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# Media and Technology Use Education in Pediatric Primary Care

Greta Jayne Hilbrands

# Media and Technology Use Education in Pediatric Primary Care

by

Greta Jayne Hilbrands, M.S.

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We the undersigned committee hereby approve the attached Doctoral Research Project, "Media and Technology Use Education in Pediatric Primary Care" by Greta Jayne Hilbrands, M.S.

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Vida L. Tyc, Ph.D., Committee Chair
Professor, School of Psychology

_____

Patrick J. Aragon, Psy.D., Committee Member
Assistant Professor, School of Psychology

_____

Jignya M. Patel, Ph.D., Committee Member
Assistant Professor, Bisk College of Business

_____

Lisa A. Steelman, Ph.D.
Professor and Dean
College of Psychology and Liberal Arts

## Abstract

Title: Media and Technology Use Education in Pediatric Primary Care

Author: Greta Jayne Hilbrands, M.S.

Committee Chair: Vida L. Tyc, Ph.D.

Youth media and technology use is growing at rapid rates and is quickly becoming a necessary tool for effective functioning in the modern world. However, such use has been shown to result in negative consequences for children and adolescents, including impaired executive functioning, increased violence and aggression, and physical and psychological health problems. As such, the American Academy of Pediatrics has recommended that all pediatric providers educate parents about healthy media and technology practices for children and families. The present study sought to examine the proportion of parents who receive media/technology education from their child's providers, the rates of compliance with these recommendations, the effects that receiving this information has on the frequency and severity of the child's psychosocial and behavioral problems, and the factors that may influence the likelihood that parents receive media/technology education from their pediatric providers. A total of 302 participants were enrolled in the study. Of the parents who chose to provide their child's demographic information, the mean age of children in the sample was 7.00 years (SD= 4.5; range= 2-17 years) and the gender distribution was 54.9% male (n=163), 44.1%

female (n=131), and 0.34% non-binary (n=3). Only 27.5% (n=78) of parents reported that media/technology was discussed at their child's most recent visit to a medical provider, however 61.9% (n=187) believed it should be discussed and addressed in this setting. The results also indicated that no parent was fully compliant with all of the AAP's recommendations for media/technology use. While all parents fell into the partially compliant category, parents of older children (M=4.31, SD=1.19) were significantly more compliant with the AAP guidelines than parents of younger children (M=3.30, SD=1.00), $t(245)=-4.78$, $p<0.001$. When examining factors that influence the receipt of media/technology use education, acute reason for referral was a significant predictor of receipt of media/technology use education. These results reveal that a significant percentage of parents do not receive media/technology use education from their pediatric providers but would support the addition of this education in the primary care setting. Findings from this study will be used to inform provider-delivered interventions for parents and families to promote healthy pediatric media/technology use.

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# Review of the Literature

## Prevalence

Many of today's youth have grown up in an environment where media and technology use is a fundamental and everyday occurrence. Research has indicated that U.S. children and adolescents spend an average of nearly eight hours a day using various forms of media/technology (Scott, Valley, & Simecka, 2017). The term "media" encompasses many different forms of mass communication that can influence people. Moreover, media can be further broken down into smaller, more specific categories, such as broadcasting, publishing, and the internet. Currently, the most widely used forms of media by children and adolescents are social media and streaming. The term "social media" can be defined as "a group of internet-based applications that…allow for creation and exchange of User Generated Content" (p.61, Kaplan & Haenlein, 2010). For purposes of this study, the term media/technology use will be used to represent all forms of digital media technology, including social media platforms, video streaming services, TVs, computers, tablets, video game consoles, and cell phones.

According to findings from the Common Sense Census 2017, nearly all (98%) children who are 8 years of age and younger live in a home with some type

of mobile device (Rideout, 2016). Personal tablet ownership has increased significantly in the past few years, with 41% of children under the age of 8 owning a tablet, up from 7% in 2013 and 1% in 2011. Data from the most recent Pew research study on social media and technology show that 85% of U.S. teens ages 13 to 17 use YouTube, 72% use Instagram, and 69% use Snapchat. Notably, only about half of U.S. teens use Facebook, which demonstrates a significant decrease from 71% in the previous survey in 2015 (Madden, 2013). Another prominent change from the previous study is the percentage of teens who have or have access to a smartphone. In 2018, 95% of U.S. teens reported owning or having access to a smartphone. This is a 22-point increase from teens who had access in 2015. These trends demonstrate the evolution and rapidly growing nature of media and technology use in young people (Madden, 2013).

With nearly all teens having access to smartphones and over 70% maintaining an online presence on numerous social media sites, internet over-use and addiction are concerns for parents and researchers alike. It is estimated that between 4-8% of children and adolescents have problematic internet use in the United States (AAP, 2016). Shapira et al. (2012) defined problematic internet use as follows:

> Maladaptive preoccupation with Internet use, experienced as irresistible use for periods of time longer than intended; significant distress or impairment resulting from the behavior; and the absence

> of other Axis I pathology that might explain the behavior, such as mania or hypomania. (p. 209)

Additionally, excessive time spent playing video games is also a growing trend, with 'Internet Gaming Disorder' being proposed in the latest revision of the Diagnostic and Statistical Manual of Mental Disorders (American Psychiatric Association, 2013). Although the American Psychiatric Association (APA) indicated that further research is required on the subject, the physical and mental health consequences of problematic technology and media use is a major point of conversation and concern.

In 2013, the first inpatient hospital program for Internet Addiction recovery opened in the U.S and empirically supported research on functional and dysfunctional internet use expanded (DeMarche, 2013). Growing research has suggested that the prefrontal cortex plays a key role in the development of Internet Addiction, and therefore, problematic internet use may be more similar to other addictive disorders (Brand, Young, & Laier, 2014). Due to the fact that more than three billion people worldwide use the internet and two and half billion people use smartphones daily, researchers have deemed it essential to measure these particular behaviors (Statista, 2018). The Internet Addiction Test (IAT) is the most commonly used measure of Internet Addiction (Young, 1998). It measures the presence and severity of internet and technology dependence on a variety of web-based services. These web-based services may be accessed on all types of devices and screens and include websites, social media, online gaming, and online

entertainment. The tool was initially created to measure adult internet use, however, it has recently been found developmentally appropriate and valid for children 9 to 18 years old (Chin & Leung, 2018). Examining problematic internet and media/technology use is particularly important in the adolescent population (12-17 years) as they, along with young adults (18-29 years), access the internet more than any other age group (PEW, 2012). Research examining the negative impact of excessive technology use in adolescent and young adults is especially relevant as they are the most at-risk population (Anderson, Steen & Stavropoulos, 2017).

## Effects of Media/Technology Use on Children

Excessive media/technology use can result in a variety of negative outcomes for children, including child developmental delays and difficulties, psychosocial and behavioral problems, and physical and mental health problems. These will be outlined in the sections that follow.

### *Child Development*

Research has found that infants and children younger than two years old require play and interaction with a trusted caregiver that is both hands-on and reciprocal in nature (AAP, 2016). This type of in-person interaction helps to develop the young child's cognitive, language, motor, and socio-emotional skills. The quality and quantity of caregiver-infant interactions affects the development of these skills. For example, studies have shown that maternal postpartum depression

decreases the mother's ability to provide reciprocal parenting, leading to increased negative emotionality and ineffective emotional regulation in their children (Blandon, Calkins, Keane, & O'Brien, 2008; Maughan, Cicchetti, Toth, & Rogosch, 2007; Wienberg & Tronick, 1998). This is particularly relevant as current trends suggest that parents are increasingly relying on media and technology as a replacement for much of these in-person interactions (Nathanson, Alade, Sharp, Rasmussen, & Christy, 2014). Limited or low quality parent-child interactions results in decreased reciprocal exchanges that are so important in promoting positive affect, security, and intimacy (Feldman, 2015).

The growing trend of using media/technology to replace parent-child interactions may negatively impact child development (Nathanson, Alade, Sharp, Rasmussen, & Christy, 2014). A recent study of 2,441 mothers and children found that higher screen time in children, aged 24 to 30 months, was associated with poor performance on a developmental milestone screening test (Madigan, Brown, Racine, Mori, & Tough, 2019). Furthermore, executive functioning in early childhood is significantly impacted by media/technology use. Introduction to media/technology at a younger age, engaging in media/technology with greater frequently and duration, and non-Public Broadcasting Services (PBS) content are all significant predictors of poor executive functioning in preschoolers (Nathanson, Alade, Sharp, Rasmussen, & Christy, 2014).

Television/video viewing is a common topic in screen media research. Numerous population-based studies have demonstrated associations between

excessive television viewing in early childhood and delays in cognitive, language, and social/emotional domains (AAP, 2016). A study examined neuroendocrine responses associated with infant block play vs Digital Versatile Disk (DVD) viewing (Christakis, Liekweg, Garrison, & Wright, 2013). A total of 49 infants participated in the study and were randomly assigned to either activity and salivary cortisol levels were obtained. Performance is known to be impaired at both high and low levels of cortisol, and no optimal level has been determined. Therefore, for the purpose of the study, the authors defined healthy cortisol levels as the amount a child produces when engaging in block play due to its well-demonstrated positive effects on language development. Results showed that children aged 15 to 18 months who were assigned to the block activity produced significantly more cortisol than those in the DVD group. This stronger neuroendocrine response indicated that block play encouraged more engagement and productivity in the task than watching a DVD (Christakis, Liekweg, Garrison, & Wright, 2013). Some researchers have proposed that the invention of the tablet and other devices that can foster more interactive media/technology use may garner results that are more similar to block play; however, there is limited research to support this at present (Christakis, 2013).

Additionally, the tone and language that mothers and characters on television use is quite different from that used by mothers in personal interactions with their child. “Motherese” is defined as a special form of language that mothers (and other caregivers) intuitively use with infants and children (Ferguson, 1964;

Locke, 1993; Snow, 1994). A mother talks to her infant or child differently depending on their developmental level and adapts her language to meet the needs of the growing child. Developmental neuroscientists believe that the unique tone spoken in specific social situations affects fundamental neurological processes that are involved in promoting language development (Kuhl, Tsao, & LIU, 2003). Educational TV (e.g., Mister Roger's Neighborhood) imitates motherese as best as it can without the important interactive piece, while noneducational TV typically employs language that is adult-like in its pacing and tone (Friedrich, 1973; Rice & Haight, 1988; Zimmerman & Christakis, 2007).

Although there are multiple sources for quality television programming, children under the age of 30 months cannot learn from these programs as well as they can from in-person interactions (Anderson & Hanson, 2013; Radesky, Schumacher, & Zuckerman, 2015). Thousands of applications and media/technology content are advertised as "educational" but most do not possess empirical evidence supporting this assertion. School-aged children need to learn specific skills, such as self-regulation, empathy, social skills, and problem solving. These skills are primarily learned through a child's exploration of the environment around them, interacting with peers and caregivers, and playing in unstructured and creative ways. Interactive screen-based media/technology typically works to increase a child's concrete knowledge or ability to learn and memorize facts, and often fails to adequately promote other skills (Radesky, Schumacher, & Zuckerman, 2015).

While the caregiver-infant/child interaction is essential for healthy development, studies have shown that one specific form of interactive and educational media/technology can facilitate positive developmental effects. Social media that employs contingent responses for child actions may enable more retention of taught information. Specifically, research has shown that video communication between a toddler and an adult is as effective for language development as real-life encounters (Roseberry, Hirsh-Pasek, & Golinkoff, 2014). Overall, due to the fact that technologies are evolving at incredible rates and that determination of the effects of media/technology use in children needs to be longitudinal in nature, conclusive evidence about its long-term developmental effects is limited at present.

