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Screen Time: Impacts on Physical Health, Sleep, and Psychological Health and Well-being

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SCREEN TIME: IMPACTS ON PHYSICAL HEALTH, SLEEP, AND PSYCHOLOGICAL HEALTH AND WELL-BEING

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Abstract

With the rise of technology there has been an increase in screen technologies that are prevalent in everyday life. Technology and screens are used in employment, education, and leisure settings. The average person in the United States spends many hours every day dedicated to screen time. Screen time can be defined as the aggregate duration of time spent in front of all screen technologies including: televisions, computers, laptops, video games, cellphones, and tablets. Increased screen time has been linked to various negative health outcomes. Some of those negative outcomes include effects on physical health, sleep, and psychological health and well-being. Much of the research examining the relationship between screen time and physical health, sleep, and psychological health and well-being shows a positive correlation between the negative health impacts and increased amounts of screen time. As a society we must find a way to have a healthy balance and utilize technology and screens but also promote and enjoy active alternatives.

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CHAPTER I: INTRODUCTION

Technology has been on the rise for many years. In our society today, individuals are bombarded with technology in all aspects of life and exposure to screens is at an all-time high. According to Mike Brooks (2018), in a *Psychology Today* article, in the United States, adults are interacting with the media over 11 hours per day and teens are interacting with the media an average of nine hours per day. For teens, this does not include time spent on homework. Brooks (2018) went on to say that, "For kids ages 8-12, the same Common-Sense media survey report found they were spending 6 hours per day interacting with media and kids ages 2-5 spend around 32 hours per week in front of a screen (e.g., watching TV, videos, gaming)" (Brooks, 2018, p. 3).

Screen time is an umbrella term that encompasses many different technological screen-based activities. People are spending screen time watching television, on the computer, laptops, or tablets, playing video games, or in front of their smartphones. According to Ash Turner (2020), the CEO of bankmycell.com, the global number of smartphone users around the world is currently around 3.5 billion, which is approximately 45.04% of the world's population, and from the years 2016 to 2020, smart phone users increased globally by 40% (Turner, 2020). According to pewresearch.org (2019), 96% of Americans own a cell phone of some kind (Pew Research Center, 2019). An article by Danielle Cassagnol (2018) reported that research done by the Consumer Technology Association in 2016 found that an average American household has 2.8 televisions and 2.4 smartphones in their homes. In 2018, the Consumer Technology Association stated in the Technology Ownership and Market Potential Study, that 96% of U.S. homes own at least one television, 87% of U.S. homes own a smartphone, and 72%

of U.S. homes own a laptop (Cassagnol, 2018). With the growth in technology and smart devices, sedentary behavior for the purpose of screen time, has risen and individuals are exposed to screens starting at a young age.

There are many things that individuals need to do to stay healthy. Eating a balanced diet, being physically active, maintaining a healthy body weight, and getting adequate and quality sleep are just a few factors that contribute to a healthy lifestyle. There have been many studies conducted that have shown that an increased amount of screen time can be associated with decreases in physical activity, sleep duration, quality of sleep, and an increase in obesity and various psychological issues, therefore hindering the goal of a healthy lifestyle.

Brief History of the Television, Computer, and Smartphone

The history of technology and the increase of screen time within technology, has greatly advanced over time. From the inception of the television to the development of computers, the internet, cell phones, and smart devices, technology has exponentially increased and made dramatic shifts, over a short period of time.

History of the Television

In the 1900s at the International World Fair exhibition in Paris, a Frenchman, Constantin Perskyi, coined the term "Television." Perskyi read his paper that examined current electromechanical technologies at the time to the International Electricity Congress (Proydakov, 1997). The idea of the television was around prior to the 20th century; however, television as a working technology was invented later in the 1900s. Technology encompasses many things, but the creation and use of a digital screen for entertainment or pastimes is a relatively new technology. There were many different

experiments and creations pertaining to transmitting images that led to the inception of the television and its popularity for personal use. Experiments and creations pertaining to receivers, and then the transmitting of images, helped pave the way for the development of the modern-day television. In the United States, in 1922, Charles Francis Jenkins sent a still picture to a screen through radio waves. Then in Britain in 1925, John Logie Baird was able to transmit the first live human face onto a screen (Fink, Fisher, Noll, & Fisher, 2020).

