Media Use and Screen Time - Its Impact on Children, Adolescents, and Families

American College of Pediatricians | May 2020

ABSTRACT: All forms of media, especially visual media, play an increasing role in the lives of children, adolescents, and families in the United States. While limited use of high-quality and developmentally appropriate media may have a positive influence, excessive or developmentally inappropriate use carries grave health risks. Excessive exposure to screens (television, tablets, smartphones, computers, and video game consoles), especially at young ages, is associated with lower academic performance, sleep disturbances, obesity, attention deficit, increased aggression, lower self-esteem, depression, and increased rates of high-risk behaviors. The American College of Pediatricians (ACPeds) encourages parents to become media literate and limit screen time for their children. Parents must lead by example and restrict their own screen time to foster a healthy relationship with their children. The ACPeds encourages pediatricians to regularly warn families about the negative impact of media during well child visits, and calls upon the media industry, sponsors, educators, and policymakers to act responsibly to protect the physical and emotional health of children and families.

INTRODUCTION

The term media commonly refers to mass communication through the use of newspapers, books, magazines, television, radio, film, Internet-enabled devices, or video games. There is abundant research evaluating the impact of various media on children and adolescents; however, television watching, video game playing, and electronic screen time have received a great deal of attention in recent years because of their popularity among youth. While not exhaustive, this position paper reviews key medical and social science research findings with an emphasis on the impact on brain development, and provides a summary of the major known adverse effects of screen time in particular. Screen time includes time spent utilizing any technology that involves a screen, including smart phones, tablets, television, video games, and computers.

TRENDS IN USE OF MEDIA

Time Spent Using Media

Children and adolescents' use of media has greatly increased in the past 5 – 10 years, and the type of media accessed has changed. Common Sense Media released a report in 2019 that surveyed a representative sample of 1677 families from all regions of the United States. Their report found 8 – 12-year old's experience almost five hours of screen

exposure each day, and teens are viewing screens for an average of almost 7 ½ hours each day. These numbers do not include time the children are using screens for school work.[1] This report also noted an unexpected increase in the amount of time that the tweens and teens were spending watching online videos. From 2015 to 2019, the percentage of children watching online videos daily more than doubled so that by 2019, 56% of 8 to 12-year-old and 69% of 13 – 18-year olds were watching every day, spending on average 56 to 59 minutes a day.[1] This correlates with a significant decrease of approximately 30 minutes in the amount of time that both groups spent watching television.[2]

The Kaiser Family Foundation regularly surveyed media use in children between the late 1990's and 2011. The Foundation's most recent report from 2010 examined the behavior of two thousand 8 – 18-year old's and showed that the average child spent 7.5 hours each day using media. However, because of multi-tasking, children actually crammed 10.75 hours of media use into that 7.5-hour period of time. On a typical day, these 8 - 18-year olds spent approximately 4.39 hours viewing television, 2.31 hours listening to music, 1.29 hours using computers, and 1.13 hours playing video games. It is important to note that print media, such as books or magazines, and movies, are also consumed on a daily basis but the least amount of time is spent with these media.[2] Another study found 18-year old's in America spent nearly 40 hours each week accessing the Internet from their home computers.[2]

As part of the 2018 International Study of Asthma and Allergies in Children Phase Three, adolescents between 12 and 15 years of age from 37 countries provided information on television viewing habits. Eighty-nine percent of adolescents reported more than one hour of television viewing daily.[3] Ninety-five percent of adolescents own a smartphone or have access to one and 45% of teens report they are online almost constantly.[4] Common Sense Media found the majority (53%) of 11-year olds also have their own smartphone, and even 19% of 8-year olds have their own phone. This was a significant increase from 2015.

The Pew Research Center released a study in August, 2018, revealing that 54% of American teens between 13 and 17 years of age worried they were spending too much time on their cell phones and 52% tried to cut back their use. Four in ten teens stated they felt anxious when they did not have their cell phone with them, with more girls (49%) experiencing anxiety than boys (35%), and 25% of teens felt lonely without their phones.[5]

Media Exposure of Younger Children

Younger children are increasingly exposed to screen time opportunities, with one study showing 18% of children 0 – 2 years old had a television in their bedroom. Sixty-three percent of children between birth and two years of age had watched television in the day prior to the survey, and the mean television viewing time was 75 minutes.[6]

A more recent study in Singapore evaluated 725 children under two years of age. Of 93 children who were between 18 and 24 months of age, 88.2% were allowed daily screen time, with television and mobile devices being the most commonly used.[7]

Another study evaluated the difference in screen time exposure in young children before and after the wide availability of mobile devices. Utilizing data from 1997 and 2014,

researchers found children between 0 and 2 years of age increased screen time from 1.32 hours each day in 1997 to 3.05 hours in 2014. Most of this time was spent viewing television, but 0.37 hours was spent on mobile devices.[8]

Children 3 – 5 years of age spent 2.47 hours each day on screens in 1997 but did not experience a significant increase in screen time in 2014. Television viewing still accounted for the greatest amount of screen time (78%) in this age group.[8]

The TABLET project in the United Kingdom (Toddler Attentional Behaviours and Learning with Touchscreens) found that 51% of infants between 6 and 11 months of age were using a touchscreen on a daily basis for over 8 minutes a day, while older 26 – 36 month olds used a touch screen for over 43 minutes a day.[9,10]

Common Sense Media also tracks media availability in children in America from birth through 8 years of age and its 2017 report found that 95% of homes have a smartphone and 78% of homes have a tablet, with 42% of children between 0 and 8 years having their own tablet. Toddlers less than two years of age spent an average of 42 minutes each day viewing screen media.[1]

A study of 350 children between 6 months and 4 years of age in a low-income, minority community found "almost all children (96.6%) used mobile devices, and most started using before age 1." The parents stated they allowed the children to use the devices to keep them calm and also before bedtime.[11] Significantly in this study, most of the 3 and 4-year old children were able to use the mobile devices without help and one-third had already started to multitask.[11]

Various Forms of Media

Although there are other media readily available, television is still the predominant medium accessed today. However, television shows may now be downloaded onto computers, smartphones, and tablets. As reported in 2010, approximately 60% of viewing by adolescents is done via television, with the remaining 40 % occurring via alternative devices.[2] And, as noted above, time spent on television viewing is giving way to time spent on smartphones.