*Psychosocial/Behavioral* Outcomes

Preschool and school-age are important periods for a child's psychosocial and behavioral development. Excessive media/technology use can affect this critical period of development in a variety of ways, and research has demonstrated a link between increased media/technology use in children and negative behavioral outcomes, poor impulse control, and risk-taking behavior (Anderson, Levin & Lorch, 1977; Valkenburg, Huizinga, & Buchman, 2014; Zimmerman & Christakis, 2007). Many researchers are increasingly focused on a potential relationship between the changing media/technology environment and the increased incidence

of Attention-Deficit/Hyperactive Disorder (ADHD) and related behaviors. A systematic review of the data on media/technology use and attention found a significant relationship between increased exposure to TV before age 3 and subsequent attentional problems (Bourchtein et al., 2019; Christakis, Zimmerman, & DiGuiseppe, 2004; Zimmerman & Christikis, 2007).

Similarly, research has found that youths and adults with symptoms of ADHD or a diagnosis of ADHD are at an increased risk for developing compulsive/addiction-driven Internet use (Anderson, Steen, & Stavropoulos, 2017; Gul, Yurmuz Solmaz, Gul, & Oner, 2018). Additionally, these individuals are more likely to have access to video games in the bedroom as well as greater preoccupation and a lack of control with video game play (Mazurek & Engelhartd, 2013). Bourchtein and colleagues (2019) recently examined technology use in adolescents with and without ADHD. They found that adolescents with ADHD had significantly higher rates of technology use compared to their peers without ADHD. Consistent with previous studies, the authors found that adolescents with ADHD spend twice as much time playing video games than their peers without ADHD (Bourchtein, Langbery, Cusick, Breaux, Smith, & Becker, 2019). Another recent study examined the time 151 adolescents spent on technology and the number of text messages sent. Over the course of 18 months, the authors found a significant positive relationship between increased time on technology and number

of texts messaged with increased same-day ADHD and conduct disorder symptoms (George, Russel, Piontak, & Odgers, 2018).

ADHD is one of the most frequent and chronic childhood disorders, with approximately 9.4% of children 2-17 ever having received a diagnosis (Zimmerman & Christakis, 2015; Center for Disease Control, 2016). That is nearly 6.1 million children with an ADHD diagnosis in the U.S., which has increased significantly since 2003. The influence of genetics in ADHD has been well established, with the Surgeon General's report on mental health indicating that gene abnormalities play a small role in the development of ADHD (Scahill & Schwab-Stone, 1994; Brown & Freeman, 2001). Therefore, the nongenetic environmental factors that cause ADHD are significant and must be further studied (Zimmerman & Christakis, 2007).

There have been several theories put forth to explain a relationship between media/technology exposure and ADHD-related behaviors. ADHD-related behaviors refer to attention problems, hyperactivity, and impulsivity experienced by children and adolescents in the general population who do not meet the DSM-V criteria for the disorder. The most common hypotheses for this relationship between ADHD and problematic media/technology use suggests that violent and/or fast-paced media/technology results in an increase in these ADHD-related behaviors. The first violence-related hypothesis is called the *violence-induced script hypothesis* and it states that exposure to violence (as portrayed by impulsive,

anti-social behaviors) may activate a behavioral script for poor self-control. Poor self-control is often viewed as an important factor for the attention problems, hyperactivity, and impulsiveness that are present in ADHD-related behaviors (Anderson & Bushman, 2001; Hummer et al., 2010). The second violence-related hypothesis is called the *violence-induced arousal habituation hypothesis*. This posits that violent content induces intense arousal in children, and that over repeated exposure, children become desensitized to high levels of arousal (Ballard, Hamby, Panee, & Nivens, 2006; Bushman & Huesmann, 2006; Fleming & Rickwood, 2001). Consequently, children may become under-aroused in typically arousing situations, and this frequent under-arousal can cause ADHD-related behaviors (Nigg, 2006; White, 1999).

There are also two hypotheses related to the fast pace of media/technology and its effects on ADHD-related behaviors. One is named the *scan and shift hypothesis.* This hypothesis posits that the quick cuts and edits of media/technology teach children to quickly scan and shift their attention to process information. Such an attentional style is ineffective and potentially problematic for tasks that require sustained attention, such as schoolwork and chores (Jenson et al., 1997). The second pace-related hypothesis is called the *fast-pace arousal-habituation hypothesis*. This is similar to the *violence-induced habituation hypothesis,* but states that children adapt to the fast pacing of media/technology whereby normal, everyday pacing becomes less stimulating and arousing (Lang, Zhou, Schwartz,

Bolls, & Potter, 2000). Researchers have found that children who watched *Mister Roger's Neighborhood* had greater tolerance for delay than those who watched *Batman,* for example (Friedrich & Stein, 1973). This demonstrates the difference between average pacing (*Mister Roger's Neighborhood*) of educational TV shows, and the fast, unnatural pacing (*Batman)* of non-educational and popular TV shows. Moreover, in another study, children who watched *Power Rangers* demonstrated a shorter attention span immediately after than those who watched *Mister Roger's Neighborhood* (Geist & Gibson, 2000). Zimmerman and Christakis (2015) proposed that emotional self-regulation may be hindered by noneducational programming because of the loud and violent content. In contrast, educational content, such as *Mister Roger's Neighborhood*, promotes prosocial behavior.

Content is an important factor when discussing media/technology and its effects on children. Due to the great amount of violence in children's media/technology, a review of the research was conducted to study the relationship between violence depicted in media/technology and child behavior. In a study examining G-rated movies released in the United States from 1937 to 1999, 100% of these movies depicted violence of some kind

(Yokota & Thompson, 2000). Concerns about violence in media/technology and its effects on children began over 50 years ago with Bandura, Ross, and Ross's (1963) famous study. They found that children who watched real-life aggression, "real" aggression on TV, and aggressive cartoons were more likely to express aggression

in the future. This concept of children expressing increased violence after being exposed to violent media/technology has been replicated many times over and similar results have been found. A study examining violent content versus educational and prosocial content found significant improvements in behavioral symptoms for those who watched the educational and prosocial content, particularly in low-income boys (Zimmerman & Christakis, 2007).

Moreover, recent research has demonstrated the effects of exposure to violent media/technology on structural changes in the developing brain. While such research is relatively new and limited, evidence suggests that the prefrontal cortex responsible for controlling emotion and behavior may be impaired with frequent violent media/technology exposure. Impaired development of the prefrontal regions of the brain may lead to increased aggression and decreased inhibitory control (Hummer, 2015). Overall, numerous studies have found that violent content is a risk factor for increased aggressive thoughts, feelings, and behaviors among children (Anderson & Bushman, 2002; Bushman & Huesmann, 2006; Gentile, 2014).

*Academic and Cognitive Problems*

Overall, school performance and media/technology use are negatively related. Studies have shown that children who watch three hours of TV per day have poorer academic achievement compared to children who watch less than 1

hour a day (Johnson, Cohen, Kasen, & Brook, 2007). When children spend less time watching TV, they likely have more time to dedicate to homework and studying. Further, research suggests that children with a TV in their bedroom perform worse on standardized tests, likely related to less time spent doing schoolwork and sleeping, both important factors in academic achievement (Borzekowski & Robinson, 2005; Gentile, et al., 2017). This poor performance trend is also evident with increased social media/technology use. Junco (2015) examined Facebook use, class rank, and GPA and found that time spent on Facebook and multitasking with Facebook were both negatively predictive of GPA for all high school students except seniors (Junco, 2015).

Relatedly, media and technology can acutely interfere with mental tasks even when the user attempts to ignore them (Wilmer, Cherman, & Chein, 2017). In a recent study of undergraduate students, researchers found that the mere knowledge of a notification of a message through a sound or vibration significantly decreased performance on concurrent attention-based tasks. While the students did not view the notification, the knowledge that they had one was enough to prompt task-irrelevant thoughts that disrupted their attention and focus on completing the task (Stothart, Mitchum, & Yehnert, 2015). Additionally, the mere awareness of the physical presence of a cellphone also significantly affected cognitive performance. Similarly, Thornton et al. (2015) asked undergraduate students to complete two neuropsychological tasks to measure executive functioning and attention; a digit

cancelation task and a trail-making task, respectively. At the start of the study, the investigator "accidently" left a cellphone or notebook on the participant's desk. The participants with the cellphone on their desk performed significantly worse on difficult tasks than those who had the notebook, but they performed similarly during easier tasks. A follow-up study asked half of the participants to place their own cellphone on the desk and found similar results of significantly poorer performance on cognitive functioning during demanding tasks for those with their cellphone visible (Thornton, Faires, Robbins, & Rollins, 2014).

While schools have different policies regarding cellphone use, many allow students to bring them to school and use them while not in class. However, as the previous studies indicated, the mere presence of a cellphone may distract them from their schoolwork and negatively affect their ability to process information. A study conducted in four English cities examined the relationship between student exam scores and school cellphone policy for adolescents between the ages of 11-16. The authors found that students at schools that did not allow cellphones performed significantly better on examinations, higher exam scores were particularly noticeable among students who were previously the lowest-performing (Beland & Murphy, 2016).

Memory has also been shown to be negatively impacted by increased use and reliance on media/technology, such as smartphones. Sparrow et al. (2011) conducted a study where adult participants typed newly learned trivia facts into a

document, with half of the participants being told the information would be erased and the other half being told it would be saved. The adults who believed they would be able to access the facts again performed significantly worse on a later recall task. This phenomenon was later termed "digital amnesia" and refers to the fact that individuals are less inclined to encode and store information they believe they will have easy access to at a later date. Like adults, most children and adolescents rely heavily on internet databases for information regarding schoolwork, and this may affect their learning and memory (Sparrow, Liu, & Wegner, 2011; Wilmer, Cherman, & Chein, 2017). Educators have agreed that media/technology can negatively impact students' attention, with 85% of teachers in a recent study endorsing that "today's technologies are creating an easily distracted generation" (Purcell et al., 2012).

Ophir and colleagues (2009) conducted one of the first studies to explore the impact of media/technology multitasking on cognitive capacities. The cross-sectional study examined 262 university students who engaged in "heavy" (i.e., frequent and extensive) media/technology multitasking compared to those who did not. Cognitive testing of the two groups found that those involved in heavy media/technology multitasking performed worse on task-switching tests than their counterparts. Although the authors hypothesized that heavy users would be better at task-switching due to practice doing it with media/technology, this was not the case. Further investigation suggested that the poorer task-switching ability in

participants with heavy media/technology multitasking was due to their increased susceptibility to distraction from irrelevant environmental stimuli (Ophir, Nass & Wagner, 2009). To date, such studies have been limited in the youth population but warrant further investigation..

Imaging studies have identified various neural mechanisms, which may account for cognitive deficits associated with media/technology use. Functionally, heavy media/technology multitasking leads to poorer performance on distracted attention tasks among adults, and these individuals also demonstrate greater activity in the right prefrontal cortex. The right prefrontal regions are usually activated in response to distracting stimuli. Therefore, an increase in activity in these areas suggests that heavy media/technology multitaskers must use greater cognitive effort to maintain concentration in the face of distracting stimuli (Moisala et al., 2016). Structurally, heavy internet use and media multitasking are associated with decreased grey matter in prefrontal regions associated with maintaining goals when confronted with a distraction (Kühn S & Gallinat, 2015; Loh & Kanai, 2014). In fact, three years of high frequency Internet use in children is linked with decreased verbal intelligence at follow-up and impeded maturation of both grey and white matter regions (Takeuchi et al, 2018). However, due to the fact that other confounding variables may affect the results of these brain imaging studies, these findings must be interpreted with caution and further research in this area is needed (Firth, et al., 2019). Moreover, a review of the literature has failed to establish long-

term effects of heavy digital media/technology use in children and adolescents due to the Internet's relative newness (Firth, et al., 2019).

