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Table of Contents

Abstract

In today's modern age, the great majority of society utilizes many readily available technological inventions. Adults have incorporated these creations not only into their daily lives, but also into the lives of their children. The current Covid-19 pandemic has taken away a key component of pediatric development, which is in-person schooling. Most children are attending school via online classes and a laptop, which adds more time on top of their usual daily screen time exposure. The current literature has studied the effects of high screen time consumption on the pediatric patient pertaining to body mass index, sleeping patterns, lifestyle habits and developmental screening performance. It has been shown that children exposed to higher than average amounts of screen time face higher odds of being overweight, suffering from impaired sleeping routines, and poorer scores on developmental tests. In addition to this, heavy screen time is associated with many risk factors for childhood obesity. Demographic characteristics, such as the parent's education level, race and gender, have been shown to affect the level of daily access young children have to screens. There is limited research on the effects of online schooling on the academic performance of young children. Studies have also not looked at the effects that heavy screen time has on pediatric mental health or their development of social skills. As nurses, it is important to explore the long term effects of unregulated screen time access on the health and wellness of the adolescent. It is imperative that both educational and leisurely use of screens are studied, so that adequate intervention can occur and young children can continue to appropriately develop, physically and socially.

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Introduction

Screen time refers to "sedentary activities done in front of a screen, such as via television, computers, tablets and cell phones" (Kaneshiro, 2019). Heavy screen time exposure is defined as more than 2 hours of screen time per day. In this paper, researchers will explore how heavy screen time affects the adolescent.

Problem Statement

The topic that I've chosen to explore are the effects of screen time on the development of the adolescent. We currently live in a time ruled and influenced heavily by technology. With developments of the smartphone, tablet and computers constantly evolving, many people are constantly exposed to technology, including young children. This topic is even more so relevant now during the Covid-19 pandemic, as many school-age children are forced to attend school via computer (Johnson et al, 2020).

In the meta-analysis by Atkin et al. (2014), the authors found that parents with higher education levels were less likely to allow their children to spend more than two hours/day of screentime. They also found that overweight/obese children were more likely to exceed two hours/day of screentime. Due to the importance of this topic, I am performing a review of the literature and proposing a study to investigate and compare children with heavy screen time usage and less than heavy usage. In addition, high screentime may result in less time spent doing active hobbies outside (Rymanowicz, 2018).

Research Questions

For adolescents, aged 13-18 years old, does heavy TV viewing and extended amounts of screen time affect their physiological and social development, compared to adolescents who do not have access to TV or screen time?

Literature Review

A literature review was conducted using various online research databases available at the Dominican University of California library. Of the many databases available, UptoDate, Iceberg and CINAHL Plus were utilized. Six research articles were found to be relevant to the topic of the effects of screen time on the health and wellness of the pediatric patient. These research articles appeared after using keyword combinations such as: screen time, pediatric, physical health, mental health and television viewing. This literature review will be divided into two categories for easier understanding. The first category consists of articles that assessed the effects of screen time consumption on the pediatric patient's physical composition and development. The second category consists of articles that described the associations between screen time usage and its effects on the pediatric patient's language and literacy development.

Screen Time and Physical Development

Hutton, Dudley, Horowitz-Kraus, DeWitt and Holland (2019) aimed to "describe the associations between screen-based media use and the integrity of brain white matter tracts that support language and literacy skills in preschool-aged children." A cross-sectional study was created that involved forty-seven healthy preschoolers, aged three to five years old. The researchers administered a ScreenQ survey to each parent before and during each child's MRI. ScreenQ is a fifteen item composite measure of screen-based media use in children aged three to nine years old. The survey focuses on the children's access to screens, frequency of use, content viewed and degree of interactivity. Prior to the MRI, there were three assessments administered. The Expressive Vocabulary Test 2nd Edition assessed vocabulary, the Comprehensive Test of Phonological Processing 2nd Edition assessed phonological processing abilities, and the Get Ready to Read test assessed core emergent literacy skills that were associated with reading

outcomes. The protocol for the MRI was that each participant was awake and no sedatives were used. The participants sat through a six minute weighted anatomical scan, four minute functional MRI sequences and eight minutes of Diffusion Tensor Imaging. There were many strengths of this study, such as the fact that the researchers were able to utilize pre-school children as their participants. It can be very difficult to successfully conduct an MRI on children at such a young age.