In 1927, there was a public demonstration given of the new television technology by the American Telephone and Telegraph company (AT&T). Regular television broadcasts were being exhibited by the General Electric Company (GE) in 1928. There were many inventors and creators working on the development of a working television, which resulted in many disputes and discrepancies about who the first television can be attributed to. The Radio Corporation of America (RCA) agreed to sign a patent/license agreement with Philo Farnsworth and agreed to pay him royalties in 1939 for the television. In response, RCA was then able to take the majority of credit for the invention of the television. Televisions for commercial use remained in black and white until the 1950s. There were a number of companies that came up with color systems for TVs, but in 1952, an industry color system was created by the Radio Corporation of America (RCA) and accepted by the National Television Systems committee (NTSC) as what would be broadcasted in the United States (Fink et al., 2020).

This RCA color system was utilized into the 21st century, and in 1954, these color TVs, with 12-inch screens, sold for $1000 apiece. Televisions did not become profitable and more affordable for consumers until the 1960s. Different color systems were and are

still today utilized all over the world, despite the inception of digital TVs. In 1987, a new analog, high definition television (HDTV) technology emerged in Japan. In 1990, the U.S. then created an American version of HDTV which was the world's first all-digital television system, by General Instrument Corporation (GI). There were many difficulties that hindered making a switch from analog TVs to digital TVs, however, by the 1990s, digital televisions were utilized across the United States. The invention of the television had a number of important uses for education, communication, and entertainment. Digital televisions paved the way for Smart TVs which allowed for faster access to more content all over the world (Fink et al., 2020). Today, 96% of U.S. homes own at least one television (Cassagnol, 2018) and in 2017, 39% of homes in the U.S. contained one or more streaming media device(s), such as a Roku, Apple TV, or Google Chromecast (Pew Research Center, 2017).

History of the Computer

Similar to the TV, the computer had many different people who contributed to its inception. The origins of the computer can date back to ideas and inventions created in the 17th century. However, there were a number of inventions around the mid-1900s that helped pave the way for the personal computers. The most notable invention in the 1940s was the Atanasoff Berry Computer (ABC Computer). It was completed in 1942 by Professor John Vincent Atanasoff, a physicist and mathematician, and his graduate student Clifford Berry. The ABC computer was the first electronic digital computer and Atanasoff was deemed the creator of various computer related ideas. After a legal dispute, the computer was deemed not patentable and was open to all, thus there were many people who contributed to the development of the modern-day computer. One

person cannot be established as the sole inventor, much like the Television and the mobile phone (The Editors of Encyclopedia Britannica, 2020).

Atanasoff and Berry worked on the ABC computer from 1939 to 1942 separately and not in conjunction with other computer developers. In 1941, a German engineer named Konrad Zuse created the first working program-controlled calculating machine. Then in 1944, a group of engineers along with Howard Aiken, at International Business Machines (IBM) completed the Harvard Mark I, which was a data-processing machine. Many advancements in computer technology happened around the mid-1900s, and after that time, computer technology continued to advance at a rapid pace (The Editors of Encyclopedia Britannica, 2020).

By the 1970s and 1980s, more and more people wanted to own a computer in their homes. The high demand brought out more competition from other companies and then led to lower prices. Prior to 1977, only individuals who could build a computer for themselves out of a kit could own a computer. Then with the demand, personal computers became widely available in a short period of time (Computer History Museum (n.d.).

The Advanced Research Projects Agency (ARPA) which was a part of the U.S. Department of Defense, laid the groundwork for ARPANET which much later helped create the internet. The first internet users were universities in California in 1969, that utilized the ARPANET (Computer History Museum (n.d.).

As computer technology excelled advancements like laptops and tablets were created. In 1981, the first recognized portable computer was created by Adam Osborne. It contained a five-inch display and weighed 24½ pounds (Computer Hope, 2020). In 2016, 89.3 percent of all households in the U.S. contained at least one computer (Statista

Research Department, 2020) and in 2018, 72% of U.S. homes owned a laptop (Cassagnol, 2018) and 68% of households contained at least one tablet (Pew Research Center, 2017).

