Association Between Television Viewing and Sleep Problems During Adolescence and Early Adulthood

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Background: Although research has suggested that extensive television viewing may be associated with sleep problems, the direction of this association has not yet been determined.

Objective: To investigate directional hypotheses regarding the association between television viewing and sleep problems during adolescence and early adulthood.

Design: The Children in the Community Study, a prospective longitudinal investigation.

Participants and Setting: A community-based sample of 759 mothers from upstate New York and their offspring were interviewed during the early adolescence (mean age, 14 years), middle adolescence (mean age, 16 years), and early adulthood of the offspring (mean age, 22 years).

Main Outcome Measures: Television viewing and sleep problems during adolescence and early adulthood measured using the Disorganizing Poverty Interview and the age-appropriate versions of the Diagnostic Interview Schedule for Children.

Results: Adolescents who watched 3 or more hours of television per day during adolescence were at a significantly elevated risk for frequent sleep problems by early adulthood. This elevation in risk remained significant after offspring age, sex, previous sleep problems, offspring psychiatric disorders, offspring neglect, parental educational level, parental annual income, and parental psychiatric symptoms were controlled statistically. Adolescents who reduced their television viewing from 1 hour or longer to less than 1 hour per day experienced a significant reduction in risk for subsequent sleep problems. Sleep problems during adolescence were not independently associated with subsequent television viewing when prior television viewing was controlled.

Conclusion: Extensive television viewing during adolescence may contribute to the development of sleep problems by early adulthood.


Research has indicated that extensive television viewing tends to be associated with sleep problems among children, adolescents, and adults. However, few studies of risk for sleep problems have assessed television viewing. Only 2 studies have investigated the sequencing of the association between television viewing and the development of sleep problems during childhood or early adolescence. The findings of both studies suggested that television viewing was associated with increased risk for sleep problems during the next 9 to 12 months. However, no prospective longitudinal study has investigated the long-term association of television viewing with the development of sleep problems from early adolescence through early adulthood. Thus, little is known about the nature and direction of the association between television viewing and sleep problems during adolescence and early adulthood.

Three hypotheses may be advanced regarding this association. First, television viewing may adversely affect the psychological and biological mechanisms that govern the onset and maintenance of sleep. For example, late evening television viewing may contribute to heightened alertness and physiological arousal, which are associated with difficulty falling asleep. Second, extended exposure to the bright light of a television screen may contribute to delayed or reduced melatonin secretion, adversely affecting the sleep-
waking cycle.7,8 In addition, perceptions of a scary world and symptoms of psychological trauma, which have been found to be associated with heavy television viewing during childhood and adolescence, may contribute to the development of sleep problems.9-11 Further, physical inactivity, which tends to be associated with extensive television viewing,8 may contribute to increased restlessness and difficulty falling or staying asleep.1 Alternatively, individuals who tend to have difficulty sleeping may spend more time watching television because they often watch television when they are unable to sleep. These hypotheses are not mutually exclusive, and there may be a bidirectional association between extensive television viewing and difficulty sleeping.

A third hypothesis is that the association between television viewing and sleep problems may be attributable to other risk factors, such as low socioeconomic status, childhood neglect, or psychiatric symptoms that may contribute to both extensive television viewing and sleep problems. For example, childhood neglect may promote extensive television viewing because of a lack of parental supervision, and neglected children may have difficulty sleeping owing to distress associated with insufficient parental support. Low socioeconomic status may promote extensive television viewing because of a lack of opportunity to engage in other leisure activities, and adversities associated with low socioeconomic status may contribute to sleep problems. Psychiatric symptoms, such as depression and chronic avoidance of social interaction, may contribute to both extensive television viewing and sleeping difficulties.9-11

It is of particular interest to investigate these hypotheses among adolescents and young adults, who often experience profound changes in their sleeping and waking patterns.12 To investigate all 3 hypotheses, it is necessary to assess television viewing and sleep problems repeatedly during adolescence and adulthood and to assess many factors that could underlie this association in a sizable general population sample. We report findings of a community-based prospective longitudinal investigation that meets these methodological criteria.

