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Digital Childhood: How mobile devices impact child development and adolescent behavior

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A new wave

A new digital wave of technology is sweeping the nation and the world, smart and mobile devices are everywhere and nearly everyone owns a piece of it. This new wave has embraced the idea of technology in the public sphere and not just in the home. Stores, restaurants, shops, cafes, and many more public areas allow for the usage of technology in what would normally be considered areas of social gathering. This new method of socialization, via a screen, has become widely accepted and has created some notable changes in the family dynamic. For example, there have been recent observations of families who take tablets, smartphones, and handheld game devices (with headphones) to public areas, such as parks and restaurants. The dynamics between caregiver and child have changed, what was considered time for social bonding and play has turned into a form of babysitting for a couple of hours of peace and quiet. While this is not the completely new norm yet, there is a growing number of families showing this behavior in public spheres. The reach of mobile and smart devices is not just limited to the United States; it's believed that over five billion people worldwide own one of these devices (Taylor & Silver, 2019).

However, while technology has increased global connectivity and supposedly simplified people's lives, like the rapid rise of anything, the impacts and implications of mobile technology must be delved into. It's not uncommon now for parents to use technology as a distraction for their children to get some solace or quiet time for themselves without having to spend money on a real babysitter. There are also many people out there who are engrossed in their own technology and who prefer to socialize with it rather than their own families. It's noted that not all families are like this and that there are individuals out there who moderate time spent on devices for both themselves and their children. However, there are some out there who do not

think it's as harmful as people make it out to be, are unaware of its potential harm, or believe it to be a necessity in life. It is the purpose of this paper to explore how early exposure to mobile devices can have implications for language, socialization, and sleep for children ages zero to eight. In addition to this, it will be explored as to whether early exposure to technology can also lead to smartphone addiction in adolescent years.

Older vs New Generations

An article by generational research psychologist Jean Twenge identifies how technology has impacted the social and emotional development of the iGen group, a generation of children born between 1995 and 2012 (Twenge, 2017). According to her, members of this group were born during the rise of smartphones, opened social media accounts before entering high school, and do not remember a time before the internet (Twenge, 2017). Essentially, these post-Millennial children were born during the start of the modern technology explosion. While there is no data on these children yet regarding how many own smartphones or mobile devices, it would be safe to infer that there would be an increase compared to the Millennial generation. One study did a survey to see how many people of certain generations used mobile devices; 92% of Millennials, 85% of Gen Xers, 67% of Baby Boomers, and 30% of the Silent generation own smartphones (Jiang, 2018). Based on this data and data from a different study demonstrating that younger individuals are more likely to own these devices and embrace technology, the previous statement should not be too much of a leap (Taylor & Silver, 2019; Jiang, 2018).

Twenge (2017) continues to interview kids born during this time and compares their life to what life was like before smartphones and tablets. She interviewed one 13-year-old girl who shared that she and her friends spend most of the time socializing together on their phones (Twenge, 2017). In addition to this she adds that she spends most of her summer in her room

alone on her phone and reports her friends lack of socialization with family (Twenge, 2017). Since her generation never got to experience life without a smartphone, she thinks sometimes her generation prefers smartphones to people (Twenge, 2017).

Twenge reported that the number of teens who simply hang out with their friends has dropped by 40% between 2000 and 2015, a noticeable difference compared to those born before the 1990s, where socializing and hanging out was the thing to do (Twenge, 2017). One would simply need to ask parents or anyone over the age of thirty to compare their childhood. The larger the gap between ages, the bigger the difference in childhood and adolescent experience. While there have been mixed results on how children and teens view their phones and social media, there is no dispute that there has been in increase in usage. Thanks to the smart capabilities of the smartphone or any other smart device, access to the internet has never been easier and teens are reporting a near constant usage of it (Anderson & Jiang, 2018). In a study the reports on the usage of teens and social media, the study had mixed data on how teens view social media and their phones, but some were honest in their negative feelings (Anderson & Jiang, 2018). These reports include one girl stating it's now harder for people to socialize face to face, a boy stating it's easier to ignore schoolwork to just scroll feed, and another boy saying it provides a fake persona (Anderson & Jiang, 2018).

Twenge's article also provides a graph to show how time spent with friends has changed over the years, going all the way back to 1976 and stretching all the way to 2015 (Twenge, 2017). There is a clear correlation going on between phone usage, social media accessibly, and time spent socializing face to face with others. The graph shows a steady jagged line for teens visiting their friends 2.7 times per week from 1980 to about 2000, from there the line seems to curve off to about 2.2 times per week around 2015 (Twenge, 2017). In the grand scheme of

things, this does not seem very alarming; however, the drop appears to be a steady decline and a bit steep and four years have passed since 2015, so it's unclear as to how often teens are visiting friends weekly. Twenge also focuses on the mental health of those who were born during the iGen years and found that more of them suffer from depression and feelings of loneliness; this was positively correlated to time spent on social media (Twenge, 2017). In the article, she claims that iGen is suffering greatly from mental health problems and that growing up with social media is a likely contributory factor (Twenge, 2017). However, it's not clear if the increase in depression is because of an increase in phone use or if an outside factor is causing it, which results in an increase phone use to self-medicate. This should be investigated more.

