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## Screen Time and the Effects on Attention Deficit Hyperactivity Disorder

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Screen Time and the Effects on Attention Deficit Hyperactivity Disorder

Submitted in Partial Fulfillment of the Requirements for the Degree of Doctor of Nursing  
Practice at the University of Kentucky

By

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Lexington, KY

2020

## **Abstract**

**PURPOSE:** The purpose of this project is to determine if an educational intervention with families decreased overall screen time use in school-aged children with attention-deficit/hyperactivity disorder (ADHD).

**METHODS:** This study was a single group pre-test, post-test interventional study design. The sample population consisted of the parents/guardians of 30 school-aged children diagnosed with ADHD (5-12 years) recruited from the University of Kentucky Developmental and Behavioral Pediatrics Clinic between November 2019 and February 2020. Parents completed a survey about their child's daily screen time exposure (tablets/cell phones, laptops/computers, video games, and television) and were educated how screen time can exacerbate ADHD symptoms, such as impulsivity and inattention. Families received a follow-up phone call one month later to complete the post survey. The Wilcoxon signed rank sum test in SPSS, version 25, was utilized to determine the efficacy of the educational intervention on reducing screen time habits, with an alpha level of .05.

**RESULTS:** Twenty-two of the 30 families recruited for the pre-interventional survey completed the post-interventional survey. There was a significant decrease in television use ( $p < .001$ ), but not in the other categories mentioned. Descriptive statistics, including frequencies, means, and standard deviations, were used to analyze the demographics of the surveyed population.

**CONCLUSION:** There was a significant decrease in parent-reported television exposure in school-aged children with ADHD after parents received an educational intervention discussing the negative effects screen time can have on ADHD symptoms. Providing parents with

education on how they can manage their children's behavioral disorders with non-pharmacological interventions can help empower families and improve ADHD symptoms. Sharing this information with pediatric providers could encourage them to emphasize to families the importance of non-pharmacological interventions in the management of ADHD and improve overall patient outcomes.

## **Acknowledgements**

I would like to offer a heartfelt thanks to my faculty advisor, Dr. Dianna Inman, who has mentored me tirelessly throughout this entire process. This final defense would not have been possible without you, as you were always eager to lend a hand and offer any assistance I needed inside and outside of the clinic. I would also like to express my gratitude to my other committee members, Dr. Leslie Scott and Dr. Morgan Chojnacki, for investing their time with my project and offering wisdom when needed. I can't thank any of you enough for sharing your knowledge with me, and one day, I hope to be as wonderful of a clinician and educator as all of you are.

I would be remiss to not thank the staff members of the University of Kentucky Developmental and Behavioral Pediatrics clinic for fostering a learning environment that enabled me to pursue my research. I would also like to personally thank the statistician, Dr. Amanda Wiggins, who helped analyze my research and studies. Finally, I would like to give special thanks to the staff of the University of Kentucky College of Nursing for their assistance in fulfilling my dream of obtaining my DNP degree.

## **Dedication**

My DNP project is dedicated to my husband, who has been by my side throughout this entire journey and provided me with constant encouragement and support. I would also like to dedicate this project to my father, as he instilled in me an unwavering desire to further my education and always reach to be the best version of myself. I also dedicate this project to my mother for believing that I can accomplish anything.

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## Introduction

Attention-deficit hyperactive disorder (ADHD) is the most prevalent neurodevelopmental disorder in the pediatric population. In the 2016 National Survey of Children's Health, about 2.4 million school-aged children had been diagnosed with ADHD, 9.6% of the population for this age group (Danielson et al., 2018). Children with ADHD face difficulties in today's educational system. These children can have difficulty focusing on social interactions and classroom activities, but they may be able to hold their attention span with video games and other forms of media, such as television and iPad usage. According to the National Survey of Children's Health, 10% of the 68,634 children included in the survey were identified as having ADHD, and watching TV for over one hour per day correlated with an increased risk for ADHD diagnosis (Lingineni et al., 2012). In another study, 4,816 graduate students used the ADHD self-report scale and discovered a positive correlation between high screen time and increased self-perception of hyperactivity and attention problems (Montagni, Guichard, & Kurth, 2016).

