

# **Electronic Media Use and Sleep Quality**

**Rebekah M. Lavender**

University of North Carolina at Charlotte

## **Abstract**

This study investigates the relationship between electronic media use and sleep quality. An online survey was administered to 60 participants, from a largely college based sample with a mean age of 27 years old. They were asked questions pertaining to their sleep quality and quantity. The questionnaire also inquired about electronic media use habits including frequency, duration and time of occurrence. The goal of the study was to investigate whether the increase in electronic media use is negatively correlated with sleep quality. Correlation tests were run on the multiple variables and the results showed a negative correlation between electronic activity and sleep quality, which is measured by daytime sleepiness and difficulties awakening in the mornings. Greater electronic use, predicted decreased sleep quality, although the associations was weakened when number of course credits were entered in the model. The findings in this study are important in determining future sleep habits in adulthood as well as guiding additional research to determine why these effects are occurring and preventative measures that can be taken to decrease the negative effects of media on sleep.

## **Key Words:**

electronic media, sleep-onset latency, sleep quality

Sleep is a vital part of a healthy lifestyle, but with technological advances, there are a number of growing factors that can inhibit this vital function, causing poor sleep quality. Deficits in sleep quality and duration have been linked to impairments in working memory and concentration (Cain & Gradisar, 2010) as well as problems with memory consolidation, decision making, critical thinking and learning (Gilbert & Weaver, 2010). Schredl, Hellriegel, and Rehm (2008) reported that TV viewing was the most often reported activity during the week. As the amount of time spent on electronics continue to increase, so do the effects that it has on our bodies. There have been numerous studies on the factors that can lead to sleep problems, with a growing concentration on the relationship between sleep and electronic media usage in children and adolescents. The goal of the present study is to investigate the relationship between habitual electronic media use, sleep quality, and sleep-onset latency in college students.

## **Television Prevalence**

It has become the norm in American society to have a television (TV) present in multiple rooms of the house, including the bedroom. With such high reports of in-bedroom electronic media devices, it is expected that as the usage of the devices increase, so do the ramifications of frequent usage. The National Sleep Foundation's 2006 Sleep in America Poll found that 97% of adolescents had at least one electronic media device in their bedroom (National Sleep Foundation, 2006). Chahal, Fung, Kuhle and Veugelers (2012) interviewed 2,298 5th grade children and their parents, and found that 64% of parents reported that their child had access to at least one electronic entertainment and communication device (EECD) in their bedroom. An EECD can include TV's, computers, tablets, cell-phones, and mp3 music players. Garrison, Liekweg, and Christakis (2011) found that children who had a bedroom TV predictably watched more media and had more sleep problems than children without a TV in the

bedroom. Access to a bedroom TV has also been shown to predict later bedtime (Custers & Bulck, 2011). Children who report having sleep problems have reported different TV viewing habits than the children who sleep well, and most of the children were from families where the TV is left on for longer periods of time (Paavonen, Pennonen, Roine, Valkonen, & Lahikainen, 2006). With EECDs showing a negative relationship with sleep quality, it is important to understand some of the possible causes.

### **Light at night and Sleep Disturbances**

Sleep onset-latency (SOL) is the amount of time it takes one to fall asleep after lying down. Multiple studies have demonstrated a relationship between the amount of electronic media usage and the timing of SOL. One of the causes of delayed SOL is nighttime use of EECDs. The EECD emits blue light, which has a direct impact on human sleep as it affects the secretion of melatonin, and decreases cognitive performance and alertness (Chellappa et al., 2013). The blue light emitted by EECDs is commonly referred to as light at night (LAN). Evening light containing blue light disrupts the body's circadian rhythm, or internal clock (Chellappa et al., 2013). This interference disturbs humans sleep wake cycle as well as sleep quality. In addition, a study by Cho, Joo, and Hong (2013) found that sleeping with the light on caused shallow sleep and arousals during sleep. With the research showing why there are harmful effects from the use of blue light and artificial light, it is better understood why electronic media use can cause the disturbances which have been reported.

