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Internet addiction, media use, and difficulties associated with sleeping in adolescents

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Abstract

The objective of this review article is to summarize the current literature regarding Internet addiction; media use, and sleep disruption in adolescents. Design: Systematic review of current literature. Methods: The data was obtained through literature review of articles published in the last 10 years. Conclusion: Internet addiction and media use have the power to have great influence over the sleep of children and adolescents and it is important to take advantage of the positive effects of media while minimizing the potentially negative, but severe, consequence of sleep disruption.

Keywords: Internet addiction, media, mobile phone, cellular phone, computer, television, sleep, insomnia

Introduction

Media use including the Internet, cellular phones, and smart phones is becoming increasingly common. According the American Academy of Pediatrics, today’s children are spending an average of seven hours a day on entertainment media (1). Worldwide, as of June 30, 2012 there were 2,405,518,376 Internet users (2). Asia is the largest Internet user in the world (44.8% of total world use), with Europe coming in second (21.5%) and North America coming in third (11.4%) (2). Social media is also increasingly popular. As of September 30, 2012 there was estimated to be 937,407,180 Facebook users (3). Other types of electronic device use, including cell phone use, are also considerably high. A Pew Research Report from 2012 found that 88% of US adults own a cell phone of some kind as of April 2012 and of these cell phone owners, more than half (55%) use their cell phone to go online (4). In Japan, the number as of cell phone users is similarly high. In 2009, 74.8% of the general population and 84.0% of...
the adolescent population (ages 13-19) own a cell phone (5).

Internet addiction is a growing and newly recognized concern along with the ever-increasing consumption of electronic media. Internet addiction is based on the DSM-IV definition for substance dependence and pathological gambling (6). It is "problematic Internet use, wherein an individual’s inability to control his or her use of the Internet causes marked distress and/or functional impairment" (6). Internet addicts have been found to lose sleep due to late-night logging, feel life would be boring without the Internet, and delay other work to spend time online (7). People with Internet addiction tend to spend many hours online avoiding interpersonal relationships with real and known people (8). Internet addicts may have comorbid psychiatric disorders such as higher levels of depression and suicidal ideation as well as dysthymia, ADHD, OCD, social phobia, and schizophrenia (9,10).

There is a growing body of evidence supporting the relationship of Internet addiction, media use, and sleep disturbance. With the number of Internet, electronic media, and cell phone users growing daily the scientific community is gaining awareness of the potential problems media use may cause in relation to sleep. Several studies have shown that the use of electronic media is associated with sleep disorders (5). It is known that media use affects children’s dreams, sleep-wake transitions, and can cause overall sleep disturbances (11,12). This has the potential to greatly affect children and adolescents as they are also commonly users of electronic media but are also growing and developing and tend to have increased sleep requirements.

Children’s bedrooms are now connected to “global networks” through the use of cell phones and Internet (13). Sleep is vitally important to the growth, behavior, emotional development, and cognitive functioning of children and adolescents (14). Children may develop behavior problems due to sleep deficiencies which may interfere with learning (15). Changes in sleep quality or duration may also have a significant impact on hormone release, cardiovascular activity and glucose regulation and may have an overall impact on morbidity (16). Therefore, due to the ever-expanding use of electronic media, and the vital importance of sleep, it is important to examine the relationship between the two for the health of our children, adolescents, and society.

**Methods**

Literature search was conducted using PubMed and included terms such as “Internet”, “Internet addiction”, “media”, “sleep”, “sleep difficulty”, “sleep disturbance”, and “insomnia.” Of the articles found, the references were reviewed which revealed further relevant literature.

Through the synopsis of articles below, this review investigates the role of media use (including Internet addiction, Internet use, mobile phones, and computers) on sleep, particularly as a cause of sleep disturbances. It specifically focuses on media use and the subsequent sleep disturbance in children and adolescents.

**Discussion**

Internet addicts face difficulties with sleep disturbance as well as excessive daytime sleepiness according to multiple studies. Internet addicts often stay up late into the night using the Internet. In a questionnaire study of 4,318 incoming university students at a university in Taiwan Internet addiction was found to be a significant predictor of poor sleep (p=0.002) (16). Another questionnaire study of 2,336 high school students in South Korea found that the prevalence of insomnia, witnessed snoring, apnea, teeth grinding, and nightmares was highest in Internet addicts. In addition, Internet-addicted students had 2.2-fold more excessive daytime sleepiness than non-addicted students (17). A study of 719 Chinese adolescents in Hong Kong who participated in a school-based cross-sectional study revealed that 17.2% qualified as having Internet addiction and 51.7% of those students were also identified as insomniacs. After Internet use time and gender were adjusted for, Internet addiction (p=0.001) and insomnia (p<0.001) demonstrated a significant association with depression (18).

It appears that circadian rhythm sleep disorder, delayed sleep phase type is reinforced by the time spent on the Internet during the night. These
individuals have a recurrent pattern of sleep disruption which leads to excessive sleepiness and insomnia. This is thought to be due to a mismatch between the sleep-wake schedule which is required by the environment and the ongoing sleep-wake pattern (19). This type of sleep disturbance may cause significant distress and impairment in social and occupational functioning (19). A study of 448 adult online gamers who were mainly young university graduates showed high rates of Internet addiction (44.2% for Goldbert Internet Addiction Disorder Scale and 32.66% for the quantitative Orman Internet Stress Scale). The gamers also self-reported significantly higher rates (3 times more) of daytime sleepiness, sleep deprivation due to play, irritability, low mood and emotional changes since online gaming onset (20). Thus, in accordance with the circadian rhythm sleep disorder, the disturbance is causing significant distress and impairment in functioning.