Youth diagnosed with mental illness are particularly vulnerable to internet addiction and overuse because a video game's immediate reward system makes lack of prolonged attention less necessary (Weiss, Baer, Allan, Saran, & Schlibuk, 2011). Video gaming has also been shown to increase striatal dopamine release, which further enhances this higher reward dependency. Weissenberger et al. (2017) reviewed over one hundred research articles to identify several lifestyle factors affecting children with ADHD. They found that in children with ADHD, impulsivity and aggressiveness increased with compulsive internet use. On the reverse side of the matter, Ho et al. (2014) evaluated the relationship between internet addiction and psychiatric comorbidities, such as attention deficit disorder. Their systematic review of eight studies showed that among a total of 1641 patients with internet addiction, attention deficit disorders

were prevalent among 21.7% of the patients, compared to an 8.9% prevalence of ADHD in the control group. It is important that providers and families are aware of the effects screen time can have on the management of ADHD symptoms. Primary care providers need to understand their patients' individual risks when discussing anticipatory guidance with families. The purpose of this project is to determine if an educational intervention with families on the effects of screen time on ADHD symptoms decreased overall screen time use in school-aged children with ADHD.

## Background

Attention-deficit/hyperactivity disorder (ADHD) is defined by a continuous pattern of hyperactivity, impulsivity, and/or inattention that interferes with a person's development or functioning. Evidence shows that increased television exposure throughout childhood is linked to children displaying more ADHD symptoms, such as inattention, hyperactivity, and impulsivity. For example, among a sample of 7024 children between 6-17 years old and diagnosed with ADD/ADHD, those with a TV in their bedroom engaged in 149 minutes/day of screen time on average, which can further exacerbate difficulties with focusing and make them more susceptible to antisocial behaviors, as well (Lo et al., 2015). According to the Japan's Children Study, heavy television exposure at an early age, such as 18 months, is positively correlated with increased acts of hyperactivity and inattention a later age, such as 30 months (Cheng et al., 2010). Additionally, Van Egmond-Frohlich, Weghuber, and De Zwaan, (2012) found a significant positive correlation between above average amount of television exposure and children with increased ADHD symptoms on the Strengths and Difficulties Questionnaire completed by the parents of 9,428 German children between ages six and seventeen years old.

Not only does increased television exposure exacerbate the symptoms of ADHD, but there is a lot of research that shows excessive gaming, whether it be with video game systems or on the internet, can contribute to these same behavior patterns. For example, Park et al. (2017) interviewed 46 male patients with ADHD, ADHD plus internet gaming disorder, and a healthy control group, in order to assess their hyperactivity, impulsivity, and inattention. These participants also completed the Korean ADHD Rating Scale and Young's Internet Addiction Scale, and underwent a quantitative electroencephalogram. Patients with ADHD and internet gaming disorder "showed lower relative delta band power and greater relative beta band power

values in temporal regions” in their QEEG results than the patients only diagnosed with ADHD. This means patients may be misled to use video gaming to self-medicate for their inattention symptoms, as the increased beta band power seen on EEG can also be seen with methylphenidate use. However, this effect does not continue for the patient once the game is turned off. Repetitive activation of the brain’s reward system and working memory during continuous gaming causes an increase in neuronal connectivity within the temporal regions for the patients with ADHD and internet gaming disorder, which leads to problematic internet usage (Park et al., 2017). Wu, Ohinmaa, and Veugelers (2016) determined children who spent 5 hours of more playing computer or video games each day were more likely to be diagnosed with ADHD than children who played computer or video games for less than one hour a day. This information was collected from the Children’s Lifestyle and School Performance Study survey conducted with 4,875 fifth grade students and their parents. In another study, Chan and Rabinowitz (2006) found statistically significant results that adolescents who played video games for more than one hour per day had increased inattentive behavior and higher scores on the Young’s Internet Addiction Scale compared with adolescents who participated in minimal video game use or none at all.