History of the Mobile Phone

Like the television and the computer, mobile phones have had many contributors to its invention and the creation of faster data networks that we now have today. According to Encyclopedia Britannica, in the U.S. in 1946, mobile transmitters and receivers were interconnected with the Public Switched Telephone Network (PSTN) and the introduction of Mobile Telephone Service (MTS) began. That was provided by the American Telephone and Telegraph Company (AT&T), and at the time only one user could talk at a time, and you had to push a button to speak. Then in 1964 the Improved Mobile Telephone Service (IMTS) was introduced by AT&T. That included automatic dialing, automatic channel searching, and more complex operations. There was a high demand for use of the channels, and all subscribers in the IMTS system were instruments based in motor vehicles. AT&T and Motorola then developed a true cellular system called Advanced Mobile Phone Systems of (AMPS) which could be used by both automobiles and pedestrians. In 1983, it was introduced to the public in Chicago and was a great success (Borth, 2017).

After the first year of AMPS service, there was 200,000 subscribers in the U.S. and then there was 2,000,000 subscribers five years later. There was a high demand for this technology and many service shortages. To increase capacity, there were many technology improvements proposed to allow for more channels, for higher rates of use, and increased connectivity. In 1983, the first handheld, portable, commercial cellular

phone was introduced. It was the Motorola DynaTAC8000X (Borth, 2017). The Motorola phone weighed two pounds, was 13 inches long, and was nicknamed “the brick” (National Museum of American History (n.d.).

There were many cellular systems that were created all over the world but none of them were compatible with other systems in other countries. In the 1980s, the analog cellular system was a big hit, but it did not sustain a high capacity of use and was not great for international communication. The analog cellular systems are often referred to now as “1G” or “first generation” then in the late 1980s and in the early 1990s, “second generation” or “2G” digital systems began to appear. There were many modifications and enhancements made after the implementation of 2G cell phones and networks. Better data service was created, image transfer, two-way text messages, and eventually internet use (Borth, 2017). With the creation of “the brick” in 1983, cell phones began appearing in movies, TV shows, and sitcoms and were a part of not only conducting business, but also everyday life. By the end of the 1980s they were very popular (National Museum of American History, n.d.).

In 2001, Japan introduced the world’s first service that was 3G. It was offered by various carriers in Japan, the U.S., and a few other countries. With 3G technology there were higher data rates, higher quality image transmission and full-motion video transmission, along with available access to global positioning system (GPS). The increasing use and high demand of cellular devices was too much data for 3G networks, and in 2009, the first 4G network was introduced (Borth, 2017). Then in 2019, large scale implementation of 5G networks began to support the vast number of global users and to increase speed, data, and increased device technology needs. According to the Pew

Research Center, 96% of Americans own a cell phone of some kind (Pew Research Center, 2019). In 2019, the Global Smartphone Market had a value of 714.96 billion US dollars. It is expected to reach 1351.8 billion by 2025 (Marketwatch.com, 2020).

If you are looking at the combined percentage of households in the United States that contain at least one tablet or TV media streaming device, desktop/laptop computer, or smartphone devices, 90% of U.S. households contain one or more. On average, the (median) household in the U.S. contains five of them. Additionally, nearly one-in-five households in the United States or 18%, are "hyper-connected." Which means that those families have at least 10 or more devices (Pew Research Center, 2017).

Personal Connection

I have been in many social and professional scenarios in which I have personally witnessed negative impacts of screens in people's lives. I have watched my roommates spend hours in front of the TV or playing video games in their rooms, only to express frustration later, stating they wished they had more time to get things done. I have been out with groups of friends, who each checked their phones every couple of minutes and had minimal conversations with one another because they were busy on social media or texting. I have experience in my own classroom with students who want to spend all of their time in front of screens instead of spending time engaging with others. I am concerned about the impacts that too much screen time can have and about screen or internet addiction and what implications that may have.

For the past seven years, I have worked in the education field. I have taught in a transition classroom with students ranging in ages from 16-21. The majority of my students have had intense interests in technology, social media, smartphones, video

games, television, and computers. If there is ever "free choice time" for breaks, students are choosing to spend their time on technology instead of conversing with others, playing outside, or playing games with others.

