Klackenberg 30–40 years earlier. This is also consistent with Smedje's findings (2000) regarding children born in the 1990s, in Sweden. The children in our study were born in the late 1990s. Their sleep duration is about 30–40 minutes shorter than that of children born in the 1950s. According to Carskadon and Acebo (2002), the sleep needs of adolescents 10–17 years of age are about 8.5–9.25 hr a night. In our study, the medium sleep duration for children aged 10 was somewhat more than 9 hr, whereas adolescents aged 14 and 16 had an average sleep duration of 8 hr and 7½ hr, respectively. Thus, the average sleep of the teenagers in our study is suboptimal. Accordingly, there was a need of both the children and their parents being informed about the length of sleep that was optimal. Inadequate sleep can coexist with other unhealthy behaviors such as use of tobacco and alcohol. Questions regarding this were not raised in the present study but could be of interest to explore in future studies.

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The results of our study are also consistent with those of previous studies in indicating irregular sleep patterns to be frequent in adolescents (National Sleep Foundation 2000). The length of sleep on weekends was 10 hr a night for each of the age categories, the more differentiated results indicating the youngest group to have stable sleeping patterns; whereas for children aged 10, the length of sleep increased by ½ hr on weekends, for adolescents aged 14 and 16 it increased by 2 and 2½ hr, respectively. In a study by Wolfson and Carskadon (1998) the corresponding figures are slightly lower but are close to this. Irregular sleep schedules can contribute to trouble falling asleep and awakening and to fragmented sleep (Carskadon et al., 1980). An Australian evaluation of a school-based intervention aimed at increasing knowledge of sleep and counteracting sleep problems in adolescents (Moseley & Gradisar, 2009) showed the intervention to result in an increase in knowledge of sleep but to have no significant effect on sleep habits generally, yet for adolescents with delayed sleep timing there being a significant reduction in the discrepancy between weekday and weekend out-of-bed times. In our study (see Table 1), adolescents showed a high prevalence of suboptimal sleep, which has been found in other studies to affect learning ability in school and school performance generally (Taras & Potts-Datema, 2005). Self-reported shortening of sleep duration, erratic sleep–wake schedules, late times of going to bed and of arising, and poor sleep quality have been found to be negatively associated with academic performance in adolescents. Poor sleep can be a factor contributing to schoolchildren's showing learning and attention disorders (Taras & Potts-Datema, 2005). Questions regarding length of sleep and sleep habits should be raised, including those of resistance to going to bed, delay in the onset of sleep, waking up at night, disordered breathing during sleep, and increased sleepiness during the day.

The responses regarding fatigue, difficulties in sleeping and in waking up and enjoying school are consistent with factors of physiological and psychological development (Dement et al., 2005). Nearly all the children aged 6 and 7 appeared to be alert in school, only a few of them reporting that they often were tired in school (2.5%). For the children aged 10, who were in the prepubertal stage, nearly one in five (18.5%) reported often being tired in school. For the adolescents aged 14 and 16, finally, in the pubertal phase, more than 40% reported often being tired at school. A majority of the adolescents had difficulties in waking up in the morning. This is consistent with other research (Dement et al., 2005), which indicates eveningness to be dominant in adolescence.

For those in the group that was studied, it seems to be toughest in school being a 14-year old. Although over 58% of the pupils in this age group enjoyed school very much, that figure is considerably lower than for the other age categories, all of which have satisfaction levels of above 70%. Being 14 is a sensitive period of life, attending school still being mandatory and providing only limited choices regarding the school subjects to take, and the like. The pupils received their first school marks that year, and they had 1 year of compulsory school education left. At age 16, upper secondary school begins, students having the possibility then of selecting an educational program in line with their interests and the marks they have received. It is not surprising, therefore, that enjoyment of school increases at this time.

Limitations

A cross-sectional design such as that used here has limitations, a longitudinal design aiming at investigating matters of causality being a possibility for future studies. An obvious limitation of self-report questionnaires concerning sleep is that the estimated length of sleep may not be fully consistent with the actual length of sleep. In future studies a sleep questionnaire could be accompanied by use of a sleep diary for a week, for example, and objective measures such as obtainable in an actigraph, or through more advanced technological measurements obtained in a sleep laboratory. The questionnaire employed here was short and was easy for the pupils to fill out. Most of them completed the questionnaire on their own, but in some cases they were helped by the school nurse's reading the text to them and explaining the meaning of various questions. Although only 64.9% of the children in the study population were given the possibility of filling out the questionnaire, the failure analysis showed pupils who were not offered the questionnaire to not differ from the others regarding either gender or geographical location within the city. Of those given the opportunity to complete the questionnaire, only 1.3% declined. The R^2 explains about 8.9% of the variance, which means that the variables included in the regression analysis only explain a part of the total variance. It can be assumed that there are other factors, not considered here, that likewise influence the length of sleep. There is a need of further research regarding this.