Japan and South Korea

Mobile devices are not limited to just one part of the world; Japan and Korea are two leaders in technology development and fully embrace its usage. Depending on where the information is located, Japan and South Korea place differently in their ranking of "most technologicalized country". However, they are always somewhere within the top ten of countries. Japan is a technological giant, many technology-based companies are from here, more recently though the country is being associated with smart toilets and its robotics (Pace, 2019). South Korea is another technology giant, this country dabbles in a bit of everything and is home to the Samsung company (Pace, 2019). One of the most notable things about South Korea though is its internet speed, it's three times faster than the U.S. (Pace, 2019). It's for these reasons that these two countries were selected: information on how two of the biggest technology industry giants react to technology use by their children and teens.

Japan is introducing Tablets or iPads into their curriculum for some nursery schools, also known as preschools, to help kids prepare for a technology-based future (Kageyama, 2018).

Granted only one percent of Japan's schools has them, but the Japanese government is worried about their children falling behind in a technology-driven world (Kageyama, 2018). Thus, it has implemented a policy to supply a digital device to one in three children, so they can play and learn using it (Kageyama, 2018). The iPads given to these preschoolers are meant to stimulate play and to help their growth in creativity, focus, and leadership skills; they encourage the children to think freely and reassure them that it's ok to do so (Kageyama, 2018). Children color and draw on these tablets, watch them come to life in a 3-D rendering and then present them in front of the class (Kageyama, 2018). However, like most of the world, while they do see benefits of technology, the costs are still unknown and limited time is spent on the iPad (Kageyama, 2018). The overall goal of this policy is to prepare young children for a future in which working with technology and understanding how it works will be mandatory for jobs (Kageyama, 2018).

This does not change the fact that while technology use in school may be monitored, technology use out of that setting may not be, and it can contribute to time overall spent on a mobile device. One longitudinal study done in Japan looked at kids age five and followed their adjustment development for a year and their use of mobile technology (Hosokawa & Katsura, 2018). It found that there was a positive correlation between mobile device usage and behavioral problems such as hyperactivity, attention, and conduct problems; it also found that children were more likely to be isolated and not socialize with others if given the chance (Hosokawa & Katsura, 2018). The authors report being worried about the children's social welfare, which was measured via questionnaires given to the parents, and this is a valid concern; time spent with technology takes away from a child's social development, which would occur through interacting and playing with others (Hosokawa & Katsura, 2018). Japan, like the rest of the world, will struggle finding a balance in identifying appropriate technology usage for educational

purposes, without inducing some sort of developmental problem based on continual overexposure to technology. However, overall Japan seems to view technology in a favorable light and is not scared of exposing its children to it, as the Japanese see it as beneficial for them in the long run.

South Korea, on the other hand, appears to have some problems with technology, mainly internet and smartphone addiction; it's gotten to the point where there are rehabilitative bootcamps to help children and teens suffering from it (Carney, 2015). The South Korean government has seen it as a health crisis that more and more young people are spending extended periods of time on the internet gaming and thus have created a way to put a stop to it (Carney, 2015). One boy from the camp reported that he spent up to 10 hours on the internet and that it's caused his grades to fall; his family reports that his behavior has changed to become more aggressive and stressed (Carney, 2015). The bootcamp gets people to exercise and socialize again, as many of the people maintain social relationships online but not in person, the camp also locks away any and all devices, so individuals there can't access them (Carney, 2015).

Smartphones were the other problem that South Korean children and teens suffered from. Around 72% of South Koreans had a smartphone by the age of 11 and spent on average around 5 hours on the device daily (Chen, 2015). One South Korean girl reported going to therapy since 2013 for her nomophobia, or fear of being without a phone; she reported that her phone became her everything, that she never went anywhere without it, and that her palms began to sweat if her phone was not with her (Chen, 2015). Her parents reported her retreating from her hobbies and school activities because of her phone, and that it even amplified some behavior problems that they did not go into detail about (Chen, 2015).