I have never been a television watcher and I do not play video games or spend a lot of time on my computer (other than for work or school); however, I do believe that I have a strong attachment to my smartphone. I feel anxious when my phone is not by me or if I do not know where it is. I am constantly checking my phone for missed calls, text messages, or notifications on my social media applications. Even when I am with my family or friends, I find myself checking my phone for "likes" or "comments" on my Facebook, Instagram, or Snapchat apps. I realize that there is this invisible pull to check my phone too often. I do not want to be addicted to my phone. I want to be present in all of my moments with my family and friends, and I do not want to waste those precious moments scrolling through social media notifications.

According to Trevor Haynes (2018), a Harvard University Researcher, adults in the U.S. spend an average of two to four hours each day on their phones. Around 73% of those people claim to experience anxiety when their phone is missing (Haynes, 2018). There has been published literature that references the science behind desires for social media notifications and "likes" and the feeling of social gratification (Sherman, Hernandez, Greenfield, & Dapretto, 2016). According to a study listed in the journal of the Association for Psychological Science, "Viewing photos with many (compared with few) likes [on a social media platform] was associated with greater activity in neural regions implicated in reward processing, social cognition, imitation, and attention." (Sherman et al., 2016, p. 9). Images of individuals' brains in the study, including the

portion for reward processing, showed they would become activated when receiving high numbers of "likes" on photos, or when viewing photos with high numbers of "likes." Of American teens, nearly 90% report being active users of social media (Sherman et al., 2016). Notifications can lead individuals to experience a feeling of reward. When individuals get a social media notification, their brain sends a chemical called dopamine through a reward pathway, which makes them feel good. That feeling and reward is one of the factors that entices individuals to log in for more (Haynes, 2018).

Thesis Questions

My experience in the classroom, along with my personal experiences, have made me very curious about screen time and how screen time impacts individuals. The following thesis questions will be addressed: What are some of the negative impacts of too much screen time? How does increased screen time affect physical health? How does increased screen time affect sleep? How does increased screen time affect psychological health and well-being? Additional questions that will be examined include; what impact does internet addiction have?

CHAPTER II: LITERATURE REVIEW

Literature Search Procedures

To find the literature and information for this thesis, searches of Education Journals, Academic Search Premier, Psychology Database, ERIC, PSYCHInfo, and EBSCO MegaFILE were conducted for studies and publications from 2010-2020. The key words that were used in these searches included “screen time,” “adolescents and screen time,” “screen time and learning,” “impacts of screen time,” “screen time and sleep,” “screen time and effects,” “screen time and physical health,” “screen time and mental health,” “predictors of screen time,” “benefits of screen time,” “implications of screen time,” “impact of screen time on development,” “screen time and self-esteem,” “screen time and stress,” “screen time and depression,” “screen time and anxiety,” “behavioral predictors of screen time,” “screen time and internet addiction” “screen time and self-image,” and “screen time and health.” This chapter will review the literature on negative impacts of screen time in three sections in the following order: Impacts of Screen Time on Physical Health; Impacts of Screen Time on Sleep; and Impacts of Screen Time on Psychological Health and Well-being. This literature review examines research surrounding three key areas of impact of increased screen time. The three areas of impact are: Impact of Screen Time on Physical Health, Impact of Screen Time on Sleep, and Impact of Screen time on Psychological Health and Well-being.

Impact of Screen Time on Physical Health

One of the key areas of impact that screen time users may experience is physical health. For the purposes of this research, physical health is defined as the overall

condition of an individual's body, which may include weight, body mass index, physical activity level, and diet.

Screen Time and Indicators of Obesity

With the growth of technology and the rise in screen exposure, there has been an increase in research on the impacts of screen time on obesity and body mass index (BMI). Suchert, Hanewinkel and Isensee (2016) examined the relationship between screen time and various indicators of being overweight, as well as negative self-concepts around physical attractiveness related to screen time. They used randomized data from the "läuft" program, which was a school intervention program that encouraged an active lifestyle in schools in Germany. This study recruited 29 schools and the participants included 1228 students ages 12-17. They determined that screen time had a significant relationship with BMI percentile and each hour of screen time was associated with an increase of BMI percent, body fat, and abdominal circumference. Even if the individual was classified as a healthy weight by researchers, the higher the amount of screen time the individual viewed, the higher the amount of body fat on the individual. The researchers suggested some of these impacts may be associated with visceral fat. Suchert et al. (2016) discovered that higher amounts of screen time was also associated with an increased amount of negative self-concept and body dissatisfaction. They hypothesized two mechanisms for the relationship between higher screen time and higher ratings of body fat, BMI, and abdominal fat. They noted that screen time has been linked to sedentary behaviors that have a strong relationship to unhealthy food consumption and decrease the amount of physical activity.