*Physical Health*

Excessive media and technology use has been increasingly associated with greater physical health concerns in adults and children alike. One such health problem is childhood obesity. Due to the increasing population of overweight and obese children and adolescents, studies have been examining factors that contribute to this health problem for decades. According to the Center for Disease Control (CDC, 2018), one in five children are obese in the United States factor often studied to explore this growing health crisis is sedentary behaviors (SB). SB is defined as an expenditure of less than 1.5 metabolic equivalents (METs) while engaging in any behavior while awake, for example, a seated or lying posture (Sedentary Behaviour Research Network, 2012). SBs includes a large range of activities, e.g. studying, quiet play, and watching television. The U.S. National Health and Nutrition Examination Survey (Torres et al., 2018) found that adults and children spend approximately 7.7 hours per day being sedentary (Matthews et al. 2018).

While there are no current guidelines that indicate a "healthy" amount of sedentary behavior, research on the importance of specific amounts and types of physical activity is extensive. According to the 2018 U.S. Physical Activity

Guidelines Advisory Committee Scientific Report, children age 6-17 are recommended to engage in 60 minutes of moderate-to-vigorous physical activity daily. Children younger than 6 years old are also encouraged to engage in daily physical activity, although there are no specific guidelines. Research shows that moving more and sitting less has a significant positive impact on health, regardless of age, race, or sex. The 2018 Report expanded upon previous research and found that physically active individuals "sleep better, feel better, and function better" (Torres et al., 2018). These findings are consistent with other research on the positive health effects of physical activity. When specifically examining physical activity in school-aged children, a systematic review of longitudinal studies found strong evidence that higher amounts of physical activity in children aged 3 to 6 was related to reduced risk in excess body weight and increased bone health and muscular fitness (Torres et al., 2018). This is particularly noteworthy as data from NHANES found that children and adolescents spend between 6 and 8 hours per day being sedentary and will likely fail to profit from this inactivity in terms of health benefits (Chobanian et al., 2003; Egan, Li, Hutchison & Ferdinand, 2014; Torres et al., 2018). Research has also found that children and adolescents do not currently meet the criteria for adequate physical activity (Torres et al., 2018).

The displacement hypothesis is one of the most frequent explanations for the physical health problems associated with frequent media/technology use. This hypothesis essentially means that one activity takes the place of another activity,

typically to the detriment of the individual. It may be that a child replaced participation in sports or other physical activity with watching TV, leading to increased likelihood of obesity and weight-related problems. A recent study of 2-year-olds found that with every hour of TV watched, Body Mass Index (BMI) increased (Wen et al., 2014). It was hypothesized that increased exposure to food advertisements and watching TV while eating (failing to notice when they are full) may contribute to the increase in BMI (Bellissimo et al., 2007). The displacement hypothesis also works in terms of academic success, whereby a child replaces homework and studying with video games or social media, earning poor grades in school. Either way, the idea of the displacement hypothesis is that children's increased media/technology use displaces important activities that benefit the child's health and overall daily success (Gentile et al., 2017).

A recent review of preschooler's physical activity from 10 countries found that children aged 2 to 5 spend between 34% and 94% of their day being sedentary (Hnatiuk, Salmon, Hinkley, Okely & Trost, 2014). Relatedly, watching TV before age 5 was found to increase body mass index (BMI), decrease cardiorespiratory fitness, and increased cigarette smoking by age 26 (Hancox, Milne, & Poulton, 2004). Further, a systematic review examined the prevalence of children and adolescent's sedentary time after school. Adolescents spend 57% of their after-school time being sedentary and children spend between 41-51% being sedentary (Arundell, Fletcher, Salmon, Veitch, & Hinkley, 2016). Notably, children and

adolescents spend less time sedentary when they are in after-school care programs than in other environments. It is hypothesized that other locations, such as a child's home, offer more readily available screen access whereas interaction and play with peers is less available (Arundell et al., 2016).

Like the negative health consequences associated with lack of physical activity among children and adolescents, SBs also adversely impact adult health. A systematic review of the relationship between physical activity and health was conducted by the researchers compiling the 2018 U.S. Physical Activity Guidelines Advisory Committee Scientific Report. In adults, a significant relationship was found between increased SBs and all-cause mortality, cardiovascular disease incidence and mortality, and higher risk of type-2 diabetes incidence and mortality. This is particularly concerning for U.S. youth because childhood and adolescent physical and sedentary behaviors typically continue into adulthood. If healthy habits are not established in childhood, the negative health outcomes that have been well founded for adults are likely to impact them. Furthermore, evidence suggests that any physical activity, both acute and regular, improves a child's cognitive functions of memory, executive function, processing speed, attention, and academic performance (Torres et al., 2018). This relates back to the displacement hypothesis as media/technology tends to replace physical activity, and therefore, negatively impacts cognitive functioning and increases ADHD-related behaviors.

Sleep is another area of child health that can be greatly impacted by media/technology use. Because media/technology is becoming lighter, smaller, and wireless, it is much easier for children and adolescents to take screen media/technology to bed with them. According to the 2014 Sleep in America Poll, 75% of children aged 6-17 have at least one media/technology device in their room (Fobian, Avis, & Schwebel, 2016). Greater media/technology use is related to decreased sleep time and increased fatigue (Li, Jin & Wu, 2007). Recent research suggests that screen time has a significant impact on sleep in that every hour of screen time is associated with 3-8 fewer minutes of sleep in children (Przybylski, 2019). It does not appear to matter which media/technology device is in use before bed as they all have a negative impact on sleep. For example, TV has traditionally been found to be related to decreased total sleep time, prolonged sleep onset latency, and delayed bedtime. However, newer studies examining the recent trends in media/technology use found that adolescents with gaming devices in the bedroom reported going to bed significantly later along with higher levels of daytime sleepiness than those who did not (Bourchtein, Langbery, Cusick, Breaux, Smith, & Becker, 2019; King, Gradisar & Drummond, 2013).

A study examining general adolescent technology use before bed found that those who engaged with technology before bed experienced negative consequences in terms of nighttime sleep and daytime functioning. Specifically, increased technology use before bed and frequency of being awakened by technology were

significantly associated with waking too early, waking unrefreshed, and daytime sleepiness (Johannson, Petrisko, & Chasens, 2016). More recently, a study examining adolescent technology use found that time spent on technology was associated with more adolescent-reported sleep-wake problems, less school-night time in bed, and more teacher-reported daytime sleepiness. The study also found that daytime sleepiness as reported by teachers was more significant for adolescents diagnosed with ADHD (Bourchtein, Langbery, Cusick, Breaux, Smith, & Becker, 2019). This is significant as this population is already at greater risk for problems at school, such that increased daytime sleepiness may further exacerbate these problems.

Remarkably, infants also experience negative effects from media/technology use before bed. A study found that infants exposed to media/technology before bed slept significantly less at night than those who were not exposed (Vijakkhana et al., 2015). Many hypothesize that screen media/technology may impact the circadian rhythm. Typically, as the sun sets, the pineal gland secretes melatonin to decrease alertness and signal sleep. However, the blue light from the screen may suppress melatonin, delaying sleep onset and decreasing time spent in restful sleep (Chang, Aeschback, Duffy & Czeisler, 2015). Although pediatricians recommend that children refrain from screen media/technology use before bed, nearly half (49%) of parents report that their

young children (under 8 years) often or sometimes watch TV or videos or play games in the hour before bed (Rideout, 2016).

*Mental Health*

As concerns about child and adolescent physical health grow with increased media/technology use, researchers also stress the potential impact of media/technology on the child's psychological health. Two of the most studied mental health disorders in relation to media/technology use are anxiety and depression. According to the National Survey on Children's Health (2016), anxiety and depression rank second and third, respectively, as the top diagnosed disorders in children. Specifically, approximately 33% of children had an anxiety diagnosis and 17% had a depression diagnosed at the time of the survey (CDC, 2018). Only ADHD was diagnosed more. There are many proposed reasons for why anxiety and depression are associated with increased media/technology use. For one, specific content has long been related to acute fearful responses, especially in movies, TV dramas, and news (Cantor & Riddle, 2014). Trauma-like symptoms from exposure to developmentally inappropriate media/technology are common in children and adolescents, and can result in loss of sleep and cause physical, cognitive, and emotional problems. Anxiety can also be experienced as it relates to social comparisons and dissatisfaction with oneself. Social media/technology often encourages an idealized and unrealistic lifestyle that not many, if any, can replicate (Hoge, Bickham & Cantor, 2016). This likely results in anxiety about how others

may evaluate you if you are unable to live up to the set standards (Richins, 1991; Bessière, 2010; Pantic et al., 2012). It is important to note that the use of social networking sites is related to increased depression and anxiety in adolescents, but the opposite is true for adults. This suggests that adults may use the internet differently than children and adolescents. It is also possible that adults possess the coping skills required to combat these negative consequences, while children and adolescents do not.

Adolescents may also seek out media/technology as a form of distraction from distressing emotions. Many individuals turn to media/technology to escape the full brunt of the effects of social rejection and interpersonal difficulties. Those who already have trouble communicating effectively with others have poor self-esteem and feelings of isolation (Young, 2017). This often leads them to use media/technology excessively as a means of mitigating their felt distress from social situations. By failing to acknowledge and address these distressing emotions, they are reinforcing their avoidance of them. This leads to a failure to learn effective emotional regulation skills. Emotional regulation is vital for day-to-day functioning as it helps individuals learn to cope with strong emotions by experiencing them and problem-solving how to internally reduce the felt distress. It has long been established that a deficiency in emotional regulation leads to increased likelihood of psychiatric difficulties, including anxiety and depression (Mennin et al., 2002). Individuals with problematic internet use have reported that they use the internet to avoid feelings of anxiety and depression (Greenfield, 1999),

and these individuals also have greater difficulty in emotional regulation (Hoge, Bickham & Cantor, 2016).

While media/technology can be used to avoid dealing with distressing emotions, adolescents may use it to avoid the anxiety that comes with face-to-face interactions. Social anxiety is a psychiatric disorder that is characterized by fear of embarrassment or rejection from others, leading to avoidance of social situations (APA, 2013). It has been found that the various alternative types of communication, such as texting, instant messaging, and email are much preferred by some people as they lessen the anxiety related to in-person social interaction (Joinson, 2004; Leung, 2011). While it may lessen symptoms of social anxiety in the moment, much of daily functioning requires the ability for face-to-face communication at some point in an individual's life. Therefore, by avoiding practicing this skill and exposing themselves to anxiety-provoking situations, they are likely reinforcing the avoidance behavior and their symptoms become worse (Erwin et al., 2004). Though somewhat new, research suggests that those who replace in-person socialization with virtual interactions actually intensify their social difficulties, whereas those who supplement their social interactions with virtual relationships report closer and better quality relationships (Erwin et al., 2004). In fact, greater cell phone use has been found to be related to higher levels of depression among adolescents, secondary to increased interpersonal distance (Bickham, Hswen & Rich, 2015).