Increased internet usage in general can create psychological and behavioral problems for children diagnosed with attention deficits disorders. One literature review conducted in the United States showed a statistically significant relationship, using the differential susceptibility to media effects model, between increased media usage and ADHD related behaviors, while also suggesting that gender and trait aggression can affect this correlation (Beyens, Valkenburg, & Piotrowski, 2018). Similarly, Aboujaoude (2013) evaluated various studies to evaluate the effect of problematic internet usage on children with ADHD symptoms. One study of 752 South

Korean elementary students found 33% of those with ADHD also met criteria for problematic Internet use. Another study in 216 Taiwanese college students showed 32% subjects with problematic internet use also had ADHD compared to only 8% of regular internet users (Aboujaoude, 2013). Using the Psychological Screening Test for Adolescents and the Internet Use Addiction Profile with 5750 primary and secondary school students in Turkey, Evren et al. (2014) found that increased use of the internet and various forms of social media can cause psychological harm during adolescence, specifically depression and attention-deficit hyperactivity disorder. From a research group of 50 male Israeli teenagers diagnosed with ADHD and 50 without an ADHD diagnosis, an additional study concluded “children with ADHD are more addicted to the internet, spend more time online, and go to sleep later than those without ADHD diagnosis” (Weinstein et al., 2015). The research shows excessive internet use can exacerbate ADHD symptoms, and people with ADHD are more prone to becoming addicted to internet and video gaming. It is important for primary care providers to know that the evidence shows children with ADHD are at an increased risk for other comorbidities, especially with excessive screen time exposure, when developing plans of care for the management of this behavioral disorder.

Risky behavior, such as problematic internet usage, may even be more common in people with ADHD symptoms who are not seeking treatment from a trained medical professional, and it can lead to even more social and health issues for these same patients. For example, Vural, Uncu, and Kilic (2015) determined from a sample of 1,389 secondary school students and their parents with the use of questionnaire forms for student’s internet usage and the Conners’ Parent Rating scale for parent’s perception of child behavior that children with increased ADHD symptoms were more likely to chat with a stranger online or meet up with a person they only

knew from the internet. In addition, Chamberlain et al. (2017) found that adults diagnosed with ADHD who were not being medically treated are more likely to suffer from lower self-esteem, excessive internet use, impulsivity, and increased chance of developing other psychiatric disorders. This research shows that increased media usage in childhood can cause damage to the psychological and behavioral health of these patients later into their adult lives.

From the findings gathered, it is evident that parental education on the risks of increased screen time need to be more frequently addressed when children are diagnosed with ADHD. The evidence shows how increased screen time can lead to more psychiatric disorders in this patient population, such as depression and other addictive disorders. Healthcare providers and medical researchers can use the information in this literature review to develop treatment plans and designs for further studies.

### **Purpose**

The purpose of this project is to determine if an educational intervention with families will decrease overall screen time use in school-aged children with ADHD. The intervention will focus on the risk factors associated with screen time for children with ADHD. This project will help to answer the following question: “Can educating parents on the risks associated with increased screen time improve outcomes for children living with ADHD?”.

### **Methods**

#### **Study Design**

This project is a one group pre-test, post-test interventional study design. The amount of screen time from school-aged children diagnosed with ADHD was analyzed. IRB approval was obtained from the University of Kentucky prior to implementation of the project. Families

agreed to participate in the study and signed informed consent for themselves and their children. The parents completed a survey about the amount of screen time that their children have on a weekly basis, and the different types they consume. Parents were also asked about their own screen time habits, along with demographical information. The survey questions were created by the primary investigator to assess the families' screen time habits (Table 2). Parents were then educated on the effects of screen time on school-aged children with ADHD and how it can further exacerbate symptoms, based on information found from the literature review previously completed. An infographic handout was given to the parents, which included this educational information, as well as tips for minimizing screen time in the home. The parents received a follow-up phone call 4-5 weeks later to complete a post-interventional survey to assess the families' screen time habits again and evaluate if there had been a change in their media consumption.