Social Media

In addition, the use of social media contributes greatly to increased screen time. In 2011, the American Academy of Pediatrics reported 75% of adolescents owned a cell phone, 25% used the phone for accessing social media, and 22% of adolescents log on to social media more than 10 times a day.[6] Adolescents use their cell phones more for texting rather than for live conversation. In one survey, teens 13 to 17 years of age were noted to send an average of 3364 texts per month, with one-third of adolescents stating they sent more than 100 texts per day.[12]

The Common Sense Media 2019 report found, although the amount of time spent on social media remained fairly constant at approximately one hour for the previous four years, children were more likely to access it daily. Sixty-three percent of teens used social media daily in 2019.[1]

Parental Rules Regarding Media

Most children and adolescents live in homes where there are no parental rules regarding screen time. In one study, less than 30% of children and adolescents 8 - 18 years of age stated there were household rules regarding time spent viewing television. Parents were more likely to have rules regarding programs viewed—but even so, only 46% of these children and adolescents stated there were such rules in their home. In this same study, 64% of those surveyed stated the television in their homes was left on during meals, and 45% stated the television was left on most of the time.[13]

Even more significant, parental television viewing time is closely associated with children's viewing time—and impacts the screen time of their children more than household rules.[14] Attempts to decrease children's viewing times will be more effective when parental screen time is also limited.

A Pew Research Center report in March 2019 found 65% of 1000 parents surveyed thought their teenagers spent too much time on devices with screens. Almost the same number of parents did monitor their adolescents' online activities via several methods, including looking through the teen's cellphone call records and messages and limiting duration of Internet access. Up to 57% of parents in the survey said they removed their teen's cell phone or Internet privileges as a form of punishment.[15] Parents of younger teens (13 – 14 years of age) were more likely to monitor their teen's activities and limit screen time. The majority

of parents of younger teens (72%) said they looked at messages on their teen's cellphones, whereas only 48% of parents of older teens (15 – 17 years) did so.[15]

Media Use Decreases Time Spent in More Healthful Activities

Time spent with 'screen use' must be taken from other more potentially beneficial activities of the day—personal 'face-to-face' communication and interaction with family and friends, outdoor play (with its associated benefits of creativity, problem solving, and exercise), reading, homework, doing chores, and sleeping.

Reading, for example, is known to stimulate brain development in young children so it is an important activity for parents to promote.[13] Time spent reading books, however, constitutes only a small portion of the toddler's day as children less than 2 years of age only experience an average of 21 minutes of reading each day.[13]

Reading is also impacted by the expansion of screen time as parents now can use eBooks to read to their children. Thirty-seven parent-toddler dyads were videotaped while using

three different reading formats – enhanced electronic books with sound effects or animation, basic electronic books and printed books. Parents and toddlers both demonstrated significantly more dialogue and verbalizations when reading printed books.[16]

Reading decreases with age, dropping from 66% of 8-12-year olds to only 51% of teens stating they read for fun at least once a week. If there is a parent with a college degree in the home, children are more likely to enjoy reading and to read more frequently.[2]

IMPACT ON BRAIN DEVELOPMENT – Infants and Young Children

The brain undergoes significant development during the first three years, and the young child is learning rapidly. The brain is therefore vulnerable during this time to both positive and negative influences.[17] Given the rapid development of the brain, it is not surprising that infants and young children exposed to screen time demonstrate changes in both the structure and function of their brains.[18]

The American Academy of Pediatrics states, "The cognitive impact of television use on infants and toddlers (<2.5 years old) is related to the amount of the exposure, the program content, and the social context of viewing."[17] There are studies that demonstrate young children (6 – 18 months of age) can learn from television and will imitate behaviors viewed on the screen. But these studies also show that the toddlers learn better from live demonstrations.[19] Researchers refer to a concept called the "video transfer deficit" in toddlers. The children less than 30 months of age can view a 2-dimensional video program but have difficulty transferring that knowledge to their 3-dimensional world, again demonstrating the importance of personal interaction with a teaching adult.[20] Toddlers generally pay little attention to adult television programming but studies show that having the television on in the background can interfere with the toddler's sustained attention to play and reduce the quality and quantity of interactions with parents.[21,22]

The impact of screen time on overall development of the young child demonstrates an adverse impact on development. Researchers utilized data on 2441 mothers and children in Canada's longitudinal cohort study "All our Families" that assessed children at 24, 36, and 60 months of age. "Higher levels of screen time at 24 and 36 months were significantly associated with poorer performance on developmental screening tests at 36 months." Because this was a longitudinal study, it helped address the question of which comes first – developmental delay or screen time. The data show greater screen time at 24 months was associated with decreased developmental performance at 36 months. In addition, the same adverse results were seen for increased screen time at 36 months leading to poorer developmental results at 60 months of age.[23]

Researchers have also investigated the role of television programs on specific educational goals such as early language development and literacy. Although there are studies that demonstrate a positive impact of educational television programs for preschoolers on vocabulary and school readiness, these children nearly always learn best when they have direct interactions with nurturing adults.[24] Different types of research, including longitudinal and cross-sectional studies, have demonstrated that toddlers who are exposed

to more screen time daily have significantly lower communication scores.[18] A case-control study that compared children with language delays to children without delays between 15 and 48 months of age found those children who started watching television before 1 year of age and also watched television more than 2 hours each day were almost six times more likely to experience delays in language development.[18] Another study evaluated the impact of viewing baby DVDs on infants who were 8 - 16 months of age. They found that for each hour per day of viewing, there was a decrease of almost 17 points on the MacArthur-Bates Communicative Development Inventory.[25] In a small study of nineteen 3 – 5-year old's, brain magnetic resonance imaging showed greater neural activation in the left side of the brain that supports language processing in children who were exposed to more reading time at home.[26]