METHOD

SUBJECTS AND PROCEDURE

The original participants in the Children in the Community Study (CICS) were 976 randomly sampled mothers, with children between the ages of 1 and 10 years, who resided in 2 upstate New York counties and were interviewed in 197513,14. The original purpose of the CICS was the validation of social indicators by demonstration of their relationship to measures of childhood problems.14 The current analyses were conducted with data from 759 families with whom follow-up interviews of the mothers and a randomly selected child were conducted in 1983 (N=749) and in 1985-1986 (N=733) or 1991-1993 (N=717). These follow-up interviews were conducted to investigate longitudinal associations of childhood characteristics with physical and mental health outcomes among adolescents in the general population.

The mean (SD) age of the offspring was 6 (3) years in 1975, 14 (3) years in 1983, 16 (3) years in 1985-1986, and 22 (3) years in 1991-1993. The 759 families in the present study did not differ from the remainder of the original CICS sample for potential risk factors or control variables used in this study. These families were demographically representative of families in the sampled region.13 The youth and their mothers were interviewed separately at mean offspring ages 14, 16, and 22 years by extensively trained and supervised lay interviewers. Study procedures were approved according to appropriate institutional guidelines. Written informed consent was obtained after the interview procedures were fully explained. Additional information regarding the study method is available from previous articles.13,14

ASSESSMENT OF OFFSPRING PSYCHIATRIC SYMPTOMS AND SLEEP PROBLEMS

Offspring psychiatric symptoms were assessed at mean offspring ages 14 and 16 years using the parent and child versions of the Diagnostic Interview Schedule for Children (DISC).15 At mean age 22 years, a modified, age-appropriate version of the DISC was administered to the offspring. The mothers and youth were both interviewed because the use of multiple informants tends to increase the reliability and validity of psychiatric diagnoses among children and adolescents.16,17 Symptoms were considered present if reported by either informant. Research has supported the reliability and validity of the DISC-1 as used in the present study.18 Items used to assess personality disorders were adapted from instruments including the Personality Diagnostic Questionnaire19 and the Structured Clinical Interview for Diagnostic and Statistical Manual of Mental Disorders, Revised Third Edition Personality Disorders,20 combined using computer algorithms21 and modified to maximize correspondence with the Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition.22 Research has supported the reliability and validity of the procedures used to assess personality disorders.23-25

Offspring sleep problems were assessed using the DISC-I and the Disorganizing Poverty Interview (DPI).14 The DPI, which was developed to assess parental and offspring behavioral, demographic, and health characteristics during the first maternal interview at mean offspring age 6 years,13,14 was readministered at mean ages 14, 16, and 22 years. Difficulty falling asleep during adolescence and early adulthood was assessed with this maternal interview item: “When your son/daughter goes to bed for the night, does he/she usually fall asleep: (a) easily, (b) fairly easily, or (c) not easily?” Difficulty falling asleep during adolescence and early adulthood was also assessed with this offspring interview item: “When you go to bed for the night, do you usually fall asleep: (a) easily, (b) fairly easily, or (c) not easily?” This problem was considered present if either informant responded not easily.

Offspring nighttime awakening during adolescence and early adulthood was assessed with these maternal interview items: (1) “Does your son/daughter often wake up in the middle of the night and not be able to go back to sleep easily?” and (2) “Does your son/daughter often wake up early in the morning before he/she has to, and feel like sleeping...
more but just can't fall asleep again?” Nighttime awakening during adolescence and early adulthood was also assessed with these offspring interview items: (1) “Do you often wake up in the middle of the night and not be able to go back to sleep easily?”; and (2) “Do you often wake up early in the morning before you have to, and feel like sleeping more but just can’t fall asleep again?” The response format was (a) “no”; or (b) “yes.” This problem was considered present if either informant answered yes to either item.