## **Setting**

The sample was collected from the University of Kentucky Developmental and Behavioral Pediatrics Clinic. The healthcare team at this clinic consists of a group of dedicated experts in developmental-behavioral conditions who have extensive experience in diagnosing and guiding treatment for neurodevelopmental disorders.

## **Sample/Participants**

The target population for this study was school-aged children with a diagnosis of ADHD, between the ages of 5-12 years. The age range for the parents of these children was 18-75 years. The children and their parents were recruited at their regularly scheduled appointments. The primary investigator visited the University of Kentucky Developmental and Behavioral Pediatric

clinic weekly. Dr. Dianna Inman sees ADHD patients specifically every Tuesday, so the primary investigator recruited from this population at this time each week.

The sample included patients who met the following criteria: (1) the primary caretaker/guardian must be present at the appointment, (2) must have active ADHD diagnosis, (3) child is school-aged, meaning they are between 5-12 years of age, and (4) the parent/guardian must be English speaking for educational purposes. Exclusion criteria for this study included: (1) ages 0-4 years and ages 13-18 years, (2) no current ADHD diagnosis, (3) no primary caretaker/guardian present at time of appointment, and (4) parent/guardian is not a primary English speaker.

### **Data Collection**

A survey was used to collect data at the initial visit and during the one-month phone follow-up. After informed consent, the primary investigator read the questionnaire on Qualtrics to the parents to complete the survey. Qualtrics analyzes and aggregates the data without personal identifiers, and it is also a password-protected database that cannot be accessed by anyone outside of the approved staff. Repeat surveys were completed within the same Qualtrics software. The primary investigator contacted the study participant by the given phone number, and the one-month follow up survey was the same as the initial survey. The primary investigator called the participants from the advisor's office located at the University of Kentucky College of Nursing, Room 417. The primary investigator identified herself at the beginning of the call and had the participant identify themselves prior to completing follow up survey over the phone. The entire phone call took place in the advisor's office with the door closed for patient confidentiality, where the primary investigator asked the survey questions and recorded the responses in the Qualtrics software.

## **Data Analysis**

The Wilcoxon signed rank sum test in SPSS, version 25, was utilized to determine the efficacy of screen time education on reducing screen time habits, with an alpha level of .05. Descriptive statistics, including frequencies, means, and standard deviations, were used to analyze the demographics of the surveyed population.

## **Results**

### **Sample Characteristics**

There were 30 parents/guardians initially surveyed about their child's current screen time habits, but only 22 parents responded to the follow-up phone call post-educational intervention. Descriptive statistics, including frequencies, means, and standard deviations, were used to analyze the demographics of the surveyed population. Of the 22 school-aged children with ADHD that were evaluated, the mean age was 9.3 years and 77.3% of the population identified as male. In addition, 54.5% of the surveyed population identified as White, 40.9% identified as Black, and 4.6% identified as Hispanic. The most common average family income was in the \$25,000-49,999 range at 40.9%. With regard to family income, 22.7% of the surveyed population fell below the average family income, and the remaining 36.4% fell above this average (Table 1).

### **Survey Data Analysis**

The survey evaluated the children's habits for multiple categories of screen time, such as number of daily hours for computers/laptops, tablets/cell phones, television, and video games. The survey also asked questions about the number of devices the children had access to, their need for screen time for educational purposes, parental screen time habits, and the number of

activities the children have that do not involve screens. Of the 30 children whose screen time habits were initially assessed, only 22 of their parents completed the follow-up survey. It was noted that there was a significant decrease in television use ( $p < .001$ ), but there were not decreased in any of the other categories mentioned (use of computers/laptops, use of tablets/cell phones, use of video games, number of devices, educational media use, numbers of non-media play activities, and amount parental screen time). The median television exposure decreased from 2.5 hours per day to 1.5 hours per day from the pre-survey to the post-survey (Table 3).