IMPACT ON BRAIN DEVELOPMENT – Elementary Age Children

Utilizing data from the 10-year ABCD (Adolescent Brain Cognitive Development) longitudinal study of 4520 American children between 8 – 11 years of age, researchers evaluated all participants for adherence to the Canadian 24-Hour Movement Guidelines for Children and Youth that included 60 minutes of physical activity per day, 2 hours or less of recreational screen time per day and 9-11 hours of sleep per night. "Compared with meeting none of the recommendations, associations with superior global cognition were found in participants who met all three recommendations, the screen time recommendation only, and both the screen time and the sleep recommendations." having less exposure to screen time was associated with improved global cognition in these children.[27]

The ABCD study also found differences in MRI brain scans when children had more than 7 hours of screen time daily. Presently the significance of those changes is unclear.[28] However, in a small study of 19 elementary school children, magnetic resonance imaging of brains demonstrated that there was increased brain connectivity between areas involved in visual word formation, language formation and executive functions in children who spent more time reading. Conversely, lower connectivity was found in children who were exposed to more screen time.[29]

IMPACT ON BRAIN DEVELOPMENT – Adolescents

Today's adolescents are often referred to as "digital natives" when discussing their interactions with media as they do not recall a time without Internet, smartphones, or social media. Their social interactions increasingly consist of media-related activities where they make connections, seek peer acceptance, and monitor peer activities.[4] There are numerous social media sites available to today's adolescents, with YouTube, Instagram and Snapchat now more popular than Facebook, according to the Pew Research Center's report in 2018, and teens generally access more than one platform. For example, 85% of adolescents report using YouTube, 72% Instagram, 69% Snapchat and 51% Facebook.[4] Adolescents themselves acknowledge both the positive and negative aspects of social media. The positive effects include the ability to connect with family and friends, the ability

to meet others who have similar interests, and as a means of self-expression. Negative effects reported by teens include bullying, harmful effects on relationships with lack of personal contact, giving an unrealistic view of others' lives and causing distraction or peer pressure.[4]

Since adolescence is a time of rapid brain development, it is important to evaluate the impact of media, especially social media, during this vulnerable time.[30] As noted in Nature Communications, "…changes in grey matter volume are observed most extensively in brain regions that are important for social

understanding and communication such as the medial prefrontal cortex, superior temporal cortex and temporal parietal junction."[30] One of the ways the adolescent and brain development may be impacted by social media is via social rejection. Researchers have utilized functional MRI neuroimaging to evaluate the impact of rejection on social media on brain activity and have found changes in several regions of the brain associated with judgment and emotions.[31] In addition, when adolescents perceive rejection in research situations, they often respond more aggressively towards those who have rejected them.[32] Conversely, acceptance on social media (receiving "likes") generates brain responses that are similar to receiving rewards such as money with increased activity in the brain regions associated with pleasure and reward (the ventral striatum).[30,33] Both rejection and acceptance on social media appear to be moderated by the dorsolateral prefrontal cortex, the area of the brain associated with executive functions, such as judgment. Since this area is not fully mature until around 24 years of age, the adolescent may be more susceptible to the emotional content of social media.[30]

IMPACT ON PLAY AND DEVELOPMENT

As younger children are increasingly exposed to screen time through the use of parental cell phones, researchers are beginning to evaluate the impact of this on the preschooler. In one study by a global security software maker 2200 mothers from 10 developed nations, including the United States and Canada, who had children between two and five years of age were surveyed. The study mothers reported that more of these preschool children could use technology than could demonstrate 'life skills' such as tying their shoes, riding a bike, or swimming. For example, 58% of the preschool children knew how to play a computer game versus only 9% who could tie their shoes. (Mothers aged 35 and older were slightly better at teaching their children 'life skills'.)[34]

The Association of Teachers and Lecturers in the United Kingdom warned that as preschool children spend more time using screen technology, they become less able to perform basic tasks such as using building blocks. Older children were less able to utilize pen and pencil for school tasks.[35] Two small studies suggest the importance of traditional toys in the language development of young children. One study of toddlers (between 18 and 30 months of age) found improved language scores among the children whose parents engaged them in play with building blocks. Another study of 26 parent-infant dyads found

that during play with electronic toys, there was less vocalization – both by the parent and their infants (age 10-16 months).[36,37]

Adults tend to absorb information from television, even though they forget the source, and sometimes cannot recall whether the events were real or simulated.[38] Children also learn from what they view. Significantly, even toddlers have been shown to imitate behaviors they have viewed on a screen.[19] More importantly, young children pay greater attention to visual images rather than the plot, so they are often unable to understand the storyline or moral lesson and are less able to separate reality from fiction.

Visual images can also be frightening for the young child—and these images can remain in the child's subconscious for a long time, causing nightmares and other sleep disturbances.