Tremblay et al. (2011) conducted a systematic review and meta-analysis of research focused on sedentary behavior and six health indicators that included: body composition, fitness, metabolic syndrome, self-esteem, prosocial behavior and academic achievement. Online databases, libraries, and government documents were searched to find relevant studies which led to a qualitative analysis of 232 relevant studies. Studies were only included if they had a specific measure of sedentary behavior. Of the 232 studies, 983,840 participants from 39 countries were included in this review. The studies and articles were published from 1958 to 2009. The review focused on subjects who were 5-17 years of age. They did not exclude studies who had participants over 17 or younger than 5, as long as the mean age was between 5 and 17 years. Out of the 232 studies, 170 were related to body composition and obesity (Tremblay et al., 2011).

The majority of the 170 studies were related to the relationship of obesity, or being overweight, and increased screen time (more specifically TV). Body composition was measured in a variety of ways, such as BMI, percentage of body fat, skin fold thickness, and composite measures. Some of the studies had mixed outcomes related to body composition but the researchers determined that sedentary behavior for more than two hours a day, typically while viewing TV, was associated with having decreased fitness as well as unfavorable body composition (Tremblay et al., 2011).

Cureau, Ekelund, Bloch, and Schaan (2017) found that screen time (ST) within sedentary behavior and lower moderate and vigorous physical activity (MVPA) are both independently associated with risk factors surrounding cardiometabolic health. Cureau et al. (2017) examined results from a nation-wide survey that included 36,956 Brazilian adolescents, ages 12–17 years, in a study of cardiovascular risks. They collected data

from students in Brazil about MVPA and ST, which were measured by self-reports. They also measured blood pressure, a model of insulin resistance, cholesterol, triglyceride levels, and waist circumference. These factors were used to calculate a cardiometabolic risk score. Cureau et al. (2017) examined the associations of each risk factor by using ordered logistic regression. Both MVPA and ST were independently connected to cardiometabolic risk. Students who met the daily recommendations for both ST (two hours or less) and MVPA (60 minutes or more) had lower odds of cardiometabolic risk, more specifically if they were overweight. The less screen time and the more physical activity the students had on average, showed better cardiometabolic and physical health (Cureau et al., 2017).

Raistenskis, Sidlauskiene, Cerkauskiene, Burokiene, Strukcinskiene, Buckus (2015) examined the relationship of children's sedentary screen time and physical activity to obesity and environmental locations. The researchers wanted to assess if there were variances in these factors and compared the differences of children living in the city and children living in a smaller town. They classified a town as an area that has between 500-3,000 people in the population. The participants consisted of 532 children from 5th-7th grade from three schools in Lithuania. Two schools were from a town area and one school was from a city area. Of the participants, 118 children were from a town area and 414 were from a city area (Raistenskis et al., 2015).

Raistenskis et al. (2015) conducted a Youth Physical Activity Questionnaire (YPAQ) and evaluated sedentary screen time and physical activity. They measured each participant's body fat percentage, waist to hip ratio, and calculated their BMI. Overall, the frequency of obesity and rates of overweight among the participants was 25.5% from

the town area and 18.6% from the city area. On average, participants from town had 9.3 min/day less moderate or vigorous physical activity. Additionally, they engaged in 33.2min/day lower energy expenditure than the participants living in the city. Both participants in town and the city had extremely high rates of sedentary screen time on the weekends. There have been several studies that have found that rural adolescents engage in more sedentary screen time and less physical activity whereas others have stated that opposite, that urban areas have less physical activity and more sedentary screen time. Either way, prevention strategies should be used to minimize sedentary screen time and increase physical activity in adolescents (Raistenskis et al., 2015).

Screen Time and Sedentary Behavior

Tremblay et al. (2011) found there is much evidence that suggests that decreased sedentary behavior led to a decrease in body weight or BMI. Furthermore, from 7 th-9 th grade, they found that increased sedentary behavior (more than two hours of TV watching), led to reduced physical fitness and an increase in unfavorable body composition. Increased sedentary behavior also led to lower levels of prosocial behavior, lower levels of self-esteem, and lower academic achievement; these findings were consistent in all of the studies, in all of the countries, and using both direct and indirect measures. The majority of these studies focused on sedentary behavior via TV watching and body composition and suggest that children and youth should be viewing less than two hours of TV per day during free time. Also, all sedentary style activities, such as playing video games, computer usage for non-school work, and other sedentary pursuits, should be minimized (Tremblay et al., 2011).