### **Discussion**

The aim of this study was to assess whether parental education on the current recommendations for screen time in the pediatric population, and how screen time affects those with ADHD, would lead to a decrease in the family's screen time habits. As it is nearly impossible to avoid exposure to screen time in today's world, it is important for families to be aware of how this can affect the development of their children and the management of their ADHD symptoms. It is also important for pediatric providers to be aware of how this excessive exposure to media may be affecting their patients' development and overall health.

Current recommendations for the management of attention-deficit hyperactivity disorder include pharmacological intervention and behavioral therapy. Non-pharmacological interventions are as important as pharmacological interventions in treating ADHD symptoms. An increased emphasis on these behavioral measures could increase the family's confidence in their ability to manage their child's disorder. Recruiting the family to be more involved in the care plans of their children could lead to greater compliance with ADHD management. Pediatric healthcare providers can use the information found in this study to improve patient outcomes by utilizing this non-pharmacological approach as adjunct therapy within their plans of care.

## **Limitations**

There were a few limitations identified in this study. First, due to time constraints, the study was conducted over a 3-month time frame. If the duration of the study had been longer, perhaps the results would have been more accurately depicted. Also, the participants were called back after only 4-5 weeks for the post survey to evaluate change, which means we are unaware if these habits were continuing to improve for these children over time.

Also, the initially surveyed population was 30 participants, and even fewer parents/guardians responded to the post survey. The fact the follow up survey was conducted over the phone also caused a few initial participants to be lost, which could skew the information about the effectiveness of this intervention. A small sample size could affect the accuracy of the results for clinical significance.

## **Recommendations for Future Studies**

Recommendations for future studies includes expanding this project to other pediatric clinics, outside of a developmental and behavioral specialty clinic. Some families have their children's ADHD diagnosis managed by the primary care provider, so this would be helpful in obtaining a larger sample size and assessing screen time habits in various communities.

Another recommendation for future studies includes incorporating an ADHD behavior scale, such as the Vanderbilt screening tool, to evaluate whether there is an improvement in symptom management with decreased screen time. The medical record would have to be accessed for this kind of study, as other factors would need to be evaluated, such as changes in the children's medication.

## **Conclusion**

The goal of this project was to determine if an educational intervention with families decreased overall screen time use in school-aged children with ADHD. A written infographic handout about ADHD and screen time can reduce television screen time and should be discussed as one means of non-pharmacological management for patients with ADHD. Providing parents with education on how they can manage their children's behavioral disorders with non-pharmacological interventions can help empower families and increase their confidence. Sharing this information with pediatric providers could encourage them to emphasize the importance of non-pharmacological interventions in the management of ADHD and improve overall patient outcomes.

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**Table 1. Demographic characteristics of surveyed population (N=22)**

<i>Demographic</i>	<i>Mean (SD) n (%)</i>
Age	9.3 (Range 5-12 years)
Gender	
Male	17 (77.3%)
Female	5 (22.7%)
Race	
White	12 (54.5%)
Black	9 (40.9%)
Hispanic	1 (4.6%)
Annual Family Income	
\$1-9,999	2 (9.1%)
\$10,000-24,999	3 (13.6%)
\$25,000-49,999	9 (40.9%)
\$50,000-74,999	2 (9.1%)
\$75,000-99,999	2 (9.1%)
\$100,000 or more	4 (18.2%)

**Table 2. Screen time survey questions**

<i>Question</i>	<i>Response Options</i>
1. Survey number 2. What is the gender of your child?	(Assigned by random number generator) Male Female Prefer not to answer
3. What is the age of your child?	(Between 5-12 years)
4. What is your race?	White/Non-Hispanic Black Hispanic Other
5. What is your annual family income?	\$1-9,999 \$10,000-24,999 \$25,000-49,999 \$50,000-74,999 \$75,000-99,999 \$100,000 or more
6. How many digital devices does your child have access to?	One Two Three Four or more
7. On average, how many hours per day does your child spend on digital screens for educational purposes?	Less than one One Two Three or more
8. On average, how many hours per day does your child spend on the computer or laptop for recreation?	Less than one One Two Three or more
9. On average, how many hours per day does your child spend on a tablet or cell phone for recreation?	Less than one One Two Three or more