IMPACT ON SLEEP

Media use may interfere with adequate quantity (duration) and quality (nighttime waking, nightmares, irregular bedtimes) of sleep. In addition to the well-known problems associated with inadequate sleep, poor quantity or quality of sleep is associated with impaired immune function, and impaired regulation of metabolism.[39]

Parents of 495 children in kindergarten through fourth grade were surveyed regarding their children's sleep habits as well as their television viewing. Twenty-five percent of the children had a television in their bedroom. The authors note, "The television-viewing habits associated most significantly with sleep disturbance were increased daily television viewing amounts and increased television viewing at bedtime, especially in the context of having a television set in the bedroom."[40]

A meta-analysis of 20 studies involving children between 6 and 19 years of age found "a strong and consistent association between bedtime media device use and inadequate sleep quantity…, poor sleep quality…and excessive daytime sleepiness. In addition, children who had access to (but did not use) media devices at night were also more likely to have inadequate sleep quantity…, poor sleep quality…and excessive daytime sleepiness."[41]

Even the youngest children's sleep is affected by screen use. In a survey of 715 families in the United Kingdom, researchers found that 75% of toddlers 6 months to 3 years of age use a touchscreen on a daily basis. Those toddlers who had increased touchscreen use had a decrease in the duration of their nighttime sleep, and increased daytime sleep and a longer sleep onset.[42]

Emphasizing the relationship between screen use and shorter durations of sleep, researchers evaluating data from the Youth Risk Behavior Surveillance System of the Centers for Disease Control learned that adolescents in 2015 were more likely to report less than 7 hours of sleep compared to teens in 2009. In addition, it was use of media screen time that contributed to less sleep, and there was a "clear exposure-response relationship for electronic devices after 2 or more hours of use per day."[43]

Sleep deprivation has other significant health effects as it is associated with obesity, diabetes, school failure, and behavior problems including hyperactivity.[39] Demonstrating the impact of night-time use of electronic devices on sleep and obesity, researchers in Alberta, Canada, surveyed 3398 fifth grade children and found 64% of parents stated their children had access to one or more electronic devices in their bedroom. The study found a relationship between night-time use of electronic devices and shortened sleep duration, increased body weight, and lower levels of physical activity.[44]

There is also concern that lack of sleep, in and of itself, may contribute to the increased prevalence of mental health concerns in adolescents. An Australian study of 1101 students aged 13 to 16 years old found poor sleep mediated the relationship between screen use and subsequent depression and externalizing behaviors.[45] There are several proposed mechanisms by which lack of sleep contributes to poor mental health. The various sleep stages are associated with changes in functional brain activity as well as brain neurochemistry. During REM sleep, for example, there is an increase in the activity in areas of the brain involved with emotional regulation (prefrontal cortex, amygdala, and hippocampus). There is also a significant decrease in levels of noradrenaline during REM sleep, indicating a relationship between sleep duration, sleep stages, and mental wellbeing.[46]

IMPACT ON NUTRITION / OBESITY

There is a definite relationship between hours spent viewing television during childhood and a higher risk for obesity. Studies of preschoolers and children have shown that heavy media use (more than 2 hours / day) leads to small but significant increases in obesity.[47]

A systematic review of 232 articles involving 983,840 participants demonstrated a dose-response relationship between hours spent viewing television with an increasing risk of obesity.[47] Even lower amounts of television viewing can increase the risk of obesity. In a study of 4072 children between 4 and 13 years of age from the Netherlands, viewing television for more than 1.5 hours a day greatly increased the risk for obesity in those between 4 – 8 years of age.[48]

In a study of over 207,000 adolescents from 37 countries, researchers found that increased hours spent watching television were associated with higher BMI in adolescents with an apparent dose response effect.[47]

In this study, those who watched between 1 – 3 hours of television daily had a 10% - 27% increased risk of obesity.[47] Other negative health effects, including increase in systolic blood pressure, are also seen with increased television viewing.[47] Just having a television present in the bedroom is an independent risk factor for obesity.[49]

IMPACT ON ACADEMIC PERFORMANCE

The negative associations between excessive media exposure and academic performance has been well documented.[50] Zimmerman and Christakis evaluated young children up to

seven years of age regarding the impact of television viewing on cognitive development. Controlling for parental cognitive stimulation and maternal education, the researchers found "each hour of average daily television viewing before age three years was associated with deleterious effects" in several scales evaluating reading recognition and comprehension.[51]

Children with a television in their bedroom are known to score 7 to 8 points lower on standardized tests for mathematics and reading than those without a television in their bedroom. [50]

If instant messaging via electronic devices is considered, research notes there may be a negative impact on academic performance when messaging interferes with sleep. A study of 1537 students from three high schools in New Jersey found those students who reported more use of instant messaging after 'lights out' were more likely to report fewer hours of sleeping and lower academic performance.[52]

IMPACT ON BULLYING

Internet bullying (cyber bullying) is common and has serious consequences. Over half of today's adolescents state that they have been bullied online, and over 25% of adolescents state that they have been bullied repeatedly through the Internet or on cell phones. However, only 1 in 10 teens tell a parent about the bullying.[53] Sadly, some victims of cyber bullying resort to suicide to escape the embarrassment. A review of 37 studies found a definite relationship between cyber bullying and suicidal ideation and behavior.[54]

IMPACT ON PSYCHOLOGICAL WELL-BEING AND DEPRESSION

Increasingly research is demonstrating the negative impact of increased screen time on the psychological wellbeing of children and adolescents. A large national sample (40,337) of children 2 – 17 years of age were evaluated in 2016 for their use of all forms of screen time. Those who were exposed to more than one hour per day of screen time had "lower psychological well-being, including less curiosity, lower self-control, more distractibility, more difficulty making friends, less emotional stability, being more difficult to care for, and inability to finish tasks." Those who were 14 – 17 years of age who had more than 7 hours a day of screen time were more than twice as likely to have been diagnosed with depression compared to those only used screens less than one hour a day. Importantly, this study is not confounded by including children with developmental or intellectual delays. In addition, it showed that the tipping point for behavioral changes seemed to occur when children were exposed to more than one hour a day of screen time.[55]