Cyberbullying has a huge impact on childhood and adolescent anxiety, depression, and suicide. Estimates of the prevalence of cyberbullying are quite varied; with between 11% and 48% of children and adolescents reporting that they have experienced it at least once (Kowalski & Limber, 2013). The research suggests that those who bully offline are more likely to cyberbully and victims of offline bullying are more likely to be cyberbullied (Hinduja & Patchin, 2010). After experiencing cyberbullying, victims often report feeling embarrassed, worried, fearful, depressed, and lonely (Ortega, Elipe & Mora-Merchán, 2012). Moreover, general internet use plus the experience of cyberbullying is related to increased suicidal ideation and self-injurious behaviors (Hawton et al., 2013). Specifically, victims of cyberbullying are more likely to contemplate and attempt suicide than their peers who have not experienced it. Data suggests that the readily available information online exposes young people to stories and conversations about suicide, normalizing the behavior (Messina & Iwasaki, 2011). Researchers also make clear that technology can provide social support and reinforce risky health behaviors (i.e. sex, alcohol, and/or drug use) among children and adolescents (Hawton et al., 2013).

Additionally, a longitudinal study by Selfout and colleagues (2009) found that quality of friendship is a moderating factor in depression. Children with low-quality friendships who spend time online exploring, but not interacting, reported increased feelings of depression. However, these same children who used the internet to socialize and interact with others reported less symptoms of depression.

This is likely due to increased social support that they may not receive offline (Selfout et al., 2009). This demonstrates that *what* children do online is just as critical to their mental health as how much time they spend online. In fact, Ferguson (2017) found that youth are quite resilient to negative impacts of screen time that greatly exceeds the recommended amount. Only those who spent more than 6 hours a day on screens reported problems relating to their well-being. Further, Przybylski and Weinstein (2017) concluded that more than 4 hours of TV and more than 2 hours of cellphone use per day resulted in negative well-being. These findings support the positive benefits of moderate technology use, whereas no use or high use is commonly associated with negative effects.

Problematic internet use is also associated with other addictive behaviors. Personality and psychological traits that typically characterize addictive behavior in adolescents are impulsivity, risk taking, and a heightened stress response (Kuss Griffiths & Billieux, 2016). Studies have shown that substance use and dependence often co-occur with other psychiatric disorders. Therefore, if individuals using the internet are at greater risk for developing depression and anxiety, they are also at greater risk of a substance use disorder (Thorens et al., 2014). A review of the research shows that there is a significant relationship between problematic internet use among youngsters and substance use and abuse (Kim, 2008). Specifically, adolescent boys who report higher problematic (addictive) video gaming are twice as likely to also report nicotine, alcohol, and cannabis use (Van Rooij et al., 2014).

Preliminary research has shown that individuals with internet addiction experience functional brain changes in the prefrontal cortex. Moreover, internet addiction is also linked with significant Dopamine Transporter (DAT) losses in the brain (Hou et al., 2012). Findings suggest that individuals who are addicted to the internet experience similar dopaminergic dysfunctions as individuals with other addictions, with or without substances (Hou et al., 2012; Potenza, 2006).

**Parental Influences on Child Media/technology Use**

Research has examined how different parenting styles may impact child media/technology use. Four parenting styles have been established through years of research, and reflect varying degrees of support and control. Authoritative parenting combines high support and high behavioral control. Authoritarian parenting is low on support and high on behavioral control. Permissive parents are high on support and low on behavioral control. Lastly, Neglectful parents are low on both dimensions (Baumrind, 1967). Authoritative parenting has been associated with less screen time in boys while Neglectful parenting has been was associated with more screen time in boys and girls (Van der Geest et al., 2017).

Attachment style has also been examined in relation to problematic internet use, and data from 243 undergraduate students suggested that parental attachment style can significantly predict problematic internet use in their child. Specifically, students with an anxious-ambivalent attachment to both their mother and father

demonstrated significantly greater problematic internet use (Jia & Jia, 2016). Anxious or ambivalent attachment refers to a parental response that vacillates between a nurturing, attuned reaction to the emotional distress of the child and an intrusive, insensitive, and emotionally unavailable response (Baumrind, 1967). The authors of the study also found that gender significantly moderated the relationship, where paternal attachment anxiety predicted problematic internet use in female students, and maternal attachment anxiety predicted problematic internet use in male students. Attachment avoidance, characterized as an emotionally unavailable, unresponsive, or rejecting parental response, was not found to predict problematic internet use in students (Jia & Jia, 2016). This is likely due to the fact that individuals who are anxiously attached look elsewhere (ie: online) for relationships and social interactions, whereas those who are attachment avoidant do not typically desire direct interaction or closeness.

Not only do parenting and attachment style impact child screen time, but the parent's own media/technology use may also influence child media/technology behavior (De Decker et al., 2012). In one novel study, researchers examined maternal mobile phone use and the frequency of mother-child interactions. Participants were 225 low-income mother-child dyads, predominately Hispanic/nonwhite race/ethnicity. When children were 6 years old, the pair was videotaped during a standardized protocol which required the dyads to try familiar and unfamiliar foods. Approximately 23% of mothers used their mobile phones

throughout the protocol, and these mothers initiated fewer verbal and nonverbal interactions with their children. The relationship between mother-child interaction and spontaneous mobile phone use was most significant when the pair was exposed to unfamiliar foods, which is especially noteworthy as new situations typically provoke conversation and interaction. The authors' results suggest that heavy parental technology use was associated with fewer verbal and nonverbal interactions between parent and child (Radesky et al., 2015).

A lack of parent-child interaction and communication has been shown to be related to increased parent-child conflict and familial distress (Radesky et al., 2014). A naturalistic observational study examined 55 caregivers eating with one or more young children at a fast food restaurant and found that nearly 73% of caregivers used mobile devices during the meal. The degree of caregiver absorption in the mobile device was found to be significant and was defined as the extent to which the caregiver's primary engagement was with the mobile device rather than the child. Caregivers who were highly engaged with their mobile device often responded harshly to a misbehaving child (Radesky et al., 2014).

Given the strong relationship between parent and child media/technology use, it may be just as important to encourage parents to discuss and monitor their own media/technology behaviors when attempting to address their child's media/technology use (Jago et al., 2012). Consistency and conflict between partners with regard to their child's media/technology restrictions is also

noteworthy. One study showed that when one parent was more restrictive than the other about their child's media use, increased inter-parental conflict was reported, as well as increased child exposure to media/technology violence. Both of these factors (inter-parental conflict and violent media/technology exposure) were related to increased physical and relational aggression, as well as internalizing and externalizing behaviors in their children. Inversely, when both parents were highly restrictive, there was less conflict between the parents and the child was less likely to be exposed to media/technology violence (Mares et al., 2018).

Increased parental self-efficacy has also been found to be significantly associated with reduced screen time in children (Jago et al., 2014; Xu, Wen & Rissel, 2014). Parental self-efficacy is a parent's belief that he or she is capable of organizing and executing tasks related to parenting a child (Montigny & Lacharite´, 2005). While parents often believe it is important to limit their child's media/technology use, they may have little confidence that they can successfully and consistently implement restrictions on screen time for their child. In fact, one small-sample study in Australia examined parental beliefs about the Australian screen time recommendations of 1-2 hours per day for children aged 2-5 years old. The results suggested that parents were not convinced limiting media/technology/technology use to 1-2 hours was achievable, and they reported preferring to emphasize increased physical activity rather than restrict screen time (Hamilton et al., 2014). Further, only 30% of parents were aware of the

recommendations for young child screen time, and once they were informed, 45% believed they were realistic, while 20% agreed with the guidelines but believed they were difficult to implement. Additionally, 85% of parent participants reported that restricted screen time was not necessary as long as their child was physically active.

Parents cited time pressures, poor weather, and parental fatigue as barriers for meeting recommended screen times for their child. Child media/technology use, especially on the weekends, was considered an inexpensive and relatively safe distraction for children when parents were busy or fatigued (Hamilton et al., 2014). Jordan and colleagues (2006) also found that parents tend to have few rules and consequences for TV restriction. The association between parental education and electronic media/technology use was examined and researchers found that a greater percentage of preschool children from high education families (84%) met recommended screen time than those from lower education families (59%). This may be related to higher parental stress and fatigue for parents with lower education, or that the children from higher educated families have access to more activities beyond electronics (Loprinzi, Schary & Cardinal, 2012).

A systematic review of interventions aimed at helping parents reduce screen time and child BMI found that of the 47 interventions reviewed, 29 (62%) were effective in significantly reducing TV viewing or screen media/technology use. The authors found that the most effective interventions were those that targeted

and set specific goals for decreasing screen time. Three major strategies were found to be most effective: electronic monitoring systems, contingent feedback systems, and clinic-based counseling. Monitoring devices record the amount of TV or screen time a child uses and many can be used to turn off the device when a specific time limit has been reached. Contingent feedback systems refer to interventions where TV viewing was contingent on another activity. For example, TV viewing significantly decreased when the child was required to participate in a physical activity, such as cycling, in order to watch TV. Finally, clinic-based counseling was found to be effective in multiple studies, particularly in medical settings by physicians, nurse practitioners, or Women, Children, and infant providers (Schmidt et al., 2012).

A more recent study on parental interventions examined the strategies that were used by parents of children aged 5–6 years to manage screen time and identified important factors that affect the implementation of the strategies. Similar to previous studies, the 53 parents that participated in the study reported that managing their child's screen time was challenging and complicated. From their findings, Jago and colleagues (2016) suggested that the following strategies were most effective: setting time limits in relation to events (meals, before/after school, bedtime), collaborative rule setting, monitoring that involves both parents, developing a family-specific alternative activity, and developing the child's ability to self-monitor (Jago et al., 2016). While there appears to be support for such

parental strategies to manage child screen time, researchers pointed to the fact that they require considerable parental effort to be implemented successfully and consistently.

## Demographic Influences on Child Media/Technology Use

Rideout (2017) recently conducted a representative survey in conjunction with Common Sense Media/technology with more than 1,400 parents from all regions of the U.S. that builds upon her previous two surveys from 2011 and 2013. Findings consistently demonstrated that children from lower-income families averaged more screen media/technology each day than those from higher-income homes (Rideout, 2016). On average, children from lower-income homes spent about an hour and a half *more* on screen time than higher-income children. Further, children from homes with lower parental education used screen media/technology more than children from homes with higher parent education (Loprinzi, Schary & Cardinal, 2012; Rideout, 2016). From 2011 to 2017, children from lower-income homes increased their TV/video and mobile media/technology viewing while children from higher-income homes decreased their use. This gap, often called the "digital divide," has been steadily declining in recent years. Currently, there is a 25 percentage-point gap in home computer access and a 22 percentage-point gap in high speed internet access at home between young children from lower- and higher-income families, with high-income families having the most access (Rideout, 2016).

Studies have not shown significant differences in overall screen time based on gender or race/ethnicity of children who were younger than 8 years of age (Rideout, 2016). In general, Hispanic/Latino parents have been found to express the highest level of concern about the negative effects of media/technology content on their children, including sex, violence, drugs, and gender and racial stereotypes. Forty-three percent of Hispanic/Latino parents "strongly" agreed that less media/technology is best, compared to 23% of Whites and 13% of African American parents. African American parents were more likely to believe that their child benefits from increased media/technology use (Rideout, 2016).

Research has suggested that there are multiple sociodemographic variables that increase one's risk for developing problematic internet use. These include being male, younger in age, and higher family income (Kuss & Lopez-Fernandez, 2016; Baloğlu, Özteke Kozan & Kesici, 2018). In terms of sex differences, recent data showed that problematic internet use was more prevalent among males (14.2%) than for females (10.1%). Specific to age, 15-year-old boys and 14-year-old girls reported the highest prevalence, and only about 13.5% reported parental control or restrictions on their internet use. Males with problematic internet use were particularly susceptible to loneliness (Vigna-Taglianti, et al., 2017).