Cureau et al. (2017) noted that regular physical activity is connected with many metabolic health increases in formative years, which lasts into young-adulthood. Cureau et al. (2017) defines sedentary behavior as activities where individuals are sitting or in a reclining position or when individuals are exerting low levels of energy expenditure, especially during screen time. “Screen time has also been identified as a risk factor for obesity and metabolic abnormalities in youth, independent of physical activity. These findings suggest that sedentary behavior should be considered as a construct distinct from, rather than lack of physical activity” (Cureau et al., 2017, p. 551).

Wang, Li and Fan (2019) examined the association between screen time-based sedentary behavior (ST-SB) and depression. They conducted a meta-analysis through an electronic search of publications printed from 2000-2018 and utilized only studies that fell within their search parameters and came from peer-reviewed publications. From there, they assessed the source to verify it was written in English and then abstracts and content were examined. Studies were only considered to be acceptable if they were observational, cohort, case-control, and cross-sectional studies. Another consideration was if they examined depression or the risk of depression specifically, assessed ST-SB, and included participants 18 and over. The quality of the data was assessed and then data extraction began. Within this meta-analysis, a total of 19 studies were accepted for review, which included 12 cross-sectional studies, seven longitudinal studies, and included a total of 232,581 participants, 118,991 of which were in cross-sectional studies and 113,590 were in longitudinal studies.

According to Wang et al. (2019), subjects who were exposed to higher amounts of screen time, more than two hours a day of ST-SB, were more likely to have depression.

When screen time was also looked at as a continuous variable, associations of depression and screen time became smaller, but remained statistically significant. There were a couple of hypotheses that the authors noted. Several hypotheses were noted which included the idea that sedentary behavior, when it is long term, may give way to sleep disturbances and cause other issues. Alternatively, physical activity is shown to boost mood and reduce symptoms of depression. These studies showed a positive relationship between obesity and sedentary behavior as well. The findings showed that the association between sedentary behavior and depression was significant in female participants, but not significant in male participants, demonstrating a gender distinction in results. Screen time and sedentary behavior should be limited to support and promote mental health, especially in women (Wang et al., 2019).

Hamer and Stamatakis (2019) examined the association of sarcopenia, screen-based leisure time sedentary activities, and muscle strength. Sarcopenia is the decline in muscle mass and strength due to age. They defined screen-based leisure time activities as daily TV viewing time and internet use. The researchers studied 6228 participants, which included 2,845 men and 3,383 women. The participants were a part of the English Longitudinal Study of Aging (ELSA). ELSA is a cohort study that is ongoing and contains a sample of the English population living in households. That sample is nationally representative and consists of women and men born on or before February 29, 1953. The participants in the study were asked questions pertaining to physical activity and sedentary behavior. The participants were also asked about their sedentary behavior pertaining to TV watching and computer use throughout the week, including weekends. Participants were also asked about their physical activity, which included: low-intensity,

moderate, vigorous, and how often they completed those activities. Physical strength was measured by two tests. One was a hand grip strength test that was measured by the dominant hand on a hand-held dynamometer. The other was a timed chair stand test that helped measure strength of the lower body. This test assessed the amount of time it took the participant to rise from a seated position to full standing with their arms crossed over their chest. Participants were also asked questions regarding history of smoking, alcohol consumption, depressive symptoms, chronic illness, and general demographic questions about themselves (Hammer & Stamatakis, 2019).

This study found that participants who watched more TV had less healthy profiles relating to smoking tendencies, higher BMI, lower physical activity, greater chronic illness, higher rates of disability, and more depressive symptoms. Additionally, individuals that had lower social status watched more TV. Participants that watched more TV on average used the internet less. A higher number of internet/computer users were of higher comparative social status related to professions (managerial/professional positions) compared to the non-computer users. Higher computer use was not found to be strongly associated with physical activity and muscle strength among the participants. The researchers stated this might be due to TV watchers prolonged sedentary behaviors compared to computer users. Computer users were found to use the computer an average of two hours per day compared with TV watching, which was found to be the highest form of sedentary behavior with one quarter of the participants reporting six or more hours of TV use each day. Higher BMI in participants was associated with higher grip strength, but slower time to complete chair rises (Hammer & Stamatakis, 2019).