Several studies demonstrate the relationship between increased use of screen time and depression. One longitudinal study in Denmark followed a cohort of 435 adolescents into young adulthood and found "each additional hour/day spent watching television or screen viewing in adolescence was associated with …greater odds of prevalent depression in

young adulthood, and dose-response relationships were indicated."[56] Another study from Canada evaluated 2482 youth in grades 7 – 12 and concluded, "Video
game playing and computer use but not TV viewing were associated with more severe depressive symptoms…Screen time may represent a risk factor or marker of anxiety and depression in adolescents."[57]

A study of 8256 Australian adolescents utilizing self-report surveys found a relationship between increased leisure time screen use and depressive symptoms in the younger (12 – 14-year-old) adolescents. A Meta-Analysis from the British Journal of Sports Medicine in 2016 suggests that screen time in children and adolescents is associated with depression risk in a non-linear dose-response manner.[58]

In a prospective study from Montreal, Canada, researchers followed 3826 adolescents beginning in 7th grade for four years to evaluate the efficacy of a "personality-targeted drug and alcohol prevention intervention".[59]

As part of the research, adolescents completed surveys that included amount of screen time and symptoms of depression. Results showed for every one hour increase in social media and computer use there was an increase in the severity of depressive symptoms. This was not true for time spent on video games.[59] Accessing social media seems to be the predominant factor that links screen time to adolescent mental health concerns. Research on the use of Facebook at a state university in Utah found that those who used Facebook longer were more likely to feel that other people were happier and had better lives.[60] In fact, this led to the coining of the term "FOMO" – fear of missing out – to describe the apprehension that others might be having fun and enjoyable experiences that are not being experienced by the viewer.[61]

Using data from the Ontario Student Drug use and Health survey, a Canadian Medical Association Journal article notes that the percentage of adolescents reporting moderate to serious mental distress increased from 24% in 2013 to 39% in 2017.[62] During the same interval, teens in Ontario who reported spending 5 or more hours a day on social media increased from 11% in 2013 to 20% in 2017.[62]

Using annual national surveys of over 1 million American adolescents in 8th, 10th, and 12th grades, researchers found psychological wellbeing suddenly decreased after 2012. The authors concluded, "Adolescents who spent more time on electronic communication and screens (e.g., social media, the Internet, texting, gaming) and less time on non-screen activities (e.g., in-person social interaction, sports/exercise, homework, attending religious services) had lower psychological wellbeing."[63]

In a study of 300 individuals, including students, researchers found just having a smartphone present on a table decreased an individual's attention to others, making one feel more distracted while experiencing less enjoyment during social interactions.[64] A new term, "phubbing" was coined to describe this behavior of 'snubbing' another person in order to pay attention to one's 'phone'.[65] Researchers are now investigating the impact of phubbing on social relationships - not just in adolescents, but also in adults. In one study

of 400 college students in India, almost one-half admitted to phubbing and those individuals were less likely to have satisfactory relationships and more likely to describe themselves as depressed.[66]

Interestingly, how social media is used, and by whom, can determine the effects on adolescent mental wellbeing.[67] An adolescent who has fewer in-person social interactions, for example, is at greater risk to develop depression than one who has high levels of face-to-face socialization.[68]

IMPACT ON BEHAVIOR AND ATTENTION

Screen time likely impacts children's behavior and capacity to pay attention via several mechanisms as it leads to sleep disturbances and adversely impacts brain development. A 2016 study linked increased screen time with poor sleep quality and behavior problems.[69]

Although studies demonstrate watching pro-social television programs may help preschoolers develop a more positive view of those who are different from them, the concern is that viewing programs with inappropriate content may lead to increased aggression and hyperactivity.[70] The number of hours spent viewing television at a young age has also been linked with future attention difficulties. Even watching a brief 9-minute cartoon was demonstrated to adversely affect the executive functioning of preschoolers' brains. Sixty 4-year-olds were assessed after watching either a fast-paced television cartoon, an educational cartoon or after drawing. "Children who watched the fast-paced television cartoon performed significantly worse on the executive function tasks than children in the other 2 groups."[71]

An analysis using the National Longitudinal Survey of Youth found "hours viewed per day at both ages one and three was associated with attentional problems at age seven."[72] Similar results are available for the adverse effect on attention in older children and adolescents. A study of 1323 middle school children and 210 late adolescents/early adult participants found a relationship between time spent viewing television and playing video games with difficulties paying attention. This study is significant because of its longitudinal design for the children in middle school which allowed the researchers to control for previous attention difficulties. In addition, the researchers documented the contribution of video game playing to the development of attention problems as assessed by teachers.[73] Another study of 9th and 10th graders confirmed the negative effects of video games, finding that playing for more than one hour a day increased the symptoms of attention deficit hyperactivity disorder.[74]

IMPACT ON AGGRESSIVE BEHAVIOR AND VIOLENCE

Aggressive Behavior

Also, of grave concern is the association between viewing media violence and increased real-life aggression. The American Academy of Pediatrics, in its policy statement on Media

Education, documents, "Results of more than 2000 scientific studies and reviews have shown that significant exposure to media violence increases the risk of aggressive behavior in certain children and adolescents, desensitizes them to violence, and makes them believe that the world is a 'meaner and scarier' place than it is."[75]

A 2010 research paper entitled *Health Effects of Media on Children and Adolescents,* poignantly states:

> *"The relationship between media violence and real-life aggression is nearly as strong as the impact of cigarette smoking on lung cancer: Not everyone who smokes will get lung cancer, and not everyone who views media violence will become aggressive themselves. However, the connection is significant. The most problematic forms of media violence include attractive and unpunished perpetrators, no harm to victims, realism, and humor."*[76]

Violence in Television

Of concern, nearly two-thirds of all TV programs contain violent scenes, including so-called children's programs, and it is well documented that children imitate behavior seen on television, including such media violence.[76,77]

Numerous studies have now documented the link between viewing violence and future aggressive behavior. One such study evaluated 430 third, fourth, and fifth graders and their teachers and found children's exposure to media violence predicted higher verbal, as well as higher physical, aggressive behavior.[78] More concerning is the fact that not only is violence depicted frequently in media, but it is depicted in ways that reinforce aggressive behavior in viewers—it is shown as justifiable, realistic, and without adverse consequences.