The researchers performed two analyses using tract-based spatial statistics to test for associations between Diffusion Tensor Imaging measures and ScreenQ scores. Their results showed that the mean ScreenQ score for children completing DTI was 8.6 points. The median age for initiating screen use was 18 months. Also, the median value for media use was 1.5 hours per day. The researchers found that increased use of screen time was associated with lower microstructural integrity of brain white matter that supports language, executive functions and emergent literacy skills. They found that screen time was associated with lower ScreenQ scores that correspond to age appropriate behavioral measures.

Wada et al (2019) wanted to determine "whether cell phone use and screen viewing are associated with excess body weight." They designed a cross-sectional study that included 3,141 students from ages six to seven years old. Each participant was asked to submit a parent-administered questionnaire that asked questions about child and parent demographics, health status and lifestyle details. Some of the data collected included birth size, number of siblings, feeding method during infancy, diet, physical activity, sedentary behavior, sleep habits and cell phone use of children. The questionnaire also asked about the parents medical histories and smoking habits. A smoker was defined as a person who had smoked at least twenty packs of cigarettes during their lifetime. A secondary questionnaire was used to assess dietary intake of

specific foods and the usual serving size that the children consume. The parents were also asked to report how long the child spends playing outside in different intervals throughout the day in an outdoor playtime checklist by Burdette el al. The researchers also asked parents to report the approximate time their children awoke or went to bed on weekdays and weekends. In addition to the time they spent in bed, the parents were asked about different criteria to see if the children suffered from insomnia. The criteria included occurrences of difficulties in falling asleep for longer than thirty minutes, waking up in the middle of the night or waking up too early and not being able to fall back asleep, for more than three times in a week.

To assess cell phone use, the students were asked how long they usually used their phone and for what purpose they use it. Options included making or receiving a call, sending mail or going on the internet. To assess screen time, the participants were asked how long they spend watching television, playing computer games, reading books or comics and time spent listening to music. Children's heights and weights were also taken, and measured to the nearest 0.1 cm and 0.1 kg respectively. The researchers calculated the children's BMIs and classified as being overweight if their BMI was greater than or equal to 25kg/meters squared.

A strength of study was that it had a high response rate for school-based research, height and weight measurements. A one way analysis of variance was used to test associations of cell phone use, time spent watching television, time spent on games and computers, time spent reading books or comics and time spent listening to music. This was compared with the reported amount of physical activity, total energy intake and sleep time. In the end, the researchers found that cell phone use of longer duration was associated with a higher risk of being overweight. Conversely, the time spent watching television was positively associated with the risk of being overweight. They also found that when compared to non cell phone users, cell phone users went

to bed at a later time. There were associations between longer time spent on games and computers with insomnia and longer duration of cell phone use with a later wake up time.

There were various limitations of the study. The researchers were unable to assess the separate associations of electronic device use with being overweight or obese, since the study inclded few children with obesity. Due to this, the researchers possibly missed significant associations between time spent on games and computers, with being overweight. Also, the measures of cell phone use and screen time were based on parent reports, so they may not be as accurate if parents weren't watching the children constantly. The researchers discussed that reducing a child's excessive exposure to cell phones and screen time may be important in the prevention of childhood obesity, especially considering that sleep deprivation is a risk factor for childhood obesity as well. Their study concluded that television viewing was inversely associated with exercise and sports, while being positively associated with later bedtimes and shorter sleep duration.

Atkin et al (2014) performed a meta-analysis that aimed "to describe the prevalence and sociodemographic correlates of screen time in an international sample of children aged four to seventeen years old." They had 11,434 participants who contributed 14,124 observations of screen time. Data from the International Children's Accelerometry Database was pulled from nine studies that had information on children's screen time.