### **Specific Contributions of TV to SOL**

A common source of this artificial light can be attributed to TVs, which are frequently used in the evening. A survey by Garrison et al., (2011) found that with each additional hour of evening media use, there was a significant increase with sleep problems, with the most frequent being delayed SOL. In children age 15 and younger, the average sleep time is 10 hours, and 7 ½ hours for adolescents 16 and older

(Garmy, Nyberg, & Jakobsson, 2012). A study on elementary aged children found that on average the children consumed 72.9 minutes of media time daily. The results showed that 14.1 of those minutes were spent after 7 pm (Garrison, Liekweg, & Christakis, 2011). Children who consume this amount of TV, especially late at night, have been found to be significantly more tired in school, and more difficulties falling and staying asleep, especially when a bedroom TV was present (Garmy, Nyberg & Jakobsson, 2012). Shochat, Flin-Bretler, and Tzischinsky (2010) interviewed 478 8th and 9th graders on their sleep habits and electronic media usage and found that those who had a TV in their bedroom went to bed later and had longer sleep latency than those without.

Delayed SOL and sleep disturbances have a direct effect on children and adolescents daytime routines, particularly at school. Garmy et al., (2012) conducted a study focusing on sleep duration in relation to TV and computer habits and the effects it had on school enjoyment. The study questioned 4,692 primary aged children about their sleep hygiene and their enjoyment of school and found that 1 out of 5 children aged 10, and 2 out of 5 of adolescents, reported that they were frequently tired at school (Garmy et al., 2011). Out of 9,718 junior high school students that were interviewed, 72.1% reported having difficulty in falling asleep. Those students who reported delayed SOL were also associated with a higher risk for sleepiness, waking up at night, poor overall sleep and a poor morning feeling (Alexandru et al., 2006). Brown, Buboltz, and Soper (2002) surveyed college students and found that twice as many students as people in the general population reported SOL, but the cause of the higher prevalence in students is not clear. The high reports of delayed SOL specifically in the college population require additional research to determine possible causes. The increasing prevalence of TV media usage and late night TV exposure creates an effect on the quality of sleep these young adults experience. These effects shown in childhood increase in college students, contributing to the reported delay in SOL and other sleep disturbances.

### **TV Viewing, Sleep, and Future Sleep Health**

Childhood sleep patterns may predict the future sleep habits of emerging adults, which make up the vast majority of the college population. Johnson, Cohen, Kasen, First, and Brook (2004) sampled 759 mothers from New York and their children who were either in middle school, high school, or early adulthood. They found that adolescents who watched 3 or more hours of television a day had a higher risk for sleep problems in early adulthood. It was also reported that adolescents who reduced TV viewing for one hour had significant reduction of later risk (Johnson et al., 2004). Another study by Custers and Bulck (2011) held face-to-face interviews with 711 undergraduate students aged 18 and older and questioned them on media access, internet usage, viewing and frequency and volume. They found that access to internet in the bedroom predicted a later bedtime. Early childhood habits of excessive and late evening TV viewings can potentially shape sleep habits in emerging adults.

### **The Present Study**

While a lot of research has focused on children, the sleep of college students in relation to EECD is less studied. College students are very active media users. The average person spends over 30 hours a month on the computer (Student use and skill with information technology, 2006). With late night hours and an excessive work load it is presumable that college students surpass that amount and that they also are using their computers late at night. College students may use more forms of electronic media due to coursework demands, entertainment and communication (Colley & Maltby, 2008). Moreno et al., (2012) found that out of 189 college-aged participants (mean age of 18.9 years old), the average time of daily Internet use was 56 minutes. As college students are transitioning to adulthood and establishing EECD and sleep habits that may persist well into adulthood, it is critical to investigate the consequences of these behavior patterns. The author hypothesized that greater electronic media usage would predict worse sleep quality among college students and young adults.

### **Method**

#### ***Participants***

The participants were recruited online as a means to meet course requirements, earn extra credit in a class, or through social media advertising. The survey was online and offered through the SONA website during the summer session at UNC Charlotte. There were a total of 60 participants who completed the survey on sleep quality and electronic media use (20 males and 40 females). The mean age of the participants was 27.25 years old, ranging from 18 years old to 57 years old with a standard deviation of 9.72. Of those 60 participants, 8.3% identified as Asian, 20% African American, 10% Hispanic, 56.7% Caucasian and 5% identified as other.