Iannotti and Wang (2013) examined the patterns between sedentary behavior through screen time, physical activity, and diet. They identified three patterns of obesogenic behaviors that related to indicators of physical and psychological health, depression, and weight status. The researchers utilized a nationally representative sample of adolescents, 11-16 years of age, from 230 schools across 39 states. There were a total of 9,174 adolescents included in the survey and they completed the 2005/2006 Health Behavior in School-aged Children (HBSC) survey anonymously. Participants were asked questions relating to sedentary behavior (SB) that included screen time, physical activity (PA), weight status, weight control behavior, body dissatisfaction, overall health, the frequency of consuming unhealthy and healthy food items, depression, physical symptoms, and life satisfaction (Iannotti and Wang, 2013).

Iannotti and Wang (2013) determined that the obesogenic patterns of behavior correlated to depression, weight status, and other indicators of physical and psychological health for 74% of participants. The researchers utilized Latent Class Analysis (LCA), which examines participants' patterns of responses across multiple variables and identifies latent classes. Data was divided into three classes of the obesogenic behaviors. Class one included subjects that had high fruit and vegetable intake, high physical activity, low intake of sweets, pop, fries, and chips, and low levels of sedentary behavior. Class two included subjects that had a high intake of sweets, pop, fries, and chips, and high physical activity. Class three included subjects that had low fruit and vegetable consumption, as well as low intake of sweets, pop, fries, and chips, and low physical activity. In class one, 26.5% of subjects fell into this category and they were most likely to be of a normal/healthy weight and they also rated high on all health indicators. In class

two, 26.4% of subjects fell into this category and they were most likely to be on a diet or trying to lose weight. This group scored poorly on physiological health indicators. In class three, which comprised of 47.2% of subjects; it was found that they were less likely to be underweight, and reported greater levels of dissatisfaction with their bodies.

Approximately three out of four participants were categorized into one of the groups of obesogenic behavior. Three out of four had unhealthy dietary and activity patterns. One class had good indicators of mental health and the optimum combination of healthy behaviors. The other two of the classes had poorer mental health and had lower rates of sedentary behavior, physical activity, and lower consumption of fruits and vegetables, with mixed consumption of unhealthy snacks (Iannotti and Wang, 2013).

Impact of Screen Time on Sleep

The literature review continues by examining research surrounding another key area of impact that users of increased screen time may experience. One of those areas is sleep duration and sleep quality. Sleep duration and sleep quality are important factors that contribute to a healthy lifestyle. Night time phone use and placement of phone while sleeping have been shown to have an impact on the amount of time sleeping or the quality of sleep.

Screen Time and Duration of Sleep

Wu et al. (2016) conducted a study in China of 8,900 children, which explored the relationship between screen time, nighttime sleep duration, and behavioral problems. The parents or caregivers were given standardized questionnaires that they answered pertaining to their student(s). Parents responded to a questionnaire that included questions about their children's exposure to screen time and the amount of time they spent sleeping

at night, in addition to questions regarding behavioral issues. Children's screen time and nighttime sleep duration were assessed by the questionnaires. Children who had more screen time and less sleep were more likely to have adverse behavioral problems (We et al., 2016).

Twenge, Hisler, and Krizan (2019) examined the relationship between screen time on portable vs. non-portable devices and how that impacts sleep. A question that guided their research was if portable devices have a higher impact on sleep than non-portable devices. In this study, data was taken from a national survey administered by the U.S. Census Bureau in 2016. The survey included caregivers of 43,755 children and adolescents, ages 0-17. They hypothesized that there are three primary reasons why portable screen devices have a greater impact on sleep than non-portable devices. One reason they hypothesized, is that bringing the device into the bedroom, the bed, or using it right before sleep, may delay the onset of sleep because they are using the devices and not sleeping. The second reason they hypothesized is because kids can bring their portable devices into private spaces (like a bedroom) and view more explicit or violent material without parent supervision, and that material may disrupt sleep or cause less sound sleep. They stated another reason that may cause portable devices to have a negative impact on sleep is that individuals typically hold these devices in close proximity to the face. This exposes the user to higher levels of blue light which may delay the melatonin response in bodies and reduce the onset of sleep, quality of sleep, and overall duration (Twenge et al., 2019).