The researchers decided to assess television viewing and computer use separately by having participants self report. To calculate screen time, researchers took the sum of television viewing and computer use, and then dichromotized it to being either greater than or less than two hours per day. In addition to this, the researchers also looked at gender, age, weight status, maternal education and ethnicity. Participants were categorized as non-overweight or

overweight/obese, based on their BMI. For maternal education status, it was reported as either non-attendance or attendance to a university. For ethnicity, participants were categorized as non-Hispanic white or non-white. Analyses were performed using Stata version 12.0 to calculate the prevalence of exceeding two hours per day of screen time for these participants. The results showed that two thirds of all participants in all included studies exceeded two hours per day of screentime.They found that girls and children with more highly educated mothers were less likely to exceed two hours per day of screen time. In addition, they found that children who were overweight or obese had a greater chance of exceeding two hours per day of screen time than those of normal weight.

The researchers concluded that interventions to decrease screen time in the pediatric population should be a public health priority. They found sufficient evidence that connects heavy screen time with noteworthy effects on pediatric health, well-being and weight. With television viewing being the main source of children's media usage, the researchers suggest that interrupting heavy television viewing be a primary intervention in helping young children decrease their screen time consumption.

Fang et al (2019) conducted a systematic review that studied the impact of TV time, screen time and computer time on children's weight. From their systematic review, they retrieved 6,028 studies from four notable databases, PubMed, ScienceDirect, Embase and Web of Science. This search resulted in a meta-analysis of fourteen articles that reported sixteen original studies, all considered to be of high and moderate methodological quality. The study inclusion criteria was that it needed to be an original study focused on the relationship between screen time and overweight or obesity in children, have a cohort study, case-control or cross-sectional study design, and have screen time categorized as greater than two or less than or equal

to two hours per day. The studies that were excluded were studied with insufficient data on screen time and overweight/obesity, if the population had a pre-existing condition or if the paper was a review or commentary article.

For their meta-analysis, they studied the impact of television time, screen time and computer time on a child's weight. They conducted a random-effects model of the articles and created a subgroup analysis. This analysis was based on the type of screen exposure, race, age, sample size, and definition of overweight and obesity. They found that the relationship between overall screen time and overweight/obesity was different from the relationship of overweight/obesity and computer use alone.

The results of their meta-analysis showed that childhood obesity was positively correlated with total screen time, television time and computer time. The researchers discussed that reducing screen time could play an important role in protecting children and adolescence from being overweight or obese.

Screen Time and Literacy Development

Madigan, Browne, Racine, Mori and Tough (2019) sought out to answer the research question, "is increased screen time associated with poor performance on children's developmental screening tests?" They performed a longitudinal cohort study that recruited 2,441 mothers and children. The inclusion criteria were that the mothers were eighteen years or older, English speaking, recruited at a gestational age of less than twenty-four weeks and were receiving local prenatal care. Researchers followed up with participants at thirty-four and thirty-six weeks gestational age and when the child was four, twelve, twenty-four, thirty-six and sixty months. The mothers completed the Ages and Stages Questionnaire, third edition, when the child was twenty-four, thirty-six and sixty months. This questionnaire looks at developmental progress

in communication, gross motor, fine motor, problem solving and personal-social aspects. After

the mothers reported their answers, a weighted weekly average of weekday and weekend screen

time was calculated to tell the childrens' screen time usage in hours per week.

A strength of the longitudinal design was that it allowed for data to be collected at more

than one point in time. Despite this being an innovative study that looked at the developmental

effect of screen time on young preschool children, there were some limitations. The first

assessment of their screen time usage was at twenty-four months, which excludes all screen time

prior to that time point. Also, technology development rapidly evolves and can potentially

outpace the research in that children could have increased screen time consumption due to the

newer developments. The researchers found that the children at ages twenty-four, thirty-six and

sixty months were watching approximately seventeen, twenty-five and eleven hours of television

per week, respectively. This correlates to approximately 2.4, 3.6 and 1.6 hours of screen time per

day, respectively. A key takeaway that the researchers found was that higher levels of screen

time at twenty-four and thirty-six months were significantly associated with poorer performance

on developmental screening tests at thirty-six and sixty months, respectively.