#### ***Measures***

##### **Sleep Quality**

Sleep duration and sleep/wake quality, which included daytime sleepiness and difficulty awakening, of the participants were measured using The Sleep Questionnaire (see Appendix A). This questionnaire was broken into two parts to assess different aspects of sleep to be tested. The first section queried how satisfied participants were with their sleep. The 3 questions used assessed the responses on a scale of 1=very dissatisfied to 5=very satisfied. The scores ranged from 5-15, with questions asking how well rested the participants felt, how they rated their sleep quantity and how they rated their sleep quality.

The Sleep Questionnaire (see Appendix A), also assessed sleep and wake properties and instances of SOL, such as how often participants experienced tiredness throughout the day, restless sleep and difficulty falling asleep or waking in the morning. The 5 questions that were assessed in this portion were on a scale from 1=never to 5=always to determine the frequency of sleep related disturbances.

##### **Electronic Use**

To measure electronic use, participants were given two measures, the Educase Center for Analysis and Research (ECAR) student technological survey (see Appendix B) and the Media Consumption Measure (see Appendix C). The ECAR survey asked participants 4 questions on a scale from 1=Never to 5=Always, on how often they partook in the following activities; using a cell phone or computer less than 2 hours before bed, falling asleep with the TV on, playing video games at night, watching a movie on the TV or computer and watching the nightly news. This allowed the researcher to examine which EECDS were being used in order to investigate specific sources of sleep disturbances. The second measure was to test the activity of electronic media use using the Media Consumption Measure. Five items questioned how many hours a day they used a computer to download music, surf the internet, online shop, play computer games, and use social media on a scale of 1=1-2 hours to 5=6+ hours with scores ranging from 9-22. This measure was used to assess the reasons for electronic media use and the prevalence of late night use.

### Design

This is a correlation design studying the effects of the dependent and independent variables, which are electronic media use and sleep quality respectively. A bivariate correlation was run on electronic activity and sleep/wake disturbances, as well as a partial correlation which controlled for credit hours. Several bivariate correlations were run to test sleep/wake quality with specific forms of EECDS such as TV, cell phone and computers. The responses from the questionnaires were evaluated to see if there is a relationship between those who report high media use and their sleep quality in comparison to those who report low electronic media use.

### Procedure

Participants will fill out an online survey accessed through either the UNC Charlotte SONA system or through outside sources providing the link to the survey such as a social media website.

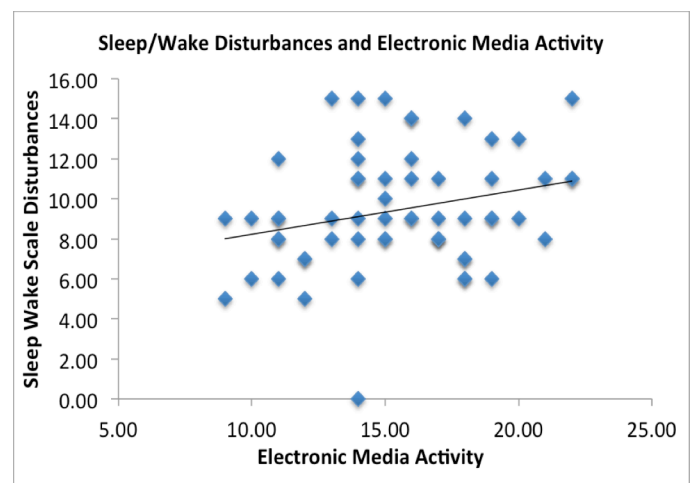
The questionnaire consisted of 20 questions including basic demographic information, The Sleep Questionnaire, The ECAR survey and finishing with the Media Consumption Measure survey.

### Results

This study was conducted to examine whether higher electronic media use predicts declines in sleep quality. The two main variables that were tested were sleep quality and electronic media activity. In order to better understand the effects of specific electronic media on sleep, correlation tests were run to determine the relationship between sleep/wake quality and the use of TVs, computers, cell phones and video games.