## Screening and Treatment Practices of Providers

Most children attend well-child visits at a pediatrician's office on a regular basis throughout their childhood, which allows providers an opportunity to screen for frequency and duration of media/technology use and educate both parents and children on the consequences of overuse (Moreno et al., 2018). Because screen media/technology has been shown to have various detrimental effects on child and adolescent physical and psychological health and development, primary care family physicians and pediatricians should provide guidance and education for parents on this topic. However, to date, only one research study has examined the impact of counseling about media/technology use delivered to children and parents in the medical setting. It should be noted that primary care providers receive little or no training on the physical and psychological health effects of media/technology and screen time on children, which likely contributes to the limited research on provider-delivered practices in clinical settings.

Moreno et al. (2018) studied the effects of a pediatrician-delivered social media/technology intervention (PDSMI) on adolescent and young adult social media/technology use. Data collected from 10,967 youth aged 14-25 years found that pediatricians trained in PDSMI were more likely to talk about media/technology with their adolescent patients (79% vs. 45%), discuss a healthy balance between online and offline activities (70% vs. 37%), discuss boundaries on various media/technology platforms (69% vs. 32%), and ask about parent-child communication regarding media/technology use (67% vs. 28%). At a 6-month

follow up, participants who received the PDSMI reported that they were more likely than those who did not receive the intervention to practice safe online "friending" behaviors, communicate with their parents about their social media/technology use, and state that their parents set limits on their social media/technology use. This study demonstrated that brief PDSMI is effective in promoting parent-child communication regarding social media/technology and adolescent "friending" behavior (Moreno et al., 2018). While this study showed the positive impact pediatric providers can have on adolescent media/technology use, little is known about the frequency and content of the communication between providers and their patients and families on the topic. In the absence of these discussions, the onus is on the parents to educate themselves and extrapolate techniques and tools from the internet to insure their children are engaging in healthy media/technology use.

*Benefits of Media and Technology Use*

Much of the current research on technology and media use is focused on the negative effects and the potential problems increased use may have on youth of the digital generations. However, there are benefits of media and technology use that must be acknowledged as well. When supported by an adult, developing children can learn how to interpret sound, image, and text, and problem solve. Digital books and literacy-oriented applications have been shown to increase children's reading for pleasure and learning. Digital gaming that involves evaluating and creating

games, as well as fostering discussions, has also been shown to support learning. Internet-connected toys (IoT) are increasingly becoming more popular as they attempt to combine physical and digital play. IoT offers the opportunity to personalize play and learning, and is specifically beneficial for developing literacy and numeracy skills. However, because media and technology is still relatively new and ever evolving, there appears to be a lack of guidance for parents on how to appropriately use media and technology with their children to achieve the benefits and avoid the pitfalls (Gillen at al., 2018).

## American Academy of Pediatrics Media/Technology Guidelines

The American Academy of Pediatrics (AAP) has endorsed an official policy for how parents and caretakers may maintain healthy child media/technology use (see appendix). Current guidelines set by the AAP indicate that children aged 0-24 months should not engage in media/technology use, with the exception of occasional video-chat media/technology to connect with family far away. For children ages 2-5 years old, the AAP suggests one hour or less of sedentary television watching per day. The AAP recommends that children older than 6 years of age have substantial boundaries on time and type of media/technology, and that it should never take the place of necessary health behaviors (e.g., sleep and physical activity) (American Academy of Pediatrics, 2016).

The AAP recommends that pediatricians play an active role in guiding parents on media/technology and screen use. Pediatricians are encouraged to start the conversation about media/technology use with parents early, help families develop a family media/technology use plan, and educate parents about brain development and the importance of hands-on learning in the early years. The AAP also suggests that pediatricians guide parents to quality products (eg, Common Sense Media/technology, PBS kids, Sesame Workshop), as well as help parents to problem-solve challenges with setting limits and provide alternative strategies to calm their child. Although there are separate guidelines for pediatricians and parents, the content of the guidelines is virtually the same—they merely differ in how the party disseminates the information. The pediatrician guidelines are focused on parent education on child media/technology use, while the parental guidelines are direct instructions to be implemented. While the AAP emphasizes the importance of the role of a child's pediatrician in helping set these guidelines, it is likely that providers may not adequately disseminate this information to parents.

One particular study asked 1,454 parents what medical professional they rely on for advice regarding their child's media/technology practice: their child's pediatrician or the AAP. Overall, 29% reported relying on their pediatrician and 24% reported relying on the AAP's media/technology guidelines. Individuals who reported reliance on the AAP's guidelines were more likely to prohibit bedroom television and follow all recommendations than those who only relied on their

pediatricians (Lapierre, Piotrowski & Linebarger, 2014). This difference in adherence may be due to the fact that pediatricians have no formal training on how to discuss media/technology use with parents and/or the clear and specific guidelines set forth by the AAP are easier to implement. The findings demonstrate that parents who are aware of the AAP media/technology guidelines can and do follow them, however, many parents are simply unaware of any such recommendations. It is likely that parental adherence to the AAP guidelines could be amplified if providers presented this specific information during their child' medical visits. Furthermore, the study also highlights that a large proportion of parents do not rely on either of these experts for guidance on appropriate family media/technology practices. This raises the question of where, if anywhere, do parents receive information about healthy childhood media/technology use and guidelines?

In addition to the recommendations for pediatricians, the AAP provides specific recommendations for parents to use as guidelines for healthy child media/technology use. Parents play a critical role in creating and maintaining a child's environment. They strongly influence and shape their child's behaviors, including how they interact with media/technology. The AAP recommends parents avoid fast-paced, violent programs or applications with highly distracting content. They also suggest that media/technology be turned "off" when not in use and to avoid using it as a calming strategy. Keeping bedtimes, mealtimes, and parent-child

interaction time media/technology free is also recommended (AAP, 2016). According to a recent consensus, only one in five parents are aware of the AAP media/technology recommendation for young children. Over half (51%) of parents indicated that they did not know about the guidelines but were interested in learning more, while 29% of parents reported that they were not interested. Specifically, findings demonstrate a divide in parents who are aware of the AAP recommendations. Significantly more white, higher-income, and higher-educated parents reported knowledge of the guidelines, compared to 16% of low-income or high school-educated parents. Hispanic/Latino parents were the least likely to report knowledge about the recommendations, but also indicated the most interest (Rideout, 2017).

## Rationale and Justification for Study

Media and technology are important for children and adolescents, in that they can facilitate learning, connect users with others, and prepare them for the rapidly expanding digital world (Radesky, Schumacher & Zuckerman, 2015; Rideout, 2017). However, such advancements directly and indirectly lead to potentially negative consequences for children. Directly, media/technology content influences the way children think and act. Fast-paced content has been shown to impair executive functioning and increase ADHD-related behaviors (Christakis, Zimmerman, & DiGuiseppe, 2004; Zimmerman & Christikis, 2007). Violent

content has also been shown to increase violence and aggression, as studies have consistently found that young children learn and replicate what they see (Anderson & Bushman, 2002; Bandura, Ross & Ross, 1963; Bushman & Huesmann, 2006; Gentile, 2014).

Indirectly, media/technology use displaces other activities that are greatly beneficial to overall child health. Time spent on media/technology devices comes at the expense of developmentally prudent activities, such as physical activity, in-person interaction, and reading (Christakis, 2014). This displacement is associated with obesity (Bellissimo et al., 2007; Hancox, Milne, & Poulton, 2004; Wen et al., 2014), sleep problems (Johannson, Petrisko, & Chasens, 2016; King, Gradisar & Drummond, 2013; Li, Jin & Wu, 2007; Vijakkhana et al., 2015), anxiety (Bessière, 2010; Cantor & Riddle, 2014; Hoge, Bickham & Cantor, 2016; Pantic et al., 2012; Richins, 1991; Young, 2017), depression and suicidal ideation (Hawton et al., 2013; Ortega, Elipe & Mora-Merchán, 2012), and substance use (Hancox, Milne, & Poulton, 2004; Hou et al., 2012; Kim, 2008; Thorens et al., 2014; Van Rooij et al., 2014).

Despite the significant effect media/technology use can have on the overall health of children, parents are often provided with little information about healthy media/technology use from their child's pediatricians. This may be largely due to lack of adequate provider training about pediatric media/technology use guidelines as well as time and resource constraints within the medical setting. Consequently, this gap in pediatric clinical practice may result in limited implementation of

healthy media/technology practices by parents at home and health and behavioral problems in their children.

Guidelines for healthy media/technology habits in children have been developed (AAP, 2016), however, many parents are not aware of recommended healthy media/technology behaviors when this information is not adequately conveyed by their pediatric providers. The guidelines proposed by the American Academy of Pediatrics recommend that children under 2 years should not be exposed to media/technology, and children 2-5 years should be limited to one hour of high quality programming with an adult per day. They also recommend all screens should be turned off one hour prior to bedtime, screens should not be in children's bedrooms or used during meals, and screen time should not displace important behaviors such as exercise, play, and social interactions (AAP, 2016). These guidelines are the most recent available to address healthy media/technology use in the pediatric population and are empirically based. However, due to the rapidly growing trend in technology use, research on the long-term effects of childhood media/technology exposure is still ongoing. Nevertheless, these recommendations should guide pediatricians in the provision of media/technology education to parents.

Previous studies have shown that pediatric healthcare professionals are inconsistent in their provision of media/technology education to parents (Lapierre, Piotrowski & Linebarger, 2014; Rideout, 2017). A number of factors have also been identified to affect parental access to information, as well as understanding or

application of healthy media/technology practices for their children, including demographic factors as well as their belief about the effects of media/technology. The present study will build on previous research by exploring the factors that impact whether parents receive information from their pediatric providers that is consistent with the most recent AAP guidelines about healthy media/technology practices. Unlike prior studies, the current study examines whether parental compliance with these guidelines impacts the media/technology practices for their children and related health and behavior difficulties. Information obtained in this study will be useful to inform effective provider-delivered screening and education efforts that improve parental awareness of healthy pediatric and family media/technology habits.

**Study Objectives:**

- Objective 1: To determine the proportion of parents who receive pediatric media/technology education from their primary pediatric providers, as based on parent report.
    - Hypothesis 1.1: Few parents (<50%) will receive media/technology education from their pediatric providers.
- Objective 2: To examine rates of parental compliance with provider-delivered pediatric media/technology recommendations.
    - Hypothesis 2.1: Low rates of parental compliance (<50%) with pediatric media/technology guidelines will be reported.

- Hypothesis 2.2: Parents who do not receive media/technology education will be less compliant with media/technology recommendations.

- Objective 3: To examine the relationship between parental compliance with media/technology guidelines and the frequency/severity of pediatric physical and mental health problems, and behavioral difficulties.
  - Hypothesis 3.1: Parents who are less compliant with media/technology guidelines will endorse more frequent and more severe overall health and behavior problems for their children.
- Objective 4: To evaluate factors that influence parent receipt of healthy media/technology education from pediatric providers. Variables to be examined include but are not limited to demographic characteristics of the child, reason for pediatric referral, and other parent and child psychosocial variables.
  - Hypothesis 4.1: Demographic characteristics of the child and parent will influence parent receipt of media/technology education from their providers.
  - Hypothesis 4.2: Reasons for the child's referral to the pediatric provider will influence parent receipt of media/technology education from their providers.

**Participants and Setting:**

The participants in this study were parents/guardians of children (2-17 years). Although AAP guidelines for infant/toddler (0-24 months) media use do exist, it is recommended children this young do not engage with media/technology (AAP, 2016). Therefore, for the purpose of this study, the research will focus on children between the ages of 2-17 years. A total of 302 participants were enrolled in the study. Participants were recruited via the internet, through social media. Parents/Guardians were asked to choose the child in their home who most recently visited the pediatrician as their focus for the survey. The parent/guardian who accompanied the child to their most recent pediatric medical visit (routine or sick visit) was asked to complete the survey. Only one parent per household completed the survey. Children did not participate in the study. The following represent the inclusion and exclusion criteria for the study:

Inclusion criteria: Parent of a child 2-17 yrs who could read the study survey and was currently living in the United States.