School Nursing Implications

Adolescents generally require at least as much sleep, as they did not long before as preadolescents, in general 8.5 to 9.25 hr a night (Carskadon & Acebo, 2002). School nurses have an important role in helping children and adolescents adopt healthy lifestyles. Sound sleep habits are essential for achieving a healthy lifestyle and optimizing one's learning ability at school. School-based interventions aimed at increasing adolescents' knowledge of sleep and helping them overcome their sleep problems have been found to reduce the erratic sleep schedules of adolescents with delayed sleep (Moseley & Gradisar, 2009). Depression and various other neuropsychiatric disorders are often associated with a lack of sleep. It can be recommended that one start with efforts to help pupils overcome their sleep problems before undertaking interventions of other sorts. In connection with this, school

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nurses can be seen as having the important mission of talking with pupils and parents about sleep in an empathetic way, being patient and endeavoring to instill hope of improvements being achieved. The school nurse meets each of the pupils individually at the regular health care visits and also meets many of them during spontaneous visits of theirs to the school health service. She can also implement health education in half- or full-class lectures, as well as workshops for the school staff, and she can attend parent meetings. A popular feature in parent meetings is for the school nurse to lead the discussions in which parents can discuss sleep habits and the setting of boundaries.

Motivational interviewing (Miller, Rollnick, & Butler, 2008) is a good starting point in meeting a pupil with sleep problems, asking the pupil to answer a few questions about sleeping habits, such as what he or she usually does during the last 2 hr or so before going to bed, and having the child fill out a sleep diary and perhaps a sleep questionnaire (see the "Questionnaire regarding sleep and lifestyle" in Appendix A). Before the health visit has been completed, the pupil may be asked to help in completing, together with the school nurse, a form that can be used for providing advice and recommendations (Hillman 2012; see Appendix B). The first step taken in completing the form is to fill in the goal (a particular number of hours of sleep), then the time of going to bed, and the time of getting up, both on school days and on holidays, needed for achieving the goal. The last step is to write down a few recommendations, ones that have been anchored with the student, and ideally, for best results, have been formulated by the pupil herself/himself.

Fact Box

An important school nursing task is to inform parents and schoolchildren regarding various factors associated with short sleep, the following in particular:

- Having a bedroom TV
- $\geq$2 hr watching TV
- $\geq$2 hr at the computer
- Being tired in school
- Enjoying school less

Conclusions

The results obtained here are consistent with those of other studies that have indicated children's sleep duration to have fallen by at least 30 min in recent decades. A short sleep duration was found to be associated with having bedroom TV, spending 2 hr or more a day watching TV or sitting before a computer, and feelings of being tired in school. The school health service has an important task of promoting healthy lifestyles. This includes attending to children's need of sleep and talking to them and to their parents about how television and computer habits can affect a pupil's sleep, as well as feelings of sleepiness during the day.

Appendix A

Questionnaire Regarding Sleep and Lifestyle

1. I have a TV set in my room: No ☐ Yes ☐
2. About how long each day I typically spend watching TV: . . . . . hrs. . . . . min.
3. About how long each day I typically spend at the computer: . . . .hrs. . . . . min.
4. How often I have difficulties in falling asleep: Never ☐ Seldom ☐ Often ☐ Every night ☐
5. How often I feel tired in school: Never ☐ Seldom ☐ Often ☐ Every day ☐
6. To what extent I enjoy being in school: A lot ☐ Fairly much ☐ Not much at all☐
7. When I have school the next day, I begin getting ready for bed at about: . . . . . .
8. When I have school the next day, I go to bed at about: . . . . . .
9. When I have school the next day, I usually sleep about: . . . . . hrs. . . . . min.
10. When I'm free the next day, I usually sleep about: . . . . . hrs. . . . . min.
11. I find it difficult to wake up in the morning: Never ☐ Seldom ☐ Often ☐ Every day ☐

Source. Garmy et al., 2012.

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Appendix B

Advice and Recommendations

Goal
Number of hours of sleep: . . . . . .hours
Time of going to bed: School days . . . . . Weekends/ holidays: . . . . . .
Time of getting up: School days: . . . . . Weekends / holidays: . . . . . .
Other recommendations:
. . . . . .
Time for a follow up: . . . . . .
with the (school nurse / school physician): . . . . . .

Source. Hillman 2012 (www.gothiaforlag.se).

Acknowledgments

We are grateful to the children, the parents and the school nurses who participated for their efforts and their cooperation in connection with the study. We also thank Robert Goldsmith for his linguistic editing of the manuscript.

Declaration of Conflicting Interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Funding

The author(s) disclosed receipt of the following financial support for the research, authorship, and/or publication of this article: The study received financial support from Södra Sveriges Sjuksköterskehem SSSH, the Queen Silvia Jubilee Fund, the Fanny Ekdahl Foundation for Paediatric Research, the Ebba Danelius Foundation (of the Swedish Society of Nursing) and the Swedish Sleep Research Society.

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