The participants were asked questions relating to their sleep and wake quality ( $M= 9.4$ ,  $SD=3$ ) and their electronic activity ( $M=15.45$ ,  $SD=3.4$ ) A correlation test was run to determine the relationship of the two variables (see Figure 1.) and found a positive correlation,  $r(60) = 0.25$ ,  $p <.05$ . This suggests that the more electronic activity use that individuals reported, the more problems they experienced with their sleep/wake quality. However, the correlation could be impacted by the number of credit hours the student was enrolled in since the more

Figure 1



This graph depicts the relationship between the amount of electronic media activity and self-reported sleep/wake disturbances.

classes they were taking, the more time they would spend on the computer.

To test the role of credit hours in the relation between electronic use and sleep/wake quality, a partial correlation was run on sleep quality and electronic use while controlling for credit hours that college students were reporting. Results revealed that when accounting for credit hours there was no significant relation between sleep and electronic use, suggesting that when credit hours are considered, the relationship weakens.

In order to examine specific forms of electronic media, the participants were asked whether or not they fell asleep with the TV on at night ( $M=2.15, SD=1.54$ ) in relation to their sleep/wake quality. The correlation between the two responses was significantly positively correlated,  $r(59) = 0.401, p < .01$ , indicating that the more the participants were falling asleep with their TV on, the more sleep/wake difficulties they had.

To determine which other kinds of EECDS were interfering with sleep quality, participants were asked how frequently they used a computer less than 2 hours before bed ( $M=3.10, SD=1.18$ ; 1=never, 5=always). The responses were correlated with self-reported sleep quality ( $M=9.42, SD=3.11$ ). The two results were negatively correlated,  $r(60)=-.25, p<.01$ , suggesting that the individuals who reported frequent computer use before bed had significantly lower sleep quality. Participants were asked how often they used a cell phone during the two hours before bedtime ( $M=3.35, SD=1.3$ ) and their self-reported sleep/wake quality ( $M=9.593, SD=3.104$ ). The results were significantly positively correlated,  $r(59) = 0.39, p < .01$ , suggesting that the more participants used their cellphones late at night (less than 2 hours before bedtime) the more sleep/wake disturbances increased.

Finally, late night (less than 2 hours before bed) video game playing ( $M=1.37, SD=0.76$ ) with sleep quality, producing the opposite effect. The relationship showed a negative correlation,  $r(59)=0.25, p<.01$ , suggesting that the more participants reported

late night video game playing, the less sleep/wake problems were encountered.

To test whether electronic use also predicted difficulty awakening in the morning (suggesting insufficiently restful sleep), a correlation was run to examine difficulty waking in the mornings ( $M=3.29, SD=1.25$ ) and electronic media activity ( $M=15.45, SD=3.40$ ). The results showed a significant positive correlation,  $r(59) = .38, p<.01$ , suggesting that electronic media use also predicts difficulties waking in the mornings.

## Discussion

It was predicted that the increase of electronic media use would lead to an increase in sleep difficulties and decrease in sleep quality. After examining multiple variables pertaining to patterns of sleep quality such as tiredness, restless sleeping, difficulties awakening and sleep quality, in relation to electronic media use, several significant associations were indicated. These correlations suggest that electronic media use does have a relationship to sleep quality. However, this association was weakened when number of current course credits was added to the model. This could be because sleep quality is effected by the heavy course load a student may be taking rather than their media use alone. If they are enrolled in a full semester of more than 12+ credit hours, then the students' use of EECDS can vary as a result. They may have less time to use electronic media because of school work or they could be on it more as a means to complete coursework. The stress of having a busy and difficult schedule is also likely to make negative impacts on their sleep.

The most supportive finding was shown with a positive correlation between electronic activity and seep/wake disturbances, meaning the more a participant reported use of electronic activity, the more they reported unsatisfying sleep. Electronic media activity also predicted increased problems with waking in the mornings.