Violence in Video Games

Video games deserve special mention; as even parents of toddlers are utilizing the games on their smartphones to entertain their young children. Children and adolescents who spend time playing video games (especially violent games) are more likely to have difficulties paying attention in school; act aggressively toward others; interpret others' behaviors more negatively; have decreased empathy; have less pro-social behavior; and respond more violently when confronted.[78,80,81,82]

More than 85% of video games contain violence, and 90% of video games marketed to children age 10 years and older have violent content. Unfortunately, the top selling video games are those that are the most violent, and parents provide less oversight for video games than they do for television viewing. Ninety % of adolescents in grades 8 – 12 reported their parents never check the ratings of video games prior to purchase and 89% stated their parents never limited time playing video games. [81]

The American Psychological Association confirmed the association between violent video game use and increases in aggressive behavior in its 2015 Task Force on Violent Media that reviewed 170 articles, including four meta-analyses.[83]

Violence in Literature

There is less research on the impact of reading violence, but one study indicates the possible adverse effects of reading literature that depicts physical and relational aggression. Using undergraduate college students, one study evaluated the impact of reading selections with either physical or relational aggression and the impact on subsequent behavior. Researchers found those who read a story with physical aggression were more likely to be physically aggressive in later interactions and those who read the story with relational aggression were more likely to be relationally aggressive in the study interactions."[84]

IMPACT ON SOCIAL-EMOTIONAL DEVELOPMENT

Mirror neurons are cells in the brain that appear to be involved in the development of empathy and compassion. They allow an individual to have 'cognitive empathy'—the mental ability to take another's perspective—and these mirror neurons are undergoing dramatic changes during adolescence, as are other areas of the brain.

A study from UCLA demonstrated the impact of media via cell phones on the ability of sixth graders to recognize people's emotions in photos and videos. Students attending a nature camp who went without screen time for five days were compared with students who would attend the camp later. Each set of students were evaluated at the beginning and end of the week, with the students who attended camp and went without screen time improving in their emotional cognition after only five days of non-use. The authors stated, "Decreased sensitivity to emotional cues—losing the ability to understand the emotions of other people—is one of the costs. The displacement of in-person social interaction by screen interaction seems to be reducing social skills."[85]

IMPACT OF MEDIA ON SEXUAL RISK BEHAVIORS

Inaccurate Sexual Information

Sexual messages are prevalent in film, television, and music, and are often explicit but also inaccurate and misleading. Unfortunately, however, these messages are frequently accepted as truth by young people. Adult sexual behaviors are often portrayed as frequent, risk-free, and are much more likely to occur between unmarried partners than spouses.[86]

Both programming and advertising are highly sexualized in their content. Teens rank the media as the second leading source of information about sexual behavior (The first is school sex education).[87]

Earlier Sexual Debut

Studies reveal that the more an adolescent watches television programming featuring sexual content, the more likely that adolescent is to prematurely initiate sexual activity. Teens exposed to a high level of sexual content were also twice as likely to experience a pregnancy within the next three years as compared to those teens who viewed less sexualized programming.[88,89] These studies also documented that teens who were exposed to talk about sex on television experienced risks similar to those teens who viewed actual sexual behavior.[88]

Additionally, a 2012 longitudinal study of 6522 adolescents in the U.S., ages 10 to 14, found that early exposure to sexual content in popular, mainstream movies was predictive of an earlier age of sexual debut and engagement in risky sexual behaviors. The findings suggested that exposure to sexual content in movies may promote sexual risk taking by changing actual sexual behaviors and also by accelerating the normal rise in sensation seeking in teens.[90] Similarly, research on 1058 youth between 14 and 21 years of age found "more frequent exposure to sexual media was related to ever having had sex, coercive sex victimization, and attempted /completed rape but not risky sexual behavior."[91] However, another longitudinal study of adolescents in the United States found sexual exposure through movies predicted the age of sexual debut, as well as engagement in risky sexual behaviors.[90]

Pornography via Internet

In the Internet era, pornography has become easily accessible to people of all ages, including children and adolescents. In recent years, there has been an increase in empirical research examining the impact of pornography use among minors. A recent and systematic examination of the peer-reviewed research spanning years 1995 to 2015 indicated that pornography use among adolescents is prevalent, mainly accessed via the Internet, and first exposure often occurs unintentionally. Although there are many variables impacting this research, pornography is associated with more permissive sexual attitudes, earlier sexual intercourse, greater experience with casual sex behavior, and increased sexual aggression both as perpetrators and victims.[92]

Pornography via Social Media

Social media sites also contribute to the early exposure of sexually explicit material via shared nude photographs ("selfies"). In her book, *American Girls: Social Media and the Secret Lives of Teenagers*, Nancy Jo Sales reports on her interviews with 200 teenagers and documents the intense pressure they experience to send and receive sexually-explicit photographs. Cybersex is impacting even middle school students as they are sending and receiving sexually-explicit photos of themselves via their cell phones, and photos which are often widely distributed and used to bully, degrade, and demean.[93] In one study, 22% of teen girls said they have sent partially nude or fully nude photos of themselves, and 18%of

boys have done so.[92] Adolescents adversely impacted by cybersex/bullying often suffer from lower school grades, anxiety, alcohol and drug use, depression, and rarely, suicidal ideation and suicide.