One study reported that children are exposed to a smartphone as early as age two and average time spent on it is about 32 minutes (Chang, Park, Yoo, Lee, & Shin, 2017). The study looked at what type of media is being introduced to children ages 3-5 and how long each form of media is being used by the child. It's reported that TV and smartphones are most widely used by children in South Korea (Chang et al., 2017). The TV was used almost every day for about an hour, while smartphones were used nearly every day for over an hour (Chang et al., 2017). It was no surprise that more time was spent on both forms of media over the weekend; what was interesting, though, is the overall decline in TV watching and increase in Smartphone use, compared to a similar study that was done in 2013 (Chang et al., 2017). The authors report that this is happening in both the U.S. and the U.K. as well but is happening at an alarming rate in South Korea since 98% of the population, as of this study, owned a smartphone (Chang et al., 2017). This is no surprise, as smartphones continue to grow in popularity and demand, while other forms of media such as TVs will start to converge. After all, a smartphone can do just about anything a TV can, but it has more streaming options with the various forms of apps that can be downloaded. It's evident that different areas around the world are doing studies to try and understand how children are impacted by mobile devices; however, it's still too early to tell what these implications are. More time and research are needed.

Addiction

Addiction is commonly associated with harmful and repetitive behavior, such as drug use, gambling, and alcohol consumption, to name a few, and it is very difficult for the individual to stop the behavior, even if they know it's bad (National Institute on Drug Abuse, 2018). There are several other forms of addiction in the world, one of them being use of technology, whether it be via tablets, phones, or any other form of mobile device. To explain how addiction works, the

common association of drugs will be used, then be converted to how technology is an addiction as well when one is exposed to it for long durations and continual use. It should be noted that drug addiction and technology addiction are not the same thing; the example of drug addiction is being used to emphasize how addiction works with a common addiction association. Drug addiction is a serious and extreme problem for some people and has more impacts and implication than technology-based addictions.

Addiction is a powerful thing, as it alters brain chemicals, namely the chemical dopamine, which is responsible for a feeling of euphoria and pleasure. This feeling eventually wears off, which is why drug users often go back to using to experience this sense of euphoria again (National Institute on Drug Abuse, 2018). Dopamine is meant to reward behaviors that help us survive, such as eating, sleeping, spending time with family, or even accomplishing a big project that took months of hard work to complete (National Institute on Drug Abuse, 2018). Eventually, the continual release of dopamine via the use of drugs is reduced by the brain, in simple terms this means the person has built a tolerance to the drug and therefor more is needed in order to get the rush of dopamine they first felt when they started (National Institute on Drug Abuse, 2018). This in turns alters other aspects in life which would have originally triggered a release of dopamine, such as eating, sleeping, socializing and so forth (National Institute on Drug Abuse, 2018). Continual use also causes problems in the brain's other functions as well, for example: learning, judgment, decision-making, memory, stress, and behavior (National Institute on Drug Abuse, 2018).

A former employ of Google, Tristan Harris, explains how big companies get people to engage in the habits that they want, such as constant social media viewing (Bosker, 2016). Like drug addiction, technology addiction can be harmful to its user. One just happens to be more

socially acceptable and legal compared to the other, and technology is specifically designed to be addictive by its marketers and developers. Individuals are not addicted to the devices themselves, but rather what the devices contain, which are apps, internet access, and anything else that enforces gratification and dopamine. Mobile devices are so good at keeping people's attention and supplying an easy rush of dopamine because of the instant gratification they give when there is a notification on an app such as Facebook, YouTube, Instagram, Tumblr, dating site, or Twitter. The game apps, such as Candy Crush, provide that easy supply of a dopamine rush, refreshing social media apps waiting for a reply from someone also supplies that gratification and rush.

One aspect looked at was the psychology used by companies to create more consumers and users, psychologists are hired to use their knowledge to change people's behavior, the example use was that of a dog and clicker (Bosker, 2016). When trying to get a dog to sit via a clicker, the clicker symbolizes the behavior wanted (sitting) and a treat usually follows to reinforce that behavior. The same thing is being done with phones and social media, instead, replace the dog with a person and a clicker with a device usage and the treat with "like" or "comment". In addition to this users are hooked via variable rewards, that is rewards such as; comments, likes, retweets, tags, and shares that don't appear on a set schedule so therefore users are forced to constantly check their feed in search of their instant-gratification-dopamine-high (Bosker, 2016). Harris commented though that the most successful sites and apps though were those who prayed on human needs, such as a need to be popular or cool (Bosker, 2016). Just like with drugs though, more use and time is required to continue feeling that sense of euphoria when receiving a notification, message, or even achieving a new high score on a game. There is no set amount of time needed to qualify being addicted to a mobile device, but rather, like a drug, the

excessive use and altering of one's life in a negative way is the indicator (Smith, Robison, & Segal, 2018).