<p>10. On average, how many hours per day does your child spend watching television?</p>	<p>Less than one One Two Three or more</p>
<p>11. On average, how many hours per day does your child spend playing on video games?</p>	<p>Less than one One Two Three or more</p>
<p>12. How many play activities does your child have that does not involve screens?</p>	<p>Almost none Few Some Many</p>
<p>13. On average, how many hours per day do you, the parent, spend on screen time per day? (Total including television, cell phone, tablet, computers, etc.)</p>	<p>Less than one One Two Three or more</p>

**Table 3. Pre-interventional and post-interventional survey results**

	Pre Median (IQR)	Post Median (IQR)	<i>p</i>
Number of devices <sup>a</sup>	3 (2-4)	3 (2-3)	0.5488
Education <sup>b</sup>	1.5 (1-3)	2 (1-2)	0.5488
Computer <sup>c</sup>	1 (1-1)	1 (1-2)	0.2188
Tablet <sup>d</sup>	2 (1-3)	2 (2-3)	0.424
Television <sup>e</sup>	2.5 (2-3)	1.5 (1-3)	0.0005
Video games <sup>f</sup>	1 (1-1)	1 (1-2)	1.000
Play <sup>g</sup>	4 (3-4)	4 (3-4)	0.61688
Parents <sup>h</sup>	4 (4-4)	3 (2-4)	0.0654

<sup>a</sup> How many digital devices does your child have access to?

<sup>b</sup> On average, how many hours per day does your child spend on digital screens for educational purposes?

<sup>c</sup> On average, how many hours per day does your child spend on the computer or laptop for recreation?

<sup>d</sup> On average, how many hours per day does your child spend on a tablet or cell phone for recreation?

<sup>e</sup> On average, how many hours per day does your child spend watching television?

<sup>f</sup> On average, how many hours per day does your child spend playing on video games?

<sup>g</sup> How many play activities does your child have that does not involve screens? (Almost none, few, some, many)

<sup>h</sup> On average, how many hours per day do you, the parent, spend on screen time per day? (Total including television, cell phone, tablet, computers, etc.)

Figure 1. Educational handout titled “How Screen Time Affects ADHD”

# HOW SCREEN TIME AFFECTS ADHD



## TIME MANAGEMENT

ADHD can make it hard to keep track of time. Children can spend hours in front of a screen. This can make it harder for them to hold their attention for longer periods of time in other life situations.

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## IMPULSE CONTROL

Children with ADHD may be more likely to engage in risky behavior. They are at a higher risk for developing internet addictions.

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## SOCIAL SKILLS

More screen time can lead to less time practicing picking up on social cues during face-to-face interactions. Televisions in the bedroom can contribute to antisocial behaviors.

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## MORE DISTRACTIONS

Children with ADHD can get lost in a game and forget that they have tasks to do. All the bells and whistles online make it even more challenging for children with ADHD to stay focused.

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## WORSENS SLEEP

Screen time can make it tougher for children with ADHD to wind down.

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## WAYS TO HELP

**Look for Natural Stopping Points**

- Learn how long it takes your child to complete certain goals in video games and social media. Talk about this with your child and then set a stopping point based on those goals. **No more than two hours total per day.**

**Ease Transitions**

- Agree ahead of time on activities to help them transition from the screen, such as doing something physical like play.

**Reduce Distractions**

- Avoid having TV on in the background during homework time. Consider using apps to block certain websites during homework time.

**Avoid Technology at Bedtime**

- Try to end screen time one hour before bed. Keeps TVs and computers in a common area. Consider leaving cell phones out of the bedroom at night.

**Create a Screen Time Contract**

- Help your child come up with a schedule together. Keep the contract out to be viewed regularly. Praise your child for following the contract rules.

**Be a Role Model**

- Set limits for your own screen time. Create "media-free zones", such as family dinners, where devices are not allowed.