These sleep problems were considered present if reported by either informant because parents and their offspring tend to have different information, perceptions, and recall of behavioral and emotional problems.26-28 As in prior epidemiological studies,26-28 there was modest, but statistically significant, agreement between maternal and offspring reports of these sleep problems at mean age 14 years (r = 0.24; P < .001), 16 years (r = 0.21; P < .001), and 22 years (r = 0.14; P < .001). Combined data from maternal and offspring reports were used because reports from both informants have been found to be independently associated with impairment and distress, and because the use of multiple informants has been found to increase the reliability and validity of psychiatric diagnoses among adolescents.10,17,26,27

Offspring nightmares were assessed with the following maternal interview item: “How often does your son/daughter have bad dreams or nightmares? (a) never, (b) hardly ever, (c) sometimes, or (d) often, (e) very often, or (f) almost every night?” This problem was considered present if the response was often, very often, or almost every night. Offspring failure to get enough sleep was assessed at mean ages 16 and 22 years with the following offspring interview item: “How often do you get less sleep than you really need? (a) most nights, (b) 3 or 4 nights a week, (c) about 1 or 2 nights a week, or (d) less than that?” This problem was considered present if the response was most nights. Offspring morning irritability was assessed at each interview with the following maternal interview item: “When your son/daughter wakes up in the morning, is he/she usually: (a) irritable, (b) happy, or (c) neither irritable nor happy?” This problem was considered present if the response was irritable.

ASSESSMENT OF TELEVISION VIEWING

Television viewing during adolescence was assessed with items that were administered during the maternal and offspring interviews. These data were used to compute an index of television viewing with 3 categories: less than 1 hour per day, 1 to less than 3 hours per day, and 3 or more hours per day. If the informants’ reports differed, the higher of the 2 reports was used. Data based on these procedures indicated that 32.3%, 28.6%, and 30.2% of the youths watched 3 hours or more of television per day at mean ages 14, 16, and 22 years, respectively.

ASSESSMENT OF SOCIOECONOMIC STATUS, PARENTAL CHARACTERISTICS, AND CHILDHOOD NEGLECT

Parental education and income were assessed during the maternal interview. Family income was transformed to the percentage of US poverty levels, and poverty was defined as a mean income below 100% of the US poverty levels. Parental education was considered low if neither parent completed high school. Offspring educational attainment was assessed with the DPI. Current maternal and paternal psychiatric symptoms were assessed during the maternal interviews at mean offspring ages 6, 14, and 16 years. Lifetime parental psychiatric symptoms were assessed during the maternal interview at mean offspring age 22 years. Interview items used to assess current maternal psychiatric symptoms were obtained from the DPI, the California Psychological Inventory,29 the Hopkins Symptom Checklist,30 and instruments that assessed other personality traits.31-34 Paternal substance abuse and antisocial behavior were assessed using the DPI. Lifetime maternal and paternal psychiatric disorders, evident by mean offspring age 16 years, were assessed using items adapted from the New York High-Risk Study Family Interview.35

Childhood neglect was assessed using 3 types of data. Information regarding youth that had been referred to state agencies, investigated, and confirmed as cases of neglect were obtained from a central registry. Self-reports of childhood neglect were obtained from the offspring at mean age 22 years. Maternal interview items at mean offspring ages 6, 14, and 16 years that corresponded with items in the cognitive, emotional, physical, and supervision neglect subscales of the Neglect Scale36 were also used to assess childhood neglect. Childhood neglect was considered present if these scores were 2 SDs or more above the sample mean.

DATA ANALYTIC PROCEDURE

Analyses of contingency tables were conducted to investigate the associations between viewing television time during adolescence and subsequent sleep problems, and between sleep problems during adolescence and subsequent television viewing. Logistic regression analyses were conducted to investigate whether these associations remained significant after controlling for baseline television viewing or sleep problems, and for age, sex, low parental educational level, low parental income, childhood neglect, parental and offspring psychiatric disorders, offspring educational attainment, and offspring substance abuse.