These can take the form of ignoring family to browse social media at dinner tables, hiding someplace where you can use the mobile device in private, constantly checking the device while at work, using it for longer periods of time where it cuts into family activities or sleep, and checking it while driving (Smith, Robison, & Segal, 2018). It can also include isolating one's self, fear of missing out, or fear and anxiety of not having the device on one's person (nomophobia), a feeling of dread or anxiety with low battery power, and phantom vibrations or ringing to where the user thinks they feel the device receiving a notification and go to check it, but there is no such notification (Smith, Robison, & Segal, 2018). It's evident that there is a rise of technology use and that it is affecting adolescents to the point where there is a noticeable change in how they socialize and that the wonderful power and accessibility that they possess is difficult to turn away from. These adolescents are showing signs of an early stage addiction. This was evident in South Korea, as stated in the previous section where a young girl has been going to therapy to treat her nomophobia (Chen, 2015).

Social, Cognitive, and Emotional Development

Through the lens of social, cognitive, and emotional development children and adults continue to develop but in different ways. For adults' social networks have already be established and strengthened and continue to build on top of that network, and those with strong bonds can help give a sense of meaning and purposeless for the individual (Charles & Carstensen, 2010). It's even been found that those with a good social group may have strengthen their cognitive function, that is tasks that require complex thinking, problem solving, reasoning, and any form of language, and prevent fast deterioration such dementia (Charles & Carstensen,

2010). Even having a good supportive social and emotional group helps with faster cognitive recovery for some health problems that impaired it in the first place, like a stroke (Charles & Carstensen, 2010). It's even been found that it helps support physical health, if the relationships are positive and supportive (Charles & Carstensen, 2010). The key building blocks for a prosperous social relationship in later adult years starts with childhood, what they experience as a child with their guardians they will bring into their adult years regarding both partnerships and friendships (Charles & Carstensen, 2010). This alone can have implications for children of this new generation when they reach adulthood and their social and emotional experiences have been met only with technology. Overall adult development appears to continue to build off developmental foundations established in childhood; this is different for child development because the child is usually going through the first stages of development.

This is important to understand because adults have the capacity and network to understand the effects of technology and to understand how it affects child development, based on what they learn from experiences and each other. Young children do not have that capacity, nor do they have the emotional maturity to understand and use technology. Some children believe that the characters and people they are watching are in the devices, and that the characters can see and hear them (Mares & Kretz, 2015). Others think that the screen is a "magical window" that is capturing the real-world events of a different world, and that the characters stories and lives continue normally off screen (Mares & Kretz, 2015). However, the article did not mentioned how this data was collected nor did they go into detail as to why children thought this way, it only discussed that they do and thus it should be addressed. In a different article however, it's discussed that children go through several stages of development and don't form a sense of maturity at which they can responsibly engage and view technology

until about age twelve (Potter, 2016). Up until age four, children just blindly watch anything without giving much thought to plots or character developments or even the content of what they are engaging with or watching (Potter, 2016). That doesn't mean that they suddenly understand what their watching or engaging with at age four, but they start to try and understand and pay attention longer, they don't usually grasp what their engaging with till about age eight (Potter, 2016). The age in which children have begun to reach a form of cognitive maturity to understand the information they've been engaging and watching doesn't happen till about adolescence (Potter, 2016). This means it takes nearly thirteen years for a child to fully understand what technology is capable of, and even then, there is still new information and entertainment coming out every year that can be accessed via mobile devices.

Of course, it doesn't take just cognitive development but emotional and moral development to understand technology (Potter, 2016). Emotion is tied with cognition because it requires logic and thinking to follow and understand what's going on in a story and how to respond appropriately emotionally to the situation (Potter, 2016). When it comes to moral development, children are born without morality and require their guardians to take care of them and show or tell them right from wrong (Potter, 2016). Children can also learn morals from what they engage with and view, if they watch something or play with something on a mobile device, they can learn morals form that (Potter, 2016). Additionally, their knowledge and view about the world can be altered, this means altering their schemas or associated characteristics of people, as well as their behavioral scripts which oversee understanding how certain people react in certain situations (Mares & Kretz, 2015). This can become a problem in some cases, so for example a guardian leaves their child with a mobile device to watch YouTube videos. YouTube has this unique ability to go from normal viewing material that was searched for to other content that was

not searched for and is possibly disturbing to some viewers. AutoPlay doesn't have to be on, the child can just continue to click the next recommended video and suddenly they are down a rabbit hole of content they didn't start out with. This doesn't mean that YouTube will always suggest odd videos, but it's not hard to end up in the odder areas of YouTube if one isn't careful in their viewing habits.

Media literacy

Another thing that separates children from adults when it comes to technology and its viewing content is media literacy. Media literacy can be defined as a way that allows people to understand, access, and analyze media, something that can be argued to be important for a world driven by media (Media Literacy Project, n.d.). Every form of content created, whether in the traditional forms (e.g. newspaper, TV, radio) or newer forms (e.g. videos, memes, social media, video games), was created by a person, and it was created for a purpose (News and Media Literacy, n.d.). This provides a way for a child to understand what they are viewing, the more media literacy they have the less they need to be guarded or protected (Potter, 2016). It allows children to do things such as think critically, become smart consumers, identify media's role in society, understand the author's purpose of creating the content, and understand new perspectives of content (News and Media Literacy, n.d.). The media is full of ways of manipulating viewers and consumers, such as persuading people to believe some content more than others and altering behavior and views, and they use special ways to do this (Media Literacy Project, n.d.). There are seven organic abilities that occur naturally with media literacy; they come from the main three aspects of cognition and emotion. The first four are part of the cognitive group, and the last three are part of the emotion group (Potter, 2016).