Another goal of the project was to consider which kinds of electronic media associated with reduced sleep quality. The results showed a significant positive correlation

between using a TV less than 2 hours before bed and sleep/wake disturbances. This is an important finding considering that the average daily TV media time for adolescence is 72.9 minutes (Garrison et al., 2012) and that adolescent TV viewing predicts a higher risk of sleep problems in adulthood (Johnson et al., 2004). The present results are from a primarily college based sample in comparison to the previous studies on adolescents. This indicates that late night computer use and reported sleep/wake disturbances are increasing with college students. Similarly, sleep quality correlated with computer use. Computers are used an average of 56 minutes daily by adolescents (Moreno et al., 2012)

A caveat to these findings was in regards to late night video game playing which showed a negative correlation with sleep/wake quality meaning that when participants reported frequent late night video game use, their sleep/wake difficulties lessened.

It is important to acknowledge that most participants were college students with a mean age of 27 and an average of 6 credit hours during summer semester. The results cannot be generalized beyond this population. If the study was done during the regular academic year the sample would have been larger and stronger correlations may have been present. The relationships shown between electronic use and sleep/wake quality is prominent in college students who are more frequently on EECds compared to the 64% of elementary aged children who reported having EECds present at night (Chahal et al., 2012).

### **Sleep in a Collegiate Environment**

College students that report having higher electronic activity and that have decreased sleep/wake activities could experience impairments in working memory, critical thinking and decision making skills (Cain et al., 2010) which are all vital to academic success. A greater predisposition to sleep problems in later adulthood could also be a result of high electronic use in emerging adulthood.

Limitations of the study include difficulty recruiting participants. Data were collected during a shortened semester and the available participant pool was smaller than normal. With a larger sample there may be more concrete data and stronger correlations. There are many confounds when dealing with college students and electronic media. College student use a wide array of devices ranging from tablets to music players to Kindles that may or may not influence sleep quality. There are also confounding variables such as staying up late, active social life, working late hours, substance abuse and any medical conditions that could inhibit sleep quality. These are just a few of the many factors among college students that contribute to a decline in sleep quality and quantity other than electronics. In addition, electronic activity should be studied while controlling for variables such as substance abuse, social obligations and work responsibilities.

The role of habitual electronic media user on health is likely under reported. The college population are increasingly depending on electronic devices as technological changes have made many assignments and exams available online. A better understanding of the effects of electronic media use on college users sleep could identify possible strategies to improve sleep quality and lessen the negative effects of electronic media usage into adulthood. There are few studies as to why electronics inhibit sleep quality, and whether those mechanisms can be manipulated to improve sleep quality. More research should be held to test theories of the role of electronic media use on sleep, such as LAN, which is known to disrupt the body's circadian rhythm (Chellappa et al., 2013). If measures were taken to reduce the harmful effects of LAN, it is possible that the effects on sleep quality could be reduced.

If aspects of sleep quality such as restless sleep, difficulty awakening, and tiredness throughout the day could be improved with intervention to electronic media use, then the topic requires more extensive research. Sleep is a predictor of physical and cognitive health. With growing reports of electronic usage in both the recreational and academic tasks, the importance

of understanding the effects of electronics on sleep will increase. Further research could explain some of the reasons behind the associations found in this study as well as potential methods to reverse the negative relationships and improve overall health and quality of life in an otherwise stressful college environment.

### Acknowledgments

This study was conducted for the purpose of Dr. Leven's research methodology course at UNC Charlotte. Correspondence concerning this article should be addressed to the UNC Charlotte Psychology Department