Dore, Logan, Lin T-J, Purtell and Justice (2020) wanted to assess whether media use is

associated with gains in children's language and literacy skills both at a single time point and

across a school year. They performed a correlational study that involved 1,583 children enrolled

in different grades from preschool to third grade. The participants got parental consent and were

asked to return a survey that included questions on media usage and demographic characteristics,

such as age, gender, race, mother's education and number of adults in the household. To measure

the child's media use on a typical school day, the parents were asked if their child watched "any

kind of video, including TV, movies or short clips on any type of device" and if their child

played "games on any type of electronic device." If the answer was yes, then the parents were asked to specify how many hours were utilized, which included response options of 0-1, 2-3, 4-5, 6-7 and 8+ hours. The children were directly assessed in the fall and spring of the academic year using subtests of the Woodcock Johnson Test of Achievement III. The Picture Vocabulary subtest assessed their language skills, while the Letter-Word Identification subtest assessed their literacy skills. The researchers specified that "six consecutive correct items were needed to establish test basal and six consecutive incorrect responses terminated the test."

The researchers reported descriptive statistics and then conducted regression analyses for both language skill and literacy skills. They assessed the relation between media use and language and literacy gains. In their initial gai models, they found that "only high levels of media use were related to smaller gains in skills and only for literacy, not for language." (Dore, Logan, Lin T-J, Purtell, Justice, 2020, pg. 6) On the other hand, in the single-time-point models, they found that media use mainly affected literacy skills, with there being an association between media use and age predicting language skills among only the older children in the sample. They also studied the relation between media use and language and literacy skills at a single time point. Their results showed a significant effect of media use, in that using "2-3 hours of media per day was associated with lower literacy scores than using 0-1 hours of media use." Between genders, they found that boys were more likely to use 2-3 hours of media on a typical school day, than girls. The researchers found an association between children's media use and the mother's education, with a less educated mother allowing the child to use 2-3 hours or 4+ hours of media on a typical school day.

The researchers discussed that the data from their study may suggest that the effects of media use on literacy skills may represent a threshold effect instead of a linear relationship. They

explained that the threshold effect may exist if large amounts of media use on a daily basis are taking priority over other activities that aid literacy skills, such as book reading.

Literature Review Conclusion

The articles in this literature review have provided key data on the effects of screen time on the pediatric patient. Heavy usage of screen time was found to decrease the quality of white brain matter in children that supports language, executive functions and emergent literacy skills. The previously mentioned studies also looked at how screen time is associated with various risk factors of obesity or being overweight. They found screen time users, which include cell phones, television and computers, slept later, woke up later, and often faced difficulties falling or staying asleep. The relationship between a child already being overweight or obese and screen time consumption was also examined in these studies. The researchers found that a higher BMI is associated with higher screen time consumption, versus pediatric patients with age appropriate BMIs.

When looking at the relationship between screen time and literacy development in the pediatric patient, there were other key findings. The studies found that the introduction of screens to the pediatric patient at a young age can negatively affect their performance on their future developmental screening tests. Additionally, they found that screens can replace or take priority over key educational activities that promote literacy development.

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Theoretical Framework

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Kathryn E. Barnard developed the Child Health Assessment Interaction Theory. It revolved around the interaction between the caregiver, environment and child. She was also the founder of the Nursing Child Assessment Satellite Training Project, which provides programs that teach health care professionals and parents how to create a nurturing environment for

children. Her research focused on improving the physical and mental health of babies. A goal of her research was to identify early childhood environments that increased childrens' risks of developing health problems. She found that parent-child interactions are key influences on the child's cognitive development.

Barnard's Child Health Assessment Interaction theory and research played a key role in the nursing profession and the approach that health care providers take in assessing children. In the proposed study, her theory supports the importance of assessing the child's environment and resources in evaluating their development. With this proposed study, researchers could potentially find evidence that sheds light on the effects that technology has on children's physical and mental development. In addition, the study could evaluate the effects of the parents role in the children's access to screens. Overall, Barnard's theory emphasizes that the interactions between parent-child are important to study, with the proposed study including the added component of screen-time exposure. For this study, Barnard's theory will be applied to adolescents.

Research Proposal

With the current Covid-19 pandemic, the greater majority of students are learning and attending school via online courses. This paper aimed to present some of the known effects of screen time on the development of the pediatric patient. In the literature review, researchers have found correlations between heavy screen time usage and higher risk for obesity/overweight. The literature review also presented evidence that connected heavy screen time usage with poorer scores on developmental screening tests. Despite these findings, the literature failed to identify any connections between screen time usage and the social skill development of the pediatric patient.