The first one, field independency, is the ability to pick out the information from the content while ignore the "noise" or other content that is not relevant and is essentially filler or entertainment (Potter, 2016). This would be like ignoring the heavy persuasion used in media to get people to buy things such as; subtext, using bribes, celebrities, beautiful people, experts, humor, and fear to name a few (Media Literacy Project, n.d.). The child would essentially get the information without the needless additional information or noise clouding their judgment. Secondly, crystalline intelligence is something that adults are rather good at, it's the memorization of information and facts, something else that most children do not practice when engaging with media (Potter, 2016). This intelligence builds off what is already known and factual within the world, which is why adults tend to be better than children when it comes to this (Potter, 2016). With information from the world already acquired it makes it easier to understand some content from media and to find meaning in it. Which would be helpful for children depending on what they are viewing. Thirdly, fluid intelligence is something that younger people would be better at than older people, it is creativity and insight, trying new things whether they're important or not (Potter, 2016). This is more of a spontaneous, out of order, trying a crazy idea, kind of thinking that young people are open too since they are still fresh and spry, compared to older people who are more set in their ways and traditions. This kind of intelligence help the views to dig deep and question what they are seeing, something that is perhaps useful for developing good morals (Potter, 2016).

Fourthly, conceptual differentiation is the way in which people group things, either in few broad categories, or many narrow categories (Potter, 2016). For example, this means either separating the YouTube video genre "theory" into a few broad categories such as; crazy theories, educational theories, or media theories. Or separating them in many narrower categories;

science, math, games, tv, conspiracy, movie, character, and so forth. It would be beneficial to have many narrow categories so that information is not cluttered and confuses the mind, this overall depends on the type of person. It helps with media in that the way the person can understand the content they are viewing and whether to store it cognitively. Something that children may not be able to do very well, also something adults may not be able to do very well either depending on their grouping choice. Fifthly, emotional intelligence is exactly as it sounds, being able to control one's own emotions, be aware of one's own emotions, and perceive other's emotions (Potter, 2016). Those who have high emotional intelligence, in other words have empathy, have more control over their own emotions because of their ability to experience someone else's and see the world through their view (Potter, 2016). This would be helpful for children, so they do not act out on their emotions or others based on what they view, children like to mimic what they see, which is why they act like their guardians or reenact their favorite content. This could give them perspective to make a fluid intelligence call such as, what is the meaning of this scene? How do the characters feel? Should I act it out?

Second to last, tolerance for ambiguity is when people are faced with something that does not fit their understanding or their norms, it's either ignored by those with low ambiguity or dissected by those with high ambiguity (Potter, 2016). This is where something like thinking critically would come into play, to understand why the information that was put there was included into the content, and to figure out whether it makes sense to them (News and Medi Literacy, n.d.). It's not uncommon for some people to witness a form of media and then go into an outcry because it does not fit their sense of normal. This usually happens with advertisements when their trying to sell a product and keep up with the modern trends and ideals of the time. An example of this would be the Campbell soup ad with two dads in it, it originally aired in 2015

(sixthseal rapture, 2015). People with high ambiguity try to figure out why their normal understanding was wrong, something that could clarify what the content was trying to get a crossed and if it's safe for their viewing consumption. Does it make them feel ok to view this knowing their norm is being challenged either in a good or bad way, those with high ambiguity want to figure this out, while those with low ambiguity don't want to think or acknowledge it. This ad is a good example since it involves a topic that some people are still not comfortable with while other people's sense of ambiguity is being challenged. Lastly, nonimpulsiveness is exactly as it sounds, whether people are impulsive or not based on the messages that they have seen (Potter, 2016). Those with low impulsiveness would be favored in media literacy, they reflect on their possible choices and decisions, more concerned with being right or accurate (Potter, 2016). This is great for viewing content, those with high impulsiveness could jump to conclusions and take actions whether they are right or wrong, but slow and reflective thinking is better in nearly all situations.

Why should people care?