Exclusion criteria: Child had not seen a medical provider in the past year.

**Methods and Procedures:**

Approval from the Florida Institute of Technology Institutional Review Board (IRB) was obtained prior to participant recruitment. Parents were asked to complete an online survey about their child's digital media/technology habits and media/technology education delivered by their child's provider. Information about

the survey was distributed via the internet (Facebook, twitter, and email) and flyers distributed at parent-friendly locations (e.g. childcare centers, health centers, and schools). Informed consent was obtained on the first page of the survey prior to study enrollment. Participant names were not collected as part of this study. The information that was collected was entered into a HIPAA-compliant database and all personally identifying information was de-identified with minimal risk of breaching confidentiality.

**Outcome measures:**

This study utilized a questionnaire that was developed for the purposes of this study. The survey is based on AAP digital media/technology guidelines and the common biopsychosocial problems found in the literature related to childhood digital media/technology use (Anderson, Levin & Lorch, 1977; Gentile, et al., 2017; Johannson, Petrisko, & Chasens, 2016; Torres et al., 2018; Valkenburg, Huizinga, & Buchman, 2014; Zimmerman & Christakis, 2007). The survey contained 45 questions, tapping the domains of demographics, child media/technology habits, child health and behavior problems, communication with the primary care provider, and compliance with pediatric media/technology use guidelines. Survey items asked about parent demographic information (12 questions), child demographic information (2 questions), child medical information including previous physical and mental health diagnoses and medication (2 questions),emotional and behavioral difficulties (1 item with 18 sub questions), the

child's most recent visit to their primary care provider (4 items), knowledge of AAP media/technology recommendations and communication with primary care provider (23 items), and barriers to adhering to healthy digital media/technology practices (1 items). The survey targeted parents of children (ages 2-17). Items were evaluated in terms of categories, and individual items were also be evaluated qualitatively for greater descriptive value. Completion of this measure required approximately 10 minutes to complete.

The primary outcomes in the current study included:

a. Receipt of digital media/technology use education from providers: This component was evaluated via one question regarding whether child digital media/technology use was discussed by the provider with the parent during the child's most recent medical visit. Receipt of information was scored as yes/no. Follow up questions asked the parent to rate the information on a numeric rating scale ranging from 0 to 5. The items included comprehensiveness of information (0=incomplete; 5=very comprehensive), ability to understand the information (0=very difficult to understand; 0= very easy to understand), and their satisfaction with the information provided (0=unsatisfied; 5= very satisfied).

b. Child Physical, Psychosocial, and Behavioral Problems: The presence of child physical, psychosocial, and behavioral problems was measured on a Likert scale (0=never to 4=always) and based on relevant content from the Eyberg Child Behavior Inventory (Eyberg, 1999) and additional items

derived from the literature review of common physical and psychological health problems related to media/technology use in children. Identified problems were evaluated in terms of frequency in which items scored as "often" or "always" identified as problem behaviors. The total number of problems endorsed ranged from 0 to 18. Problem severity was also assessed based on Likert scale ratings with total scores ranging from 0 to 72) and categorized into no (severity scores of 0-9), mild (severity scores of 10-30), moderate (severity scores of 31-48), or severe problems (severity scores of 49-72).

c. Parent compliance with AAP guidelines: Level of compliance was measured based on the AAP guidelines for different age groups. For children 2-5 years old, level of compliance was measured in terms of total time the child spends on media/technology use. Parents were asked to indicate, in hours, how much time his/her child spends on media/technology on a typical weekday (i.e. less than 1 hour, 1-2 hours, 2-3 hours, 3-4 hours, more than 4 hours). A response of "less than 1 hour" was assigned one point as it is consistent with the AAP guidelines for this age group. All other responses were assigned a score of 0. For children older than 6 years, level of compliance was measured by whether the parent endorsed having rules in the household regarding amount of media/technology screen time the child is allowed. A response of "yes" was scored 1 point as this is consistent with the AAP guidelines for this age group. A response of "no" was scored 0.

The total time on media/technology score, in combination with the points/score assigned to additional items that align with AAP guidelines and are universal to all age groups, were used to assess parent compliance with the pediatric media/technology guidelines.

The scores were then categorized as compliant, partially compliant, or noncompliant. A composite score was calculated for compliance, ranging from 0 to 8 with points being earned for compliance with the age-appropriate duration recommendations or media/technology rules and the general media/technology use guidelines identified by the AAP. Compliant was defined as the child's digital media/technology use duration falling within the recommended number of hours (age 2-5) or having specific rules/limits on their media/technology use (6 and older), as well as adherence to all of the child media/technology use guidelines endorsed by the AAP ("Does your child's media/technology use effect sleep", "does your child's media/technology use take the place of physical activity", "are the TV and other media/technology turned off when not in use", "do you monitor and test the applications and content that your child uses/watches", "does your child have a TV, computer, or other media/technology in his/her bedroom", "does your child use media/technology 1 hour before bedtime", and "does your child use media/technology during mealtimes") (compliance score= 8); partially compliant was defined as any combination of compliance with total time spent using media/technology and/or other

media/technology guidelines resulting in a score between 1 and 7; and noncompliance was defined as not complying with any of the media/technology use guidelines (compliance score= 0).

d. Demographic information; Child information obtained included age and gender. Parent demographic information included age, gender, race/ethnicity, annual household income, and education. Child medical information was also addressed, including previous physical and mental health diagnoses, prescribed medications, and information about the child's most recent visit to their pediatric provider.

**Research Design and Analysis Plan**

This study utilized a cross-sectional design. Data was collected via an online survey, was published using the Qualtrics software program. This survey was available through FIT's partnership with Qualtrics, and the survey was maintained on the Qualtrics website. The first page of the survey provided a description of the survey along with the informed consent.

Descriptive statistics including means, standard deviations, and frequencies were calculated for child and parent demographic variables, for the primary outcomes (parental receipt of child media/technology education, parental compliance with digital media/technology use guidelines and child physical, psychosocial, and behavioral problems), and all covariates. Chi square testing was conducted to examine the relationships between receipt of media/technology

education and parental compliance with guidelines. Analyses of variance (ANOVA) was used to examine the relationship between parental compliance and child age on the frequency and severity of child behavioral problems. Logistic regression models were constructed to examine the predictors of parental receipt of provider-delivered media/technology information. Preliminary analyses were conducted to determine those variables that would be included in the final regression model. Data was analyzed using the Statistical Package for the Social Sciences (SPSS) –version 25.

## Results

*Participants*

A total of 302 participants were enrolled in the study. Of the parents who chose to provide their demographic information, 89% of the sample was female (n= 265), while 11% (n=33) was male, and 0.3% (n=1) identified as non-binary/third gender. Approximately 80% of the sample (n=243) was between the ages of 31 and 50 years. Full demographic characteristics of the parent sample are presented in Table 1. Of the parents who chose to provide their child's demographic information, the mean age of the children was 7.0 years (SD= 4.5; range= 2-17 years). The gender distribution of children in the sample was 54.9% male (n=163), 44.1% female (n=131), and 0.34% non-binary (n=3). Full demographics of the children sampled are presented in Table 2.

*Relationship Between Parental Receipt of Media/Technology Education and Compliance*

Only 27.5% (n=78) of parents reported that media/technology was discussed at their child's most recent visit to a medical provider. Of the parents who reported that media/technology was discussed, 66.7% (n=66) reported that the conversation about media/technology was initiated by the medical provider, while 14.3.1% (n=11) reported they initiated the conversation themselves. When answering whether they believed the information provided was comprehensive (0= incomplete; 5= very comprehensive), parents' mean score was 3.53 (SD=1.22), indicating receipt of moderately comprehensive media/technology use education from their child's provider. Parents also endorsed a mean knowledge score (0 = difficult to understand; 5= very easy to understand) of 4.39 (SD=0.89), indicating that the information was easy to understand. Lastly, parents reported a mean satisfaction score (0= unsatisfied; 5= very satisfied) of 4.09 (SD=1.03), indicating that parents who received this information were satisfied with the media/technology education provided to them.

Overall, 52.3% (158) of parents reported that they were aware of the AAP guidelines regardless if they had been discussed with their child's medical provider. While over half of the parents were aware of the AAP guidelines, 61.9% (n=187) believed that they should be discussed and addressed by their child's medical provider. Ninety-seven percent (n=273) of parents reported that their child uses media and technology, with the most frequently endorsed activities being streaming

video content (79.8%), watching TV/movies (66.2%), and school work/educational (58.6%). Table 3 presents the frequency of type of media/technology used by the children. Overall, the mean hours of time spent on media/technology by children was 2.45 hours (SD=1.18). When examining media/technology use by age, the mean time spent on media/technology for younger children was 1.93 hours (SD= 0.76) and 2.83 hours (SD= 1.23) for older children. Furthermore, the results showed that the number of hours parents spent on media/technology was significantly related to number of hours the child spent on media/technology, $r$ = .34, $p < .01$.

A total score was calculated for parent compliance, ranging from 0 to 8 (8=compliant). Overall, the mean compliance score for the total sample was 4.03 (SD=1.14). For children 2-5 years old, level of compliance was measured in terms of total time the child spent on media/technology each day and adherence to all of the child media/technology use guidelines endorsed by the AAP. The survey revealed that 20.0% (n=19) of parents of young children were not in compliance with the AAP recommendations for time spent on media/technology per day. In terms of overall compliance, including the AAP guidelines, no parent responded in a way that indicated complete non-compliance. Results showed that all parents of young children were partially compliant with the AAP guidelines (M=3.30, SD=1.00).

For children 6 and older, level of compliance was measured in terms of having specific rules/limits on their child's media/technology use, as well as

adherence to all of the child media/technology use guidelines endorsed by the AAP. The survey revealed that 33.3% (n=57) of parents of older children were not in compliance with the AAP recommendations of having specific rules/limits on media/technology use. Similar to the younger children, the survey showed that all of the parents of older children fell into the partially compliant range (M=4.6, SD=1.4). Analysis showed that parents of older children were significantly more compliant with the AAP guidelines than younger children, t(245)=-4.78, $p<0.001$. Parent responses also indicated the AAP guidelines that were most difficult to follow. For example, sixty-two percent (n=188) of children used media/technology one hour before bedtime, 36.8% (n=111) were calmed by media/technology, and 32.1% (n=97) had media/technology in his/her room.

A median split was performed to identify low and high parental compliance groups (compliance with AAP guidelines) and examine the differences between these groups on a number of variables. There was a significant difference in child age for the high parent compliant (M=7.93, SD=4.49), and low parent compliant (M=5.97, SD=4.34) groups, t(295)=-3.82, p<0.00. Table 4 presents parental compliance and receipt of education for the different child age groups (ages 2-5 years and ages 6-17 years). Chi-square analyses were performed to examine the relationship between parent receipt of media/technology education (yes/no) and parent compliance (low/high) for the two child age groups. There was no significant association between parental receipt of education and compliance for the

younger children, $\chi_2$ (1) =0.85, $p$ >.10 or the older child age group, $\chi_2$ (1) =3.11, $p$ >.10.

*Child Physical, Psychosocial, and Behavioral Problems*

Physical, psychosocial, and behavioral problems in children were evaluated in terms of frequency (total number of problems endorsed; ranging from 0 to 18) and severity (based on the Likert scale ratings and ranging from 0 to 72). The mean frequency of problem behaviors endorsed by parents for the total sample was 2.41 (SD=2.32). The mean severity of problem behavior endorsed by parents for the total sample was 17.7 (SD=9.6). The most frequently endorsed physical health problem for both child age groups was lack of exercise, with 57.7% of parents reporting their child had difficulties completing 60 minutes of moderate to vigorous-intensity physical activity at least one day per week. Table 5 presents the frequency of parent endorsement of each child behavior problem.