Computer games and television, in addition to online gaming, may cause sleep impairment. In a study of seven healthy males (average age 24.7 +/- 5.6 years) played computer games (specifically shooting games) and were then evaluated in a sleep laboratory were found to have significantly shorter REM sleep after playing the games than after the control conditions. They were also found to have significantly longer sleep latency and higher heart rate after playing the games (21).

The content of electronic media has also been shown to appear in the dreams of children. A study which consisted of 2,546 children in a random sample of 15 secondary schools in Flanders, Belgium who completed a questionnaire about their television viewing habits, computer game playing, and pleasant dreams and nightmares found that media content frequently showed up in dreams. For 33% of the children, TV content showed up frequently in nightmares. Computer games were associated with nightmares in 5% of girls and 10% of boys. Influences were not always negative however. In 60% of 13 year olds and 50% of 16 year olds reported having pleasant dreams related to television (12).

Television exposure has been shown to be associated with sleep disturbances in 5 to 6 year old children. A randomized population-based survey was administered to 521 parents of children ages 5-6 years. The survey evaluated TV viewing, sleep disturbances and psychiatric symptoms. It was found that active television viewing and passive television exposure were related to sleeping difficulties. Specifically, passive television exposure (p<0.01) and viewing adult-targeted television programs (p=0.01) were strongly related to sleep disturbance (11).

Media use after lights out, especially cell phone use is increasingly common and may be related to being involved in bullying and being a bully victim. A study of 1656 school children in Flanders, Belgium (average age of 13.7 years in youngest group and 16.9 years in oldest group) completed questions on the use of the mobile phone for receiving and transmitting text messages or calls via questionnaire. Only 38% of the subjects never used their mobile phone after lights out. Those who used it more than once a week after lights out were 5.1 times more likely to feel very tired (95% CI 2.5-10.4). The study concluded that mobile phone use after lights out is very prevalent among adolescents and is related to increased levels of tiredness (13). Another study which examined data from the cross-sectional survey of psychopathologies conducted for 19,436 Japanese students found that bullying status was significantly associated with irregular bedtime (OR = 1.23 and 1.41 for pure bullies and bully-victims, respectively). This study concluded that school-based interventions for sleep pattern and cellular phone usage may reduce bullying (22).

The presence of a television, computer, or cell phone in a child’s or adolescent’s bedroom also impacts sleep behaviors. In a cross-sectional survey of 40 students in 8th and 9th grade (mean age 14 +/- 0.8) in Israel who completed the modified School Sleep Habits Survey and the modified Electronic Media and Fatigue Questionnaire, the presence of electronic media inside the bedroom was associated with later bedtime, increased exposure (p=0.004), increased sleep latency (p=0.001), and decreased sleep duration.

This article concluded that electronic media exposure during unstructured and unmonitored leisure time contributes to altered sleep patterns (23). Another study of 19,299 elementary-school children in China who completed a parent-administered questionnaire found that media presence in the bedroom and media use were positively correlated with later bedtimes and awakening times. They also found a shorter duration of sleep during weekdays and weekends (14). This study shared the conclusion of
the previous study that media in a child’s bedroom has a negative effect on children's sleep patterns (14).

The effect of media exposure may not only temporarily impair sleep patterns but the effects may be cumulative. A prospective cohort study with self-reports and a follow up questionnaire after one year which evaluated adolescents in Flanders, Belgium and consisted of 1,656 school children found that even moderate use (use about once a week) of the mobile phone after lights out doubles the risk of long term tiredness (P<0.0001) (13). In another study, already discussed, which examined computer game playing and Internet use in addition to television viewing and time to bed and time out of bed found that media use lead to a delayed time in bed but did not seem to lead to a compensatory behavior of sleeping later on the weekends. Therefore, the study hypothesized in the concluding remarks that the effects of lack of sleep may be cumulative (24). These sleep problems may lead to daytime sleepiness, behavior problems, and even accidents (24).

Limitations of these studies exist. Many studies have been completed in Belgium, South Korea, and China. More studies need to be done in other parts of the world. Also, many studies obtain data by using questionnaires (retrospective subjective reports). More information may be gleaned from prospective diaries and the use of more objective measures such as actigraphy or more studies using polysomnography (23). Future directions of investigation may focus on content of electronic media, daytime cognitive functioning, academic achievement, and reasons for screen use (23).

A growing body of evidence demonstrates the negative effect that media may play on the sleep, and consequently the lives, of children and adolescents. Along with evaluating the problem comes finding solutions. In 2009 the journal Ergonomics published principles for the wise use of computers by children which includes ensuring personal safety and privacy, encouraging appropriate social development, and facilitating appropriate physical development (25).

The American Academy of Pediatrics recommends limiting screen time and offering educational media and non-electronic formats including books, newspapers and board games. Parents should watch television with their children. There should also be “screen-free” zones at home by making sure there are no televisions, computers, or video games in children's bedrooms. Children and teenagers should have no more than one or two hours a day of media exposure. It is important for kids to spend time on outdoor play, hobbies, reading, and using their imaginations in free play. No television is recommended until the age of 2 years. A child’s brain is rapidly developing during the first few years.

Young children learn by interacting with people, not screens (1). Following these guidelines will enable children and adolescents to continue to take advantage of the positive effects of media while minimizing the potentially negative, but severe, consequence of sleep disruption.

References

Internet and sleeping