Children go through many stages of development from the time their born well into adulthood, it's well established that they must be cared for, monitored, and taught during this time. Children are considered vulnerable and weak to the realities of the world and therefore require protection until it's deemed that they are mature enough to handle it. Technology possess a problem for the development and safety of the child. All forms of streaming devices are infiltrating homes and the lives of everyday people, as well as social gatherings outside the home. Everyday observation can be made on the implications and impacts that technology has created in this modern age society. Some restaurants provide TVs and tables at their establishments, examples include Applebee's, Buffalo Wild Wings, Red Robbins, in addition to

the devices that are already brought from home like hand-held gaming, tablets, and smartphones. These tablets come with gaming features for both adults and kids for entertainment and to allow for the eliminating of the middleman (servers) so that food can be ordered and paid for without the need for additional human interaction. As mentioned earlier most of these kids do not have the capability to understand what they are engaging with, having guardians blindly allow their children to interact and engage with technology extensively will impact them developmentally.

Guardians are ever presently starting to wonder if constant exposer to technology is even good for their kids, one article written by Ben Popper explains how he and his family struggles with technology use with his own child. Ben has a love for technology and works with it for a living, he wanted to share that love with his newborn son, he believes it would be beneficial for his son in the future (Popper, 2013). His family, mainly his wife and mother, are part of technophobia that is sweeping some families who are fortunate enough to have all the qualities needed to not be chained down by technology. They fear that exposing his young son to media and devices will hurt his development and turn him into a vegetable, something Ben does think will happen if everything is done in moderation (Popper, 2013). There are probably many guardians out there who believe that monitored exposer won't have a lasting impact on their kids, but the extent of that truth is still unknown. No matter the family, the children born today, in the next couple of years, or from a few years ago are growing up in a heavily technology driven world. This is a world where technology has become a babysitter for nearly every family with a child, and it's time to see how that exposure will impact them.

Children are affected in x/y/z ways

Why does this matter? It matters because children are being affected and the extent to which they are is still a mystery that is trying to be understood and solved. Technology impacts

developmental aspects of a child's life including language, sleep, and basic social interactions. Children learn language through their guardians and peers by way of social interaction in order to understand how to adequately communicate and engage with other individuals (Linebarger & Vaala, 2010). Language is typically acquired during the first three years of a person's life, after that it continues to be developed and refined (Linebarger & Vaala, 2010). Children also begin to learn and understand normal behaviors and beliefs by observing interactions, whether this be from in real life social interaction or through the screen in which "real life" is depicted in the media (Strasburger, Jordan, & Donnerstein, 2010).

In addition to this, adolescent sleep is being affected by the easy access of mobile devices, causing access stimulation which prohibits the sleep chemical melatonin (Mazzer, Bauducco, Linton, & Boersma, 2018). The reason for the insomnia caused by a device could either be because the adolescent has a sleep problem and therefore uses the phone because it's stimulates them preventing boredom (Mazzer et al, 2018). Or the adolescent could be enticed by the device, preventing sleep because they are engaged with its many features (Mazzer et al., 2018). The recent explosion of technology is being integrated into young lives, it's not surprising considering it is a convenient and easy form of entertainment that children seem to enjoy. The subtle, but increased, replacing of human interaction with a technological based one is a leap that is not fully understood. The long-term effects of human interaction being equal to that of technological interaction, or even being less so, is not yet abled to be observed. A wave of technological wonders appears each generation and is better than the last, this current wave of "smart" and mobile technology is still relatively new and is increasing the overall time that children spend engaging with it.

Language Development

As stated before, primary language development occurs during the first three years of a child's life, the factors that contribute to this development is both environmental and biological (Linebarger & Vaala, 2010; U.S. Department of Health and Human Services (HHS), 2010). Before they can even speak words, they are taking in information and understanding what sounds mean, for example, they realize that crying gets their guardians attention and from that they will either get their biological or emotion needs met, such as food and companionship (Linebarger & Vaala, 2010; HHS, 2010). Since the birth of the child they are learning and understanding the sounds in their environment and what they are associated with, such as the voice of their caretakers and guardians, and by the six-month marker a child can understand their native languages basic phonic sounds (HHS, 2010). At around ten to fifteen months, a child will speak its first word, and at around eighteen to twenty-two months, it will begin to expand its vocabulary by an additional nine new words daily (Linebarger & Vaala, 2010).

Somewhere between those milestones, they learn that words can be made up of different parts that give the words new meanings, and usually by the age of three they have achieved the milestone of mastering language use (Linebarger & Vaala, 2010). Those who talk and socialize with their child in a more meaningful way are thought to help improve the child's communication and language development (Linebarger & Vaala, 2010). They don't have to be directly talked to, just overhearing conversations helps stimulate language growth (Linebarger & Vaala, 2010). It should be noted and emphasized how technology affects a child's language development. Without proper stimulation and adequate partners to richly stimulate the development the child would be at risk of falling behind and have a smaller repertoire of vocabulary compared to those who are not exposed. The evidence is clear that the best form of language learning is through social interaction with other people, not through forms of

technology. Talking is the primary form of communication, while technology has made communicating easier, basic face to face human interaction is needed for most day to day things. Therefor careful consideration and thought should be put into how much screen time a child should get, in fact children before the age of three probably shouldn't get any.