### References

- American Academy of Pediatrics Committee of Public Education. (2001). Media violence. *Pediatrics, 108*, 1222-1226.
- Alexandru, G., Michikazu, S., Shimako, H., Xiaoli, C., Hitomi, K., Takashi, Y., & Sadanobu, K. (2006). Epidemiological aspects of self-reported sleep onset latency in Japanese junior high school children. *Journal of Sleep Research, 15*(3), 266-275.
- Brown, F. C. P. D., Buboltz, W. C. J. P. D., & Soper, B. P. D. (2002). Relationship of sleep hygiene awareness, sleep hygiene practices, and sleep quality in university students. *Behavioral Medicine, 28*(1), 33-38.
- Cain, N., & Gradisar, M. (2010). Electronic media use and sleep in school-aged children and adolescents: A review. *Sleep Medicine, 11*(8), 735-742.
- Chahal, H., Fung, C., Kuhle, S., & Veugelers, P. J. (2013). Availability and night-time use of electronic entertainment and communication devices are associated with short sleep duration and obesity among Canadian children. *Pediatric Obesity, 8*(1), 42-51.
- Chellappa, S. L., Steiner, R., Oelhafen, P., Lang, D., Götz, T., Krebs, J., & Cajochen, C. (2013). Acute exposure to evening blue-enriched light impacts on human sleep. *Journal of Sleep Research, 22*(5), 573-580.
- Cho, J. R., Joo, E. Y., Koo, D. L., & Hong, S. B. (2013). Let there be no light: The effect of bedside light on sleep quality and background electroencephalographic rhythms. *Sleep Medicine, 14*(12), 1422-1425.
- Colley, A. & Maltby, J. (2008). Impact of the internet on our lives: Male and female personal perspectives. *Computers in Human Behavior, 24*(5), 2005-2013.
- Custers, K., & Van, . B. J. (2012). Television viewing, internet use, and self-reported bedtime and rise time in adults: Implications for sleep hygiene recommendations from an exploratory cross-sectional study. *Behavioral Sleep Medicine, 10*(2), 96-105.
- ECAR Study of Undergraduate Students and Information Technology, 2013 | [EDUCAUSE.edu](http://www.educause.edu). (2013). Retrieved from <http://www.educause.edu/library/resources/ecar-study-undergraduate-students-and-information-technology-2013>
- Garmy, P., Nyberg, P., & Jakobsson, U. (2012). Sleep and television and computer habits of Swedish school-age children. *The Journal of School Nursing : The Official Publication of the National Association of School Nurses, 28*(6), 469-476.
- Garrison, M. M., Liekweg, K., & Christakis, D. A. (2011). Media use and child sleep: The impact of content, timing, and environment. *Pediatrics, 128*(1), 29-35.
- Gilbert, S., & Weaver, C. (2010). Sleep quality and academic performance in university students: A wake-up call for college psychologists. *Journal of College Student Psychotherapy, 24*(4), 295-306.
- Johnson, J. G., Cohen, P., Kasen, S., First, M. B., & Brook, J. S. (2004). Association between television viewing and sleep problems during adolescence and early adulthood. *Archives of Pediatrics & Adolescent Medicine, 158*(6), 562-568.
- Kim, H. J., Kim, J. H., Park, K.-D., & Lee, H. W. (2011). Sleep Questionnaire Retrieved from PsychTESTS. Doi: 10.1037/t24063-000
- Moreno, M. A., Jelenchick, L., Koff, R., Eikoff, J., Diermyer, C., & Christakis, D. A. (2012). Internet use and multitasking among older

- adolescents: An experience sampling approach. *Computers in Human Behavior*, 28(4), 1097-1102.
- National Sleep Foundation - *Sleep Research & Education*. (2006). Retrieved from <http://sleepfoundation.org/>
- Paavonen, E. J., Pennonen, M., Valkonen, S., & Lahikainen, A. R. (2006). TV exposure associated with sleep disturbances in 5- to 6-year-old children. *Journal of Sleep Research*, 15(2), 154-161.
- Pasek, J., Kenski, K., Romer, D., & Jamieson, K. H. (2006). Media Consumption. Retrieved from PsychTESTS. Doi: 10. 1037/t31505-000
- Schredl, M., Anders, A., Hellriegel, S., & Rehm, A. (2008). TV viewing, computer game playing and nightmares in school children. *Dreaming*, 18(2), 69-76.
- Shochat, T., Flint-Bretler, O., & Tzischinsky, O. (2010). Sleep patterns, electronic media exposure and daytime sleep-related behaviours among Israeli adolescents. *Acta Paediatrica (oslo, Norway : 1992)*, 99(9), 1396-1400.
- Student ownership of, use of, and skill with information technology (2006). Retrieved July 6, 2014. from <http://net.educause.edu/ir/library/pdf/ERS0607/ERS06074.pdf>