The proposed study would aim to answer the following research question: For the pediatric patient under 18 years old, does heavy television viewing and extended amounts of screen time - defined as greater than two hours of viewing per day - affect the child's social skill development, compared to pediatric patients who consume less screen time?

The evidence in the literature, indicating that higher amounts of screen time negatively affect the health and well-being of the pediatric patient is deeply concerning. The ultimate goal for this research will be to determine effective screen time guidelines for the pediatric patient, so that their physical and social development are not being hindered by their screen exposure.

Hypothesis

The researchers hypothesize that there may be a negative correlation between high screen time consumption and low social skill development in children.

Design

This proposal will be designed as a mixed method - qualitative, exploratory and quantitative, comparative - longitudinal study to include 100 teenagers, aged 13-to-18. The study will use questionnaires to collect data. Questions will be open-ended for the exploratory portion and closed-ended for the quantitative, comparative portion.

Sample and Recruitment

In order to find participants for the study, the researchers would recruit teenagers that meet the inclusion criteria. The inclusion criteria are age (13-18 years old) and reside in the United States. The only exclusion criteria is if the potential participant is not a teenager or lives outside of the United States.

A convenience sample will be obtained by contacting the Children's Screen Time Action Network and requesting a collaboration to recruit through one of their action groups. The

researchers also plan to recruit through local families who participate in day camps and/or play groups. Snowball sampling will be encouraged, i.e. recruiting through word-of-mouth among potential participants. After explaining the study and obtaining informed consent from parents and/or assent from participants, they will be divided into two groups, based on their screen time usage. The first group would include participants who spend more than 2 hours per day using a screen, while the other would consist of participants who use less than 2 hours per day.

Methods

Each participant will be provided with a questionnaire that asks various questions about their background, lifestyle habits, daily screen time usage, type of screens used and weight (10 minutes). A second questionnaire will be given that focuses more on the participants' social skills, such as their comfort level holding a conversation with strangers, speaking up in social settings and their rating of their dependence on their devices with screens (5 minutes). Both questionnaires will be based on previous research and will use a likert Scale or categorical questions that can be numerically coded for the quantitative data followed by one or two open-ended questions for the qualitative data collection. The participants will be followed over a four-year period, with check-ins occurring four times a year. At each check-in, the participants will report if any increases or decreases in screen time consumption have occurred since last asked. The participants will also be asked to fill out both the first and second questionnaires at each check in to see if their comfort level in social settings has decreased, increased or stayed the same. The researchers will analyze the data and see if any connections can be made between high screen time consumption and poorer social skills. The researchers' goal is to test their hypothesis and determine if the data supports a connection between high screen time use and increased risk for low skill development.

Plan for Data Analysis

In order to analyze the data, the researchers will conduct the proposed study over a four-year duration. The researcher will collect the data - two questionnaires - for each participant four times each year. Each participant will be assigned a code and the questionnaires will be organized. The goal will be to obtain a total of 16 time-points for the data analysis of each participant. The researchers will examine the data for any trends among all of the participants, between the age groups and between the genders. Next, the data collected from the group with more than two hours of screen time will be compared with the data from the group with less than two hours of screen time. Once the four-year study has been completed with all data collected, the researchers will perform the analysis using the statistical program for the quantitative data. The data will be viewed in a time-series with correlation of the different data points. For qualitative questions, the answers will be scrutinized for potential connections between the amount of screen time and social skills. The data will then be graphed in order to focus on the more prominent trends.

A content analysis will be conducted for the exploratory open-ended questions. Similar words and phrases will be organized into groups and themes will be derived.

Depending on the type of relationships between screen time and social skills development that the data may reveal, the researchers next step will be to create nursing interventions and recommendations that improve pediatric physical and social development.

Concluding Statement

Overall, the literature review showed that there are negative effects associated with screen time and the physical health of the pediatric patient. The proposed study could shed light on different nursing interventions, specifically screen time guidelines, that could improve

pediatric social skill development. These guidelines could help keep pediatric patients within a

healthy weight range, improve their communication skills and ensure that they feel more and

more comfortable in social settings as they mature. I believe that the futures of pediatric patients,

and the health care system in general, could benefit from the proposed study.

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Appendix