Sleep

Sleep is an important aspect of any living creatures life, especially for children as it helps with memory, language, and executive functions which develops over time and allows for the retaining of information, focus, and usage of information, and to be able to switch from one process to another (Center on the Developing Child, 2012; Tham, Schneider, & Broekman, 2017). The circadian rhythm is a process that occurs during sleep that cycles through REM and non-REM sleep (National Sleep Foundation, n.d.). REM sleep, also referred to as Rapid Eye Movement, is the deeper part of sleep were dreaming occurs (National Sleep Foundation, n.d.). Sleep is needed to help process the information of the day's events, it helps with feeling refreshed, hormonal regulation, as well as growth (Field, 2009). The circadian rhythm is governed by light and dark, children just born need time to develop this cycle which is why their sleeping schedule and patterns are irregular (National Sleep Foundation, n.d.). Throughout the beginnings of a child's life they require different amounts of sleep, the National Sleep Foundation (NSF) recommends 10-18 hours of sleep for children just born to age three months (National sleep foundation, n.d.). From 4-11 month 9-12 hours of sleep is recommended with naps throughout the day, ages 1-2 years 11-14 hours are recommended, 3-5 years 11-13 hours are recommended, and ages 6-13 years need about 9-11 hours of sleep (National Sleep Foundation). As child grow up, they need less sleep, but it's still vital to their overall health and development.

However, technology can interfere with sleep at any age. The light created by technology disrupts the circadian rhythm by suppressing the chemical melatonin, which is responsible for the process of falling asleep (Science, n.d.). As mentioned before the circadian rhythm is governed by light and dark, that light from a screen can trick the brain and prolong the release of melatonin, preventing the necessary sleep for development and overall good health. Technology can also keep the brain stimulated, an active brain is not likely a brain that will fall into REM sleep (Science, n.d.). Playing games, checking email, or browsing Facebook makes the brain think that it needs to stay awake (Science, n.d.). Lastly, having a device such as a phone near you when you sleep can cause someone to wake up and disrupt their sleep. This can happen when receiving a notification, the light or sound would prompt the person to check their phone and that can spiral into an hour long scroll through feed (Science, n.d.). Resulting in an hour or more of lost sleep that is vital for a person to function in day to day life, especially for kids. Therefore, people are encouraged to remove technology from their areas of sleeping and why children especially should not have any form of technology in their room. There are other more extreme examples of devices preventing sleep, such as having a phone explode or catch fire to the bed, which happened to a girl in Texas whose phone melted the sheets of her bed (Twenge, 2017).

Twenge discussed with her college students why a person would sleep with their mobile devices in their room. Many of them reported having their phone within arm's reach of them when they go to bed, such as on the mattress or under the pillow, many even checked their phone up until they went to sleep (Twenge, 2017). Some even reported checking their phone if they woke up in the middle of the night claiming that they know they shouldn't, but they can't help it, and some even consider it a part of themselves and find it comforting (Twenge, 2017). The pull of modern technology is strong an alluring, so much so that it seems to act as an addiction for

older individuals. Jean has even witnessed her toddler, who cannot walk, swipe away and use a tablet confidently (Twenge, 2017). This should be cause for concern since sleep is a vital part of development and everyday function in regard to their mental and physical health, as well as leading to a behavior that encourages technology oversleep.

Social connectedness

Interacting day to day with other individuals in a socially acceptable manner is a requirement for every person on the planet. It helps with effective communication to find partners, get jobs, locate places to live, get food, and just about any other activity the requires face-to-face interaction. Lately there has been cause for concern that technology is taking away from that important developmental milestone of communication. As discussed earlier, children are at risk for slower language development with continual exposure to certain types of media that does not provide enough verbal stimulation (Linebarger & Vaala, 2010). In addition to this technology can increase a child's chance of social isolation and social development problems due to secluded technology interaction (Hosokawa & Katsura, 2018). There have been some reports later down in the adolescent years were technology is the preferred form of communication, and that those adolescents are losing their ability to communicate face-to-face (Solecki & Fay-Hillier, 2015). Technology can not only isolate the child from friends, but family as well, and interrupt creative and physical play need for development (Solecki & Fay-Hillier, 2015).