ASSOCIATIONS OF COVARIATES WITH TELEVISION VIEWING AND SLEEP PROBLEMS

All of the covariates were significantly associated with television viewing time and sleep problems during adolescence. Difficulty falling asleep and nighttime awakening were significantly more prevalent at mean age 14 years than at mean ages 16 and 22 years (Table 1).
TELEVISION VIEWING DURING ADOLESCENCE AND RISK FOR SUBSEQUENT SLEEP PROBLEMS

The amount of time spent viewing television at mean age 14 years was significantly associated with frequent difficulty falling asleep, frequent awakening during the night, any frequent sleep problem, and 2 or more sleep problems at mean age 16 or 22 years (Table 2). These associations remained significant after controlling for age, sex, low parental educational level and income; parental psychiatric symptoms; childhood neglect; offspring educational attainment; offspring psychiatric disorders; offspring substance abuse; and the corresponding sleep problem at mean age 14 years. Television viewing time at mean age 14 years was associated with an elevated risk for subsequent sleep problems among youth with and without a history of sleep problems (Figure 1). Significant associations were obtained between television viewing time at mean age 14 years and 1 or more subsequent sleep problems based on the findings obtained with data from both the maternal (adjusted odds ratio [AOR], 1.52; 95% confidence interval [CI], 1.06-2.20) and offspring (AOR, 1.31; 95% CI, 1.03-1.65) interviews.

Television viewing time at mean age 14 years was significantly associated with an elevated risk for frequent midnight awakening (AOR, 3.79; 95% CI, 1.24-11.50) and any frequent sleep problem (AOR, 1.98; 95% CI, 1.18-3.32) at mean age 16 years after the covariates were controlled. Television viewing time at mean age 14 years was significantly associated with an elevated risk for difficulty falling asleep (AOR, 2.16; 95% CI, 1.13-4.14) and 2 or more sleep problems (AOR, 2.23; 95% CI, 1.04-4.78) at mean age 22 years after the covariates were controlled. Television viewing time at mean age 16 years was significantly associated with an elevated risk for difficulty falling asleep (AOR, 2.16; 95% CI, 1.13-4.14) and 2 or more sleep problems (AOR, 2.23; 95% CI, 1.04-4.78) at mean age 22 years after the covariates were controlled.

SLEEP PROBLEMS DURING ADOLESCENCE AND SUBSEQUENT TELEVISION VIEWING

There were no significant bivariate or multivariate associations between sleep problems at mean age 14 years and the television viewing time at mean age 16 or 22 years. Frequent nighttime awakening and 2 or more sleep problems at mean age 16 years were associated with subsequent television viewing time before, but not after, the covariates were controlled.

COMMENT

The present findings are consistent, in several respects, with the hypothesis that extensive television viewing during adolescence may be associated with an elevated risk for sleep problems later in adolescence or during early adulthood. First, extensive television viewing (ie, ≥3 hours per day) during adolescence was associated with risk for subsequent sleep problems after previous sleep problems were controlled statistically. Second, these associations were independent of offspring age, sex, psychiatric disorders, substance abuse, educational attainment, childhood neglect, parental educational level, parental income, and parental psychiatric symptoms. Third, sleep problems during adolescence were not independently associated with subsequent television viewing, suggesting that the preponderance of the long-term association between television viewing and sleep problems may be attributable to an increased risk for sleep problems among adolescents who tend to spend several hours per day watching television. Fourth, youth who reduced the amount of time that they spent watching television to less than 1 hour per day by middle adolescence experienced a marked reduction in risk for subsequent sleep problems during later adolescence or early adulthood.

Our findings are also of interest because they suggest that extensive television viewing during adolescence may be associated with the development of frequent sleep problems among youth who have not previously had frequent sleep problems. Specifically, the present findings suggest that adolescents with no history of frequent difficulty falling asleep who watch 3 hours or more of television per day may be twice as likely as those who watch less than 1 hour per day to experience...
lescents, and adults, will require further investigation.37

Fundamental issues, such as differences in the prevalence of sleep problems during childhood and adolescence. However, there have been few epidemiological stud-

lems tend to be common during childhood and adolescence. Previous research has indicated that sleep problems are more prevalent at mean age 16 or 22 years among youth who reduced their television viewing from 1 hour or more per day at mean age 14 years to less than 1 hour per day at mean age 16 years.

frequent difficulty falling asleep by early adulthood. In addition, our findings suggest that youth with no history of frequent nighttime awakenings who watch 3 or more hours of television per day may be twice as likely to experience frequent nighttime awakenings, including difficulty going back to sleep, by early adulthood.