There was a significant association between level of parent compliance and the child's diagnosis, $\chi_2$ (1) =8.17, $p$ < .01. Child diagnosis was categorized by whether the parent endorsed that his/her child has been diagnosed with a least one physical/psychological disorder (n=101) or if they do not have any physical/psychological diagnoses (n=171). Results indicated that a greater proportion of children with at least one diagnosis had high compliant parents (80.2%) than low compliant parents (19.2%). Level of compliance was specifically examined in relation to the child's diagnosis of ADHD, and a marginally

significant association between a diagnosis of ADHD and level of parental compliance was found, $\chi_2$ (1) =3.62, $p$ = 0.06.

Frequency of behavior problems was analyzed with a 2 (Parent Compliance: Low versus High) X 2 (Child Age: Younger versus Older) between-subjects ANOVA. Levene's test suggests that the homogeneity of variances assumption was fulfilled, $F(3,242) = 1.25$, $p = .29$. Results showed that there was not a significant main effect of parent compliance, $F$ (1, 242) = 0.38, $p$ = 0.54, partial $\eta_2$ =0.002, or child age, $F$ (1, 242) = 3.74, $p$ = 0.05, partial $\eta_2$ =0.02, on frequency of child behavior problems. There was also no significant interaction effect between parental compliance and child age on frequency of child behavior problems, $F$ (1, 242) = 0.94, $p$ = 0.33, partial $\eta_2$ =0.004.

Additionally, severity of child behavior problems was analyzed with a 2 (Parent Compliance: Low versus High) X 2 (Child Age: Younger versus Older) between-subjects ANOVA. Levene's test suggests that the homogeneity of variances assumption was fulfilled, $F(3,242) = 1.18$, $p = .32$. Results showed a significant main effect of child age on severity of behavior problems, $F$ (1, 242) = 4.92, $p$ = 0.03, partial $\eta_2$ =0.02. The severity of problem behaviors was significantly greater for younger children ($M$=19.41, $SD$=1.06) than older children ($M$=16.32, $SD$=0.91). However, there was not a significant main effect of parent compliance on severity of child behavior problems, $F$ (1, 242) = 1.09, $p$ = 0.30, partial $\eta_2$ =0.004. Further, there was no significant interaction effect between

parental compliance and child age on severity of child behavior problems, $F$ (1, 242) = 0.24, $p$ = 0.62, partial $\eta_2$ =0.001.

Parents endorsed a number of barriers to limiting their child's media/technology use, including that it is easy for their child to use media/technology when they cannot attend to them (39.1%), the use of media/technology for school (32.8%), and the parent's work schedule (20.0%). Parents also indicated multiple benefits of the child's use of media/technology, including learning and education (82.1%), relaxation (55.6%), and skill development (35.1%).

*Factors That Influence Receipt of Media/Technology Education*

A logistic regression analysis was performed to assess the impact of a number of factors on the likelihood that parents reported receipt of media/technology education from their child's pediatric provider (see table 8). Preliminary analyses were performed to decide which variables would be included in the model. Chi square analyses were used to determine the significant variables that were included in the final regression. The model contained child's age, child's gender, estimated household income (less than $99,999 and greater than $99,999), and reason for referral. The full model containing all of the variables was statistically significant, $\chi_2$ (6) =27.68, $p$ < .01, indicating that the model was able to distinguish between parents who received media/technology use education from those who did not. The model as a whole explained between 10.2% (Cox and Snell

$R^2$) and 14.8% (Nagelkerke $R^2$) of the variance in receipt of education, as correctly classified in 71.9% of the cases. As shown in Table 8, only acute reason for referral and household income of less than $99,999 were significant predictors of receipt of media/technology use education. The strongest predictor of receipt of media/technology use education was acute reason for referral, as demonstrated by an odds ratio of 18.75. This indicated that when acute illness/behavior problem was the reason for referral, parents and providers were 18.75 times more likely to discuss media/technology during the medical visit than when children were referred for other reasons, controlling for all other factors in the model.

## Discussion

*Impact of Study*

Previous studies have shown that pediatric healthcare providers are inconsistent in their provision of media/technology education to parents (Lapierre, Piotrowski & Linebarger, 2014; Rideout, 2017), an outcome that was confirmed in this study, with only 27.5% of parents reporting that media/technology was discussed at their child's most recent visit to a medical provider. These results support the first hypothesis that few parents (<50%) would receive media/technology education from their pediatric providers. While parents reported awareness of the need to manage their child's screen behaviors, despite not receiving information from their child's medical provider, these rates are still discouraging as they highlight a large gap in pediatric clinical practice.

Furthermore, most parents indicated a desire to receive media/technology education from their child's medical provider. The development and use of evidence-based screening tools and multiple ready-to use information sources by the provider, involvement of the medical team during the clinical encounter, and continuing education of providers about recommended guidelines may improve dissemination of information to parents about appropriate and safe media and technology use for their children.

Examination of factors that influenced the likelihood that parents received media/technology use education indicated that the child's visit for an acute illness or behavioral problem was the strongest predictor of whether media/technology was discussed at the visit. This finding may be explained by the fact that children's daily routine and behaviors may be explored and scrutinized more closely when an acute problem is present, such that the provider is more apt to inquire about media habits. However, the AAP recommends that pediatric providers inquire about the quantity and quality of a child's media/technology use at every well-child visit, and not only when the child is sick or experiencing behavioral problems.

Additionally, parents from higher income levels were more likely to report receipt of media/technology use education, while parents from lower income levels were less like to report receipt of media/technology use information from their providers. This finding may be explained by research that suggests that physicians are less likely to perceive low SES patients as intelligent, independent, or responsible when compared to other patients. They are more likely to believe that

patients of lower SES are less likely to comply with medical advice and will therefore delay or fail to provide comprehensive medical information and services (Arpey, Gaglioti, & Rosenbaum, 2017; van Ryn & Burke, 2000; Woo et al., 2004). Additionally, research shows that health literacy—an individual's capacity to obtain, process, and understand basic health information needed to make health decisions—is lower for racial/ethnic minorities and individuals with low SES (Ayotte, Allaire, & Bosworth, 2009; Rikard et al., 2016). Studies have also shown a digital disparity in health information in which age, ethnicity, and socioeconomic status predict less health information seeking behavior (Jacobs, Amuta, & Chan Jeon, 2017).

For children in particular, research has consistently found disparities in health and healthcare related to both race or ethnicity and socioeconomic status (Mudd et al., 2019; Cheng & Goodman, 2015; Seith & Isakson, 2013). A recent study examining racial disparities in family-reported experiences of care found that minority parents reported a 30-50% lower satisfaction score related to poor communication and cultural incompetency (Nagarajan, Rahman, & Boss, 2017). While closing the gap in healthcare disparities has been an important focus for AAP in recent years, the results of the current study demonstrates that a difference in receipt of healthcare information based on socioeconomic status may still exist.

Contrary to our hypothesis, a significant relationship between parental receipt of education and their compliance with media/technology use guidelines was not found. Overall, no parent was fully compliant nor completely non-

compliant with the AAP guidelines; all participants fell into the partially compliant range. The lack of a significant association between parental receipt of information and compliance level may partially be explained by the fact that there was limited variability in parent compliance scores and a limited number of parents who received media/technology use education from their child's provider. It may also be reflective of a social desirability bias, in that parents responded to the survey questions in a way to appear favorably to others due to the face validity of the survey items. That is, they may have over-reported "good behavior" (i.e., endorsing compliance with guidelines) and under-reported "bad behavior" (i.e., denied non-compliance). Additionally, the content and scope of information delivered by the provider to the parent during the medical visit was not evaluated such that it is difficult to determine to what extent the AAP guidelines were specifically addressed. As this is the first study to examine these variables, additional research including objective measures of both information delivery by providers and compliance would be necessary to more fully examine how provider education impacts parent compliance.

There was, however, a significant difference in level of parental compliance between the child age groups. The results showed that parents of older children were significantly more compliant with the AAP guidelines than parents of younger children. This was surprising due to the fact that parents are typically more involved in younger children's daily routines, which should ensure greater compliance. The greater compliance with recommended media/technology use for

older children may be due to the fact that there are no specific guidelines for hours spent on media/technology as there is with younger children (only the loose recommendation that there should be limits), making it easier for parents to be compliant. Furthermore, because parents may have less oversight of their older child's daily media/technology habits, their report of their child's adherence to the guidelines may be less accurate. This observation is consistent with previous research that has demonstrated that parents tend to underestimate teens' media use (Blackwell et al., 2016).

We hypothesized that parents who were less compliant with media/technology guidelines would endorse more frequent and more severe behavior problems for their children. However, this finding was not supported by our results and is inconsistent with previous studies that found that increased media/technology use was significantly related to increased behavioral problems (Anderson & Bushman, 2002; Bushman & Huesmann, 2006; Gentile, 2014; Zimmerman & Christakis, 2007). Specifically, increased media/technology use has been significantly related to increased symptoms of ADHD (Bourchtein et al., 2019; Christakis, Zimmerman, & DiGuiseppe, 2004; George, Russel, Piontak, & Odgers, 2018; Zimmerman & Christikis, 2007). The greater severity of behavior problems reported among younger children in our study may more likely reflect the child's developmental status rather than parental management of screen time. While we attempted to include survey items that assessed behavior problems across age groups, some items may have been more salient for younger age groups (i.e.

temper tantrums) and reported more frequently. Behavior problem items included for older children (ie. alcohol/drug use) may not have been endorsed due to parental lack of awareness of their child's habits. Our study findings may further be limited, however, by the overall low frequency and severity of child behavior problems endorsed by parents. Additionally, parents' compliance scores were all within the partially compliant range (1-7), thereby limiting variability on this measure.

In terms of health problems, the results demonstrated that the presence of a physical or psychological diagnosis was significantly associated with a higher level of parental compliance. This may reflect a tendency of parents to be more vigilant about their child's behaviors if they view them as more vulnerable. This finding is particularly important as previous studies have found that increased media/technology use is related to adverse health outcomes (Chobanian et al., 2003; Egan, Li, Hutchison & Ferdinand, 2014Gentile et al., 2017; Torres et al., 2018; Wen et al., 2014). Therefore, if parents of children who already demonstrate at least one health problem are endorsing higher levels of compliance with AAP guidelines of media/technology use, they may prevent or reduce the possibility for increased negative health effects in an already vulnerable population. It is important to note that parents did endorse some difficulty with adhering to the AAP guidelines specific to sleep. While not statistically significant, two of the guidelines that were complied with the least were related to the child using media at least one hour before bedtime and the child having media/technology in the bedroom. This is consistent with research on sleep that found increased screens in the child's

bedroom, particularly in racially diverse and low income households (Bourchtein et al., 2019; Fobian, Avis, & Schwebel, 2016; Przybylski, 2019).

*Limitations of Study and Future Areas of Research:*

There are several limitations for the current study that are inherent in pediatric media/technology use research. First, the primary outcomes in this study are based solely on parent report. It is possible that the rates of parental receipt of information may be influenced by parental perceptions and recollection of the experience with their child's provider and may not accurately reflect whether media/technology information was actually delivered by the provider. Future studies should consider inclusion of provider reports of the interaction and/or observational data regarding the visit to supplement parent report. In addition, this study relies on parent report of their child's media/technology use, which is a major outcome of this study. It is difficult to assess the accuracy of parental reports of their child's media/technology use, particularly for older children who may spend much of their time away from the parent. However, the survey items have been designed to detail different types of media/technology to aid in the accuracy of the report. Ideally, inclusion of an objective media/technology use measure, such as an application on all devices to measure the exact use duration, would improve the validity of parent reports.