The survey conducted by Twenge et al. (2019) was done via the U.S. census website and standard mail. Houses were randomly selected and caregivers were asked to

respond to questions about their children ages 0-17. One child from the home was picked at random to be the subject of the survey. If the child had one of eight major conditions, the child was excluded because the condition may disrupt their daily functioning and sleep. The eight conditions were: autism, blindness, cerebral palsy, deafness, Down Syndrome, developmental delay, epilepsy, or intellectual disability. Caregivers were also asked if the child had ever been diagnosed with depression or anxiety, the child's BMI status, and the amount of physical activity the child experiences in a week. Across all age groups, children who were exposed to more time on portable devices slept for less hours. Individuals that spent more time playing video games or watching TV also slept for less hours. Children who were exposed more to one type of screen usually had more time on all types of the screens as well. Up until the age of 10, the amount of sleep was negatively impacted/decreased from the use of portable and non-portable screen time. Both non-portable and portable screen time decreased the amount of sleep. However, after the age of 10, the non-portable screen time no longer affected sleep duration. They hypothesized that this may be that after the age of 10 the students have personal devices. Across all ages, spending multiple hours a day on a variety of electronic devices is associated with reduced sleep duration. Portable electronic devices had a stronger connection with shorter sleep duration, than non-portable devices (Twenge et al., 2019).

Munezawa et al. (2011) found that cell phone use after lights out, for texting or calling, was related to more sleep disturbance. That sleep disturbance was broken down into four different types: insomnia symptoms, excessive daytime sleepiness, short sleep duration, and subjective poor sleep quality. They controlled for several factors, including mental health, extracurricular activities, gender, grade, eating breakfast, and alcohol or

cigarette use. This study randomly selected junior high and senior high schools and used stratified cluster sampling. Participants included 10,955 junior high schools and 5115 senior high schools that were registered in Japan and 130 junior high schools and 110 senior high schools were sampled. All of the students that attended the schools in each sample were subjects of the study. Each student was given a private questionnaire to fill out and asked questions pertaining to personal data, mobile phone use, mental health, sleep, and lifestyle. A total of 94,777 adolescents responded and were given questionnaires for analysis. About 11% of junior high school students utilized cell phones after lights out and approximately 22% of high school students utilized cell phones after lights out. High school students had more mobile phone use in general and girls had more mobile phone use than boys. It was surmised that the reason high school students had more exposure to mobile phone use is because they are allowed to have mobile phones in school, whereas other grade levels are not. Generally, high school students and high school girls had shorter sleep duration, poorer perceived sleep quality, and excessive daytime sleepiness. In general, girls had more short sleep duration, subjective poor sleep quality, and excessive daytime sleepiness, but found no significant difference between males and females regarding insomnia symptoms. This study showed that mobile phone use after lights out is associated with various sleep disturbances.

Hale and Stanford (2015) conducted a systematic literature review that examined research surrounding children and youth, primarily between the ages of 5-17 and examined scientific research relating to screen time and its association to sleep outcomes. They looked at various types of screen time, including TV, computer, video games, and mobile phones, and associations of that screen time to sleep outcomes. The sleep

outcomes they looked at were sleep timing, sleep duration, sleep quality, sleep onset latency (SOL), subjective assessment of daytime sleepiness/tiredness, or other outcomes that were reported, including subjective assessment of symptoms of insomnia. The studies and articles were published from 1999 to 2014, a 15-year time period. Of the 67 studies, European populations were used in a little over 40% of the studies, US samples were used in 21% of the studies, Japanese samples were used in 10% of the studies, and Australian samples were used in 7% of the studies. Of the remaining studies included, participants were from Taiwan, Saudi Arabia, New Zealand, Israel, China, Canada, and Brazil. Studies were divided into screen types which included: TV media (42), computer screens (31), video games (21), and mobile device screens (16) as well as 11 articles that were categorized as multiple uses of screen time into a single measure (Hale & Stanford, 2015).

Hale and Stanford (2015), found that in all screen types, 90% of the studies they examined show a significant negative association with at least one of the sleep outcomes listed