This doesn't have to solely rely on the child using technology though, in a technology driven home guardians can unintentionally set the stage for poor social communication within the home and public setting if they are constantly on a mobile device. The child can learn that this is the preferred way of communication in a partnership at an early age, the child can then

bring that into a friendship in later years. However, like everything else it's been reported, there are some positives. Technology can help stimulate and improve social connected for children and their guardians, as well as stimulate creative play (Plowman, McPake, & Stephen, 2009). What technology can hinder for one child can spark imaginative play for another in the shape of cardboard cutouts from the printer, some family relationships can be strengthened by the sharing of pictures and videos of important events or milestones (Plowman, McPake, & Stephen, 2009). However, these findings were a decade ago, and more recent studies should be done to try and understand where technology falls within the social development of a child and how that can translate into teen years. It's already been reported in some other countries that adolescents have a strong online social bond but are losing a bond with their real-life friends (Carney, 2015). It's clear that there is something effecting social connectedness and communication among children and teens, new age technology is a strong candidate for being the culprit behind this.

What can be done?

There is the age-old question of who is responsible for guiding and protecting children. The burden of protecting kids and guiding their technological use mostly falls on the parents or guardians. They are suggested to reduce time, to monitor what is being watched, to do their own research on what their children are engaging with. Unfortunately, guardians are not all-powerful beings that can do this every minute of every day, and children and teens are bound to find a way around the restrictions. However, there is a saying, "it takes a village to raise a child", meaning it takes more than just the guardians of the child to help prepare them for the world. In short, the manufactures, creators, government, and legal guardians are responsible for the wellbeing of the child, and therefore they are all to blame in some way if the child suffers from a developmental problem because of early exposer to technology. I propose a working combination of

government, creator, and guardian cooperation to insure the safety of children. The idea that is being proposed would look something like this; guardians are still left to govern and raise their child as they see fit and decide if technology is something they should be concerned about. The creators of technology can have warning labels or apps installed into the device to ensure that people are aware that there are certain risks to over exposure to technology, and to help regulate that use and its content for kids. Lastly, the government can add another department or branch to the Federal Communications Commission (FCC). The FCC is responsible for overseeing cable, television, wire, satellite, and radio (FCC, n.d.-a). This department would be meant for new mobile technologies, more power could be given to the FCC to help regulate the content in mobile devices and to help regulate the creators of these devices that could then hold them to a standard that would not pray on children as consumers.

Essentially, it could help guardians limit the amount of time their child spends on the devices as well as help the guardians understand that there are real implications of over exposure to mobile devices and the content they hold. The Telecommunications act of 1996 did something similar with TV, guardians were given more freedom to monitor what their children watch with the help of the government that mandated that all TVs would come with a v-chip (FCC, n.d.-b). The v-chip would block channels that are not suitable for young children and the act also include the TV Parental Guidelines, that's the square pop-up before a show starts that says TV MA LSV or TV PG (FCC, n.d.-b). This lets guardians know what content is about to be shown and they can act accordingly. By combing all three entities; guardians, creators, and government, a sort of checks and balances system can be made for the benefit for kids and each entity involved. Guardians get the satisfaction of feeling like they have control over what their child is viewing or interacting with on a mobile device and make smart educational decisions based on the

information provided by the creators by law of the government. Creators can get a lifelong loyal consumer of their brands because they have built a trust between them and their consumers, and the government gets to create more competition in the market to see who can create the next mobile device that is safe for kids.

Conclusion

This paper has explored the wide world of mobile devices and its effects on children not only in their early years but in their adolescents as well. It's clear that there are problems arising but it's still unclear as to what the final and everlasting outcome will be for the generation raised with a digital childhood. What is known is that mobile devices effect children's language at an early age, an important milestone for cognitive development, sleep is also impacted which is harmful for children's overall development when it comes to learning and growth (Linebarger & Vaala, 2010; HHS, 2010; Field, 2009). Lastly, there are some indication that it's affecting socialization, an important aspect in nearly every person's life to create friends and partners (Hosokawa & Katsura, 2018; Solecki & Fay-Hillier, 2015). It's evident that technology problems for kids are not just in the United States but in other areas of the world as well, South Korea and Japan are dealing with technology in their own unique ways. Japan appears to be embracing the rise while South Korea struggles with technology addicted youth (Kageyama, 2018; Carney, 2015; Chen, 2015; Chang et al., 2017).

The solution to this problem, that would only work in a perfect world, was inspired by the saying "it takes a village to raise a child". The idea revolves around how guardians, creators, and the government could work together and create something that does not result in prohibiting the child from engaging with technology but monitoring it so that it does not harm the child in lasting ways. However, this idea needs to be fleshed out more and the idea of media literacy

possibly explored and integrated into the plan. There are still areas of the research that can be improved. It's clear that more research needs to be done on if and how mobile technology impacts socialization and whether if it's something to be a cause for concern. In addition to this, the cognitive, behavioral, and social aspects of development should be looked at and compared in a study between older generations above the age of 30 and those below it. The explosion of technology happened around the 2000s so it would be interesting and wise to explore whether the differences in a digital childhood impacted them in any way. In addition to this, a longitudinal study of children would be beneficial to understand how growing up with technology will impact them throughout their key development milestones and to further look into whether early exposure leads to technology addiction in adolescents.

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