Adolescents sharing such photographs could be prosecuted for being in possession of child pornography—and indeed some attempts have been made to curb this epidemic by doing so. In 2014, law enforcement in Fayetteville, North Carolina, were investigating a suspected statutory rape case and found an explicit photograph of a 16-year-old girl on a 16-year-old boy's cell phone. Both the male and female were charged with multiple counts but most charges were dismissed as the County District Attorney Cumberland stated, "…the consequences were much too serious for the conduct."[94] This case demonstrates the difficulties law enforcement encounters as it seeks to decrease the possession and distribution of sexually-explicit material among minors, and several states have responded by decreasing the penalties for minors convicted of sexting.

Pornography via High School Literature Classes

Common Core standards influence the selection of books utilized in United States high school English literature classes, and some books listed in the Appendix B of the standards include pornographic sections containing graphic depictions of consensual and, more disturbingly, illegal sexual behavior (e.g., rape, incest, abuse, bestiality, pedophilia). The likelihood of adolescents encountering violent or pornographic literature at school is increasing in part due to the fact that Advanced Placement English classes, by nature, lend themselves toward more mature content. The number of students enrolling in Advanced Placement classes in the United States has nearly doubled in the last decade and more than quadrupled among low-income students. ("10 Years of Advanced Placement Exam Data Show Significant Gains in Access and Success; Areas for Improvement.")[95]

Although the majority of research conducted on the effects of reading are positive, studies have almost exclusively focused on the amount of time engaged in reading as an activity, or the level of reading ability. The impact of different types of content in literature is a newer arena of examination, but one that has been initiated in recent years. For example, research examining the effects of reading physical and relational aggression in literature has revealed a correlation between reading aggressive content in literature and subsequent increases in actual aggressive behavior.[96] Additionally, neuroscience is beginning to evaluate, via functional MRI scans, the way in which literature impacts the brain. Changes in the connectivity between various regions of the brain have been documented after a study subject read a novel, and some of the changes persisted for several days after the reading was completed.[97] (See also the College statement, The Impact of Pornography on Children, for additional information: http://www.acpeds.org/the-college-speaks/position-statements/the-impact-of-pornography-on-children.)

Sexual Exploitation

Pornography is often viewed as a 'victimless' crime, but its relation to sex trafficking and cybersex clearly demonstrate the harm associated with it. Pornography fuels the demand for sex trafficking as men develop a sense of 'entitlement' and women are portrayed as objects of sexual satisfaction. Mary Layden, co-director of the Sexual Trauma and Psychopathology Program at the University of Pennsylvania, found that men who visited prostitutes were twice as likely to view pornography as men who did not engage with prostitutes.[98]

A related and serious challenge facing children, adolescents, and their parents is cybersex. Cybersex or Internet sex is a virtual sex encounter between persons remotely connected via a computer network. It is a form of role-playing; the participants pretend they are having sexual relations. These computer sites are available to all who desire access, including children. The Internet also plays a growing role in sex crimes committed against children. These crimes range from sexual exploitation, such as child pornography, to actual assault against a victim identified through the Internet.[99]

IMPACT ON TOBACCO AND ALCOHOL USE

Excessive viewing of television, movies, computer, and video games also results in increased tobacco and alcohol use.[87,100]

A recent study documented that when parents restrict viewing of R-rated movies, children have a reduced risk of experimenting with cigarettes in the future.[101]

IMPACT ON PARENTING

The amount of time a parent views television can influence the amount of screen time a child will experience. A 2013 study of 1550 parents with children less than 18 years of age found the amount of time a parent watched television was a better indicator of the children's viewing time than were rules about time limits or even whether the child had a television in the bedroom.[14] So, it is important to encourage parents to limit their television viewing to maintain healthy habits in their homes.

The impact of cell phone use on parenting is a new area of research, but the data that is surfacing is concerning. An online survey[102] of 6000 children and parents found 54% of children said their parents checked their smartphones too often, and 32% felt they were unimportant when parents were distracted.

Parents agreed. Over half of the parents said they probably checked their smartphones too frequently and 28% felt they did not set a good example for their children. In addition, 25% stated they wanted their children to use their smartphones less.[102]

A study from Boston Medical Center evaluated parent-child interactions at fast food restaurants. Fifty-five caregivers were observed, and children were between infancy and 10

years of age. Forty of the caregivers used a cell phone during the meal and 16 used it throughout the entire meal.[103]

Since young children learn more from face-to-face encounters, and older children feel unimportant when parents are using cell phones, parents must be encouraged to turn off their cell phones when interacting with their children.

IMPACT ON SAFETY

Adolescent drivers are known to be at increased risk for accidents due to distracted driving and inexperience, so all 50 states in America have implemented Graduated Driver's Licenses. Several national surveys have demonstrated the widespread use of cell phones while driving, including texting. In a 2013 study of 3000 people aged 16 years and older, 58% of the 16 – 18-year-old drivers stated they had talked on a cell phone, 39% said they had read texts or emails, and 31% said they had sent emails or texts while driving within the last month.[104]

Another study of 8500 high school students aged 16 and up found 45% of drivers said they had texted while driving within the preceding month.[105]

Since even experienced drivers are at risk for distracted driving and show slower responses to hazards when talking on a cell phone, it is important for inexperienced adolescent drivers to be encouraged to avoid all technology while operating a vehicle.[106]

IMPACT OF ADVERTISING

It is also important to mention the impact not only of media content but also of sponsors (i.e., advertisers). Advertising is a powerful force in American culture. The preeminent advertising medium is television. The principal goal of most children's television is to sell products to children and their families. The television commercial is likely the single most influential source of information to which the young are exposed. The average American child will have viewed approximately 500,000 television commercials by the end of high school. Numerous studies have documented that the young child is often unable to understand the intent of advertising and usually accepts the advertising claim as true.[107]

Among products seen on television, food is the most widely advertised. In children's shows, 50% of advertisement time is devoted to foodstuffs. Most of these ads are for products that nutritionists agree should be consumed occasionally and/or in small portions. Only 15% of food ads targeting children include reference to an active lifestyle. Public Service Announcements (PSAs) on fitness and nutrition are very few. TV stations dedicate an average of only 17 seconds per hour to PSAs; moreover, 46% of all PSAs air after midnight. Children under eight years old see one PSA on fitness and nutrition for every 26 food-related advertisements.[108,109] Young children (at the mean age of eight) have been shown to select food products that they have seen advertised over those that were not.[110]

In addition, the sedentary hours spent viewing media take away from outdoor activities that might promote a healthy lifestyle and counter the rising incidence of obesity.