In the present CICS subsample, difficulty falling asleep and nighttime awakening were more prevalent at mean age 14 years than at mean ages 16 and 22 years. The high prevalence of sleep problems at mean age 14 years may have been attributable, in part, to the stress that may be associated with physiological maturation and the onset of puberty. Previous research has indicated that sleep problems tend to be common during childhood and adolescence. However, there have been few epidemiological studies of sleep problems during childhood and adolescence. Fundamental issues, such as differences in the prevalence of specific sleep disturbances among children, adolescents, and adults, will require further investigation.37

The present findings may have important clinical and public health implications. Our findings suggest that by

restricing the amount of time that they spend watching television, adolescents may be able to reduce the likelihood that they will experience the onset of frequent sleep problems by early adulthood. Parents, health care professionals, and other adult caretakers may be able to help young people avoid developing sleep problems by encouraging them to avoid excessive television viewing. The importance of limiting television viewing time is underlined by previous findings indicating that extensive television viewing may be associated with symptoms of psychological trauma; alcohol, cigarette, or drug use; antisocial, aggressive, or violent behavior; desensitization to the effects of violent acts; obesity; perceptions of a mean or frightening world; and disruptions in diet, eating patterns, and body image.6-8,38-41 Based on such findings, the American Academy of Pediatrics has recommended that youth should not watch more than 1 to 2 hours of television per day.42 The present findings provide additional support for this recommendation. Our findings are also consistent with previous research indi-

Table 2. Television Viewing at Mean Age 14 Years and Sleep Problems Reported at Mean Age 16 or 22 Years*

<table>
<thead>
<tr>
<th>Sleep Problems Reported at Mean Age 16 or 22 Years</th>
<th>Amount of Television Viewing at Mean Age 14 Years, Hours per Day</th>
<th>χ² Test</th>
<th>P Value</th>
<th>ADR (95% CI)†</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frequent difficulty falling asleep</td>
<td>&lt;1 (29/98) 37.0 (154/416)‡‡‡‡</td>
<td>12.08</td>
<td>.002</td>
<td>2.05 (1.19-3.53)</td>
</tr>
<tr>
<td>Frequent awakening with difficulty going back to sleep</td>
<td>11.2 (11/98) 14.7 (61/416)‡‡</td>
<td>9.16</td>
<td>.01</td>
<td>2.38 (1.11-5.09)</td>
</tr>
<tr>
<td>Frequent nightmares</td>
<td>5.1 (5/98) 3.1 (37/416)‡</td>
<td>2.78</td>
<td>.25</td>
<td>0.86 (0.36-3.79)</td>
</tr>
<tr>
<td>Frequent failure to get enough sleep§</td>
<td>19.4 (19/98) 24.5 (102/416)‡</td>
<td>1.79</td>
<td>.41</td>
<td>1.56 (0.79-3.12)</td>
</tr>
<tr>
<td>Usually irritable on awakening</td>
<td>14.3 (14/98) 17.1 (71/416)‡</td>
<td>2.41</td>
<td>.30</td>
<td>1.67 (0.90-3.09)</td>
</tr>
<tr>
<td>Any frequent sleep problem</td>
<td>52.0 (51/98) 59.4 (247/416)‡</td>
<td>7.92</td>
<td>.02</td>
<td>1.90 (1.14-3.17)</td>
</tr>
<tr>
<td>≥2 Sleep problems</td>
<td>21.4 (21/98) 26.0 (108/416)‡</td>
<td>18.36</td>
<td>&lt;.001</td>
<td>2.48 (1.36-4.49)</td>
</tr>
</tbody>
</table>

Abbreviations: AOR, adjusted odds ratio; CI, confidence interval.

*Data are given as percentages (number of participants/total number of participants). The total number of participants from the Children in the Community Study subsample was 759.