Another potential challenge for the study was the possibility that the parent/guardian who accompanied the child to medical visits (and eligible to

participate in this study) was not the parent in control of the child's media/technology use. As media/technology use is widely and easily available, children and adolescents may access media/technology without their parent's direct knowledge or in settings away from the home. This prevents a direct examination of the association between parental receipt of information and translation of that information into implementation of the media/technology guidelines. In order to better control for this in future studies, inclusion criteria would require that parent participants both accompany their child to their medical visit and manage their child's media/technology use for most accurate reporting.

Additionally, it must be recognized that there are individual differences in a child's need for media/technology use. The ranges endorsed by the American Academy of Pediatrics for recommended media/technology use are guidelines, and as such, it is possible that individual children could fall outside of the recommended range. Children and adolescents who have disabilities that effect their mobility may acquire more time spent on media/technology due to decreased ability to engage in physical activities. Further, individuals with developmental disorders, such as Autism Spectrum Disorder, may show increased media/technology use to cope with their difficulties in social situations and communication deficits. Older children and adolescents may also engage in media/technology use for educational purposes and/or required schoolwork that increases their time spent on various media platforms. Questions about these factors are included in this survey, however, it is difficult to determine how they

influence children on an individual basis. Methodologically, the study's cross-sectional design also limits the evaluation of persistent media/technology use problems over time which may require more intensive preventative efforts in addition to provider education.

Lastly, the sample for this study is relatively small, predominantly white and middle to upper income, and not representative of the population as a whole. This may limit its generalizability to the general population. The limited number of minority and low SES parents in this study is consistent with the profile of participants who typically participate in community surveys (Cifuentes et al., 2008; Goodman & Blum, 1996). Many researchers have hypothesized that individuals in lower SES positions may have less time, more fatigue, and less motivation to participate in surveys and engage in social participation (Karasek & Theorell, 1990). The impact of income levels on the types and sources of information available to parents about media/technology, how parents engage with their provider, and how parents access and understand new information is a focus for future research.

## Tables

**Table 1**

*Descriptive statistics for parental demographic variables*

| Variable | N (%) |
|---|---|
| Gender | |
| Male | 33 (11.0%) |
| Female | 265 (88.6%) |
| Non-binary | 1 (0.33%) |
| Age | |
| 20-30 | 43 (14.2%) |
| 31-40 | 136 (45.0%) |
| 41-50 | 107 (35.4%) |
| 51-60 | 11 (3.6%) |
| Race | |
| White/Caucasian | 271 (90.3%) |
| American Indian/Alaskan Native | 1 (.33%) |
| Black/African American | 8 (2.7%) |
| Asian/Asian American | 6 (2.0%) |
| Biracial/Multiracial | 8 (2.7%) |
| Other | 6 (2.0%) |
| Ethnicity | |
| Hispanic/Latino | 17 (5.7%) |
| Not Hispanic/Latino | 283 (94.3%) |
| Marital Status | |
| Single | 23 (7.7%) |
| Married | 248 (82.7%) |
| Separated | 4 (1.3%) |
| Divorced | 15 (5.0%) |
| Widowed | 4 (1.3%) |
| Remarried | 6 (2.0%) |
| Education | |
| Less than 8th Grade | 2 (0.7%) |
| High School | 5 (1.7%) |
| Some College | 35 (11.7%) |
| Associate's Degree | 18 (6.0%) |
| Bachelor's Degree | 123 (41.0%) |
| Master's Degree | 94 (31.3%) |
| Doctoral Degree | 23 (7.7%) |
| Income | |
| Less than $20,000 | 5 (1.7%) |
| $20,000-59,000 | 55 (16.7%) |
| $60,000-99,000 | 82 (24.4%) |
| $100,000 or greater | 162 (54%) |

*Note.* N=302; Some parents elected not to provide specific demographic information such that frequencies may not reflect the total sample.

**Table 2**

*Descriptive statistics for child demographic and medical variables*

| **Variable** | **N (%)** |
|---|---|
| Gender | |
| Male | 168 (54.9%) |
| Female | 131 (44.1%) |
| Non-binary/Prefer not to say | 3 (0.34%) |
| Medical/Psychological Diagnoses | |
| None | 190 (50.9%) |
| Attention-Deficit/Hyperactivity Disorder (ADHD) | 37 (9.9%) |
| Oppositional Defiant Disorder (ODD) | 3 (0.80%) |
| Autism | 17 (4.6%) |
| Developmental Delays | 9 (2.4%) |
| Anxiety/Panic Attacks/Social Anxiety | 26 (7.0%) |
| Depression | 6 (1.6%) |
| Learning Disability | 13 (3.5%) |
| Gastrointestinal (e.g. stomach/GI) problems | 10 (2.7%) |
| Obesity | 6 (1.6%) |
| Other | 47 (9.9%) |
| Reason for Referral | |
| Check-up/Well Visit | 213 (74.2%) |
| Acute Illness (flu, cold, strep throat, etc.) | 61 (21.3%) |
| Acute behavioral problems | 4 (1.4%) |
| Chronic Illness (asthma, allergies, other) | 7 (2.5%) |
| Chronic Behavioral problems | 1 (0.4%) |
| Sleep Problems | 1 (0.4%) |
| Last Visit to Pediatrician | |
| Within the last month | 83 (28.9%) |
| 1-6 months ago | 145 (50.5%) |
| 6 months to 1 year ago | 53 (18.5%) |
| Greater than 1 year ago | 6 (2.1%) |

*Note.* N=302; Some parents elected to not provide specific information such that frequencies may not reflect the total sample.

**Table 3**

*Frequency of type of media/technology use*

| **Type of media/technology** | **N (%)** |
|---|---|
| Streaming video content (YouTube, Netflix, Hulu, Amazon Prime, etc…) | 241 (79.8%) |
| Video Games | 155 (51.3%) |
| Watching T.V./movies (non-streaming) | 200 (61/2%) |
| Texting, cellphone, video chatting | 118 (39.1%) |
| Schoolwork/education | 157 (58.6%) |
| Social Media | 57 (18.9%) |
| Music/podcasts | 106 (35.1%) |
| Internet Browsing | 72 (23.8%) |

*Note*. N=302; Parents were asked to indicate all types of media/technology his/her child uses such that the frequencies exceed the total sample due to children using multiple platforms.

**Table 4**

*Parent compliance and receipt of media/technology education for younger and older children*

| | **Level of Compliance** | | **Receipt of Education** | | $\chi^2$ |
|---|---|---|---|---|---|
| Age | Low (n= 72) | High (n=155) | Yes (n=69) | No (n=192) | |
| Younger Children[a] | 36 (42.9%) | 48 (57.1%) | 18 (21.4%) | 66 (78.6%) | 0.85 |
| Older Children[b] | 36 (22.2%) | 107 (62.6%) | 51 (31.5%) | 126 (77.8%) | 3.11 |

*Note*. Some parents elected to not provide specific information such that frequencies may not reflect the total sample.

[a]Younger Children = 2-5 years; [b]Older Children = 6-17 years

All p values > 0.1

**Table 5**

*Frequency of child's psychosocial and behavioral problems (endorsed "often" or greater)*

| Variable | Younger Children[a] n=94 (%) | Older Children[b] n=166 (%) | Total n=260 (%) |
|---|---|---|---|
| Following rules | 26 (27.4%) | 25 (14.6%) | 51 (19.6%) |
| Listening without threat of punishment | 37 (38.9%) | 37 (21.6%) | 84 (32.3%) |
| Temper tantrums | 22 (23.2%) | 9 (5.3%) | 31 (11.9%) |
| Sadness or loss of interest | 1 (1.1%) | 7 (4.1%) | 8 (4.0%) |
| Worry, anxiety, nervousness | 11 (11.6%) | 39 (22.8%) | 50 (19.2%) |
| Aggression toward parents, teachers or other caregivers | 5 (5.3%) | 3 (1.8%) | 8 (4.0%) |
| Aggression toward peers/siblings | 8 (8.4%) | 12 (7.0%) | 20 (7.7%) |
| Trouble making/keeping friends | 9 (9.5%) | 5 (2.9%) | 14 (5.4%) |
| Easily distracted | 28 (29.5%) | 44 (25.7%) | 72 (28.7%) |
| Fails to finish tasks/projects | 16 (16.8%) | 23 (13.5%) | 39 (13.9%) |
| Difficulty entertaining self | 10 (10.5%) | 27 (15.8%) | 37 (15.0%) |
| Overactive or restlessness | 18 (18.9%) | 14 (8.2%) | 32 (12.3%) |
| Trouble falling asleep | 6 (6.3%) | 11 (6.4%) | 17 (6.5%) |
| Waking up in the middle of the night/difficulty staying asleep | 10 (10.5%) | 10 (5.8%) | 20 (7.7%) |
| Sleepiness throughout the day | 3 (3.2%) | 8 (4.7%) | 11 (4.2%) |
| Completing 60 minutes of moderate to vigorous-intensity physical activity | 54 (49.4%) | 96 (51.4%) | 150 (57.7%) |
| Overeating | 2 (2.1%) | 11 (6.4%) | 13 (5.0%) |
| Drug or alcohol use (Includes marijuana, cigarette and e-cigarette use) | 1 (1.1%) | 5 (2.5%) | 6 (0.23%) |

*Note.* Some parents elected to not provide specific information such that frequencies may not reflect the total sample.

[a]Younger Children = 2-5 years; [b]Older Children = 6-17 years

**Table 6**

*Factorial ANOVA results of the effects of parental compliance and child age on frequency of behavior problems*

| Source | SS | df | MS | F |
|---|---|---|---|---|
| Parental Compliance | 2.03 | 1 | 2.03 | 0.38 |
| Child Age | 19.88 | 1 | 19.88 | 3.74 |
| Compliance * Child Age | 5.01 | 1 | 5.01 | 0.94 |
| Error | 1286.16 | 242 | 5.32 | |

*Note:* All p values > 0.1

**Table 7**

*Factorial ANOVA results of the effects of parental compliance and child age on severity of behavior problems*

| Source | SS | df | MS | F |
|---|---|---|---|---|
| Parental Compliance | 99.94 | 1 | 99.94 | 1.09 |
| Child Age | 453.00 | 1 | 453.00 | 4.92* |
| Compliance * Child Age | 22.42 | 1 | 22.42 | 0.24 |
| Error | 22265.58 | 242 | 92.01 | |

*$p < .05$

**Table 8**

*Logistic regression results for factors influencing parents receipt of media/technology use information from providers*

| Predictors | *B* | SE | Odds Ratio (95% CI) | *p* |
|---|---|---|---|---|
| Child's Age | -0.46 | 0.31 | 0.63 (0.35, 1.15) | 0.13 |
| Child's Gender [a] | -0.27 | 0.28 | 2.77 (0.63, 3.55) | 0.43 |
| Income < $99,999 | 0.62 | 0.29 | 1.86 (1.05, 3.31) | 0.04* |
| Income >$99,999 | 0.17 | 0.51 | 1.20 (0.44, 3.25) | 0.73 |
| Reason for Referral-Acute Illness[b] | -20.58 | 0.40 | 18.75 (8.44, 23.16) | 0.00** |

*Note.* 10.2% (Cox and Snell $R^2$), 14.8% (Nagelkerke $R^2$). Model $\chi_2$ (6) =27.68, $p < .01$

[a]reference group is male, [b]reference group is other reason for referral. *p<0.05, **p<0.001

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