IMPORTANCE OF MEDIA EDUCATION – for parents, children, and adolescents

The ACPeds emphasizes the positive and critical role of media education (defined as learning how to analyze the underpinnings and influence of mass media). A media-educated public is better able to understand mass media messages and their purposes. A media-educated person understands that all media messages are constructed, that media messages shape our understanding of the culture, and that mass media has powerful economic implications. It is crucial that all parents become media educated. Parents should be aware of program ratings and monitor programs that their children watch.[111] Software that allows the adult to block undesirable programs is also a helpful tool. The mass media must be held accountable to the principles of the Children's Television Acts of 1990 and 1996. Enforcement of the Children's Television Acts will help to ensure that children's programs are truly designed for them. Media education of children has been accomplished as early as elementary school. It has been incorporated into school curricula in Canada, Australia, and Brazil. As a result of this intervention, children have demonstrated the ability to evaluate programs and advertising more critically.[112]

In summary, the media have a substantial influence on today's children and adolescents. At the current time, disappointingly, parents cannot confidently look to the media for a consistent menu of high-quality programming. Pediatricians and parents must do their part, ideally working with the media, to secure opportunities for educating children that facilitates the best outcomes for children. We urge them to do so.

RECOMMENDATIONS

1. Discourage TV viewing and all screen exposure (including on smartphones and iPads) for all children under the age of two.[113]

2. Discourage use of electronic toys for younger children.

3. Encourage use of toys fostering creativity, such as blocks and crayons.

4. Have a goal of limiting all media exposure for entertainment purposes (television, movies, computer/video games, and music) to one hour or less per day for children over two years of age, and avoid developmentally inappropriate content all together.
    a. Turn the television off during mealtimes.
    b. Do not allow your child or adolescent to have a television, computer, or Internet access in the bedroom, including Internet-enabled game consoles and phones.
    c. Determine appropriate time limits for use of social media with adolescents.

5. Although teens have a need to develop and practice independence and separation from their parents, it is important to encourage alternate forms of entertainment, especially those involving physical activity with participation of all family members.[113]

6. Parents should screen and monitor the media viewing of their children and adolescents.

a. Watch television with your children so you know what programs they are watching and what lessons they are receiving. Every television program and video game will teach your children something. Choose programs and games that support your family's values.
b. Ask your children questions while watching the program. Do they understand what is happening? Do they think what is happening is real or possible? (Young children often cannot understand the story's idea–they just see the action.)
c. Explain commercials to your children. Commercials are made to encourage us to spend money. Children can understand that we do not need a certain product to really be happy. Ask your children questions that stimulate conversations about the commercials.

7. Parents should also be aware of the video game rating system and know the rating of the games their children play. Pornography is embedded and accessed through a variety of games aimed at youth.

a. Video games often become more violent and more sexual at higher levels. Parents need to check the levels of the games their children have access to and remove any inappropriate games from these devices.
b. Set limits on video game play just as with television viewing.
c. Disallow play of video games on the Internet with unknown players.

8. Pediatricians and parents should become media literate and should be good role models in their use of media.

a. Parents should limit their own use of media – turn off the television, smartphones, and computers during mealtimes.
b. Don't text or talk on cell phones while driving.
c. Think of other ways to entertain your child while traveling, such as listening to or singing songs together, making up stories, and bringing books for your child to read.
d. Parents should be encouraged to consider utilizing Internet or router filters such as "Covenant Eyes" or "Router Limits", or Internet provider services such as "Integrity Online" to decrease the likelihood of inappropriate access to obscenity or high-risk online activities.
e. Parents should maintain awareness of literature children are reading in school, especially in high school. Be aware of the increasing use of sexually explicit material in high school literature classes.

9. Pediatricians should routinely provide anticipatory guidance that addresses media exposure as a part of the health maintenance visit.

10. Pediatricians and parents should discuss the profound influence the mass media has on a child's well-being and actively work together towards improving the overall quality of media content as well as reducing the child's exposure to cyber bullying. Parents should be encouraged to:

a. Discuss this topic with their children and adolescents
b. Limit younger adolescents' access to social media
c. Monitor social media sites.

11. Educators are encouraged to only use high-quality and developmentally appropriate media, including books, in the classroom. Additionally, educators are encouraged whenever possible to model and teach principles of media literacy, digital citizenship, and Internet safety. We encourage educators to maximize the benefits of mass media and technology while at the same time minimizing the risks when children and adolescents are in their care.

12. The media industry should consider the substantial influence that programming and advertising have on children and adolescents. The ACPeds calls upon the media industry and their sponsors to act responsibly. This would include limiting the portrayal of unhealthy behaviors including violence, smoking, overeating, eating high sugar/high fat foods, sexual behavior between unmarried individuals, and sexual innuendos or frank references. Instead, increase portrayals of healthy behavior to include families engaging in physical activities together, healthy eating, and respectful dialogue between individuals.

Originally posted as: Children, Adolescents, and the Media, October 2005
Revised: May 2020 by Jane Anderson, MD

The American College of Pediatricians (ACPeds) is a national medical association of licensed physicians and healthcare professionals who specialize in the care of infants, children, and adolescents. The mission of the ACPeds is to enable all children to reach their optimal physical and emotional health and well-being.

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