†The ORs based on the comparison between the less than 1 hour and 3 or more hours per day of television viewing groups after age, sex, low parental educational level and income, childhood neglect, parental and offspring psychiatric disorders, offspring educational attainment, offspring substance abuse, and the presence of the corresponding sleep problem at mean age 14 years were controlled statistically.

‡Supplemental analyses, conducted to examine relative risk for comparisons of the cells in each row, indicated that there was a significantly higher level of the subsequent sleep problem in comparison with individuals who spent less time watching television at mean age 14 years.

§Because failure to get enough sleep was not assessed at mean age 14 years, any frequent sleep problem at mean age 14 years was controlled statistically.

Figure 1. Television viewing time at mean age 14 years and the prevalence of sleep problems at mean age 16 or 22 years among youth with and without a history of sleep problems.

Figure 2. Television viewing time at mean age 14 years and the prevalence of sleep problems at mean age 16 or 22 years among youth who reduced their television viewing from 1 hour or more per day at mean age 14 years to less than 1 hour per day at mean age 16 years.
Sleep problems are common among adolescents and adults.\textsuperscript{44,47} It is estimated that more than 40 million Americans have a chronic sleep disorder.\textsuperscript{90} Sleep disorders have been found to be associated with depressed mood; difficulty concentrating; drowsiness; impaired memory; and impaired cardiovascular, endocrine, immune, interpersonal, occupational, psychomotor, and metabolic functioning.\textsuperscript{47,90,99} Drowsiness and psychomotor impairment associated with insomnia and sleep deprivation have also been found to account for a large proportion of motor vehicle collisions.\textsuperscript{98,60} These findings have demonstrated that insomnia is a significant public health problem. The use of behavioral modification strategies that promote improved sleep, such as reducing the amount of television viewing in the evening, may have a wide range of health benefits.

It will also be of interest for future research to investigate the causal mechanisms that may underlie the association between television viewing and sleep problems. A variety of factors, including heightened alertness, physiological arousal, the frightening or traumatic content of some television programs, bright television light, and physical inactivity associated with extensive television viewing may all contribute to difficulty falling or staying asleep.\textsuperscript{1,7,11} Although our findings suggest that the association between television viewing and sleep difficulties during adolescence and early adulthood may be predominantly unidirectional, it will be interesting to see if future research supports this conclusion. In addition, this association may tend to become bidirectional during adulthood.

The limitations of the present study require consideration. Because data were unavailable regarding the television programs that the youth watched, it was impossible to investigate associations between television programs viewed and sleep problems during adolescence. Similarly, because data were unavailable regarding when the youth watched television, it was impossible to investigate the hypothesis that late evening television viewing may be particularly likely to promote the development of sleep problems during adolescence.\textsuperscript{1} Future studies will need to investigate the specific patterns of television viewing that are most strongly associated with the development of sleep problems during adolescence. The offspring in this study were adolescents in the 1980s, and it is possible that the association between television viewing and sleep problems has evolved during the interim. However, recent studies have indicated that most youth continue to watch an average of 2 to 3 hours of television per day,\textsuperscript{1,6,60} and there has been no evidence suggesting that the magnitude of the cross-sectional association between television viewing and sleep problems has changed.\textsuperscript{1,6} Recent studies have also provided evidence suggesting that biological mechanisms and cognitive and perceptual factors associated with psychological and physiological arousal may underlie the association between television viewing and the onset of sleep problems.\textsuperscript{7,9} It will be of interest for future studies to investigate, more extensively, the longitudinal association between television viewing and sleep problems among adolescents and adults in the community.

**What This Study Adds**

Previous research has suggested that extensive television viewing may be associated with a variety of sleep problems during childhood and adolescence. However, the direction of this association has not yet been determined. The findings of our study suggest that extensive television viewing during adolescence may contribute to the development of sleep problems by early adulthood. These findings also indicate that adolescents who reduce their television viewing to less than 1 hour per day may be able to reduce the likelihood that they will experience subsequent sleep problems.

**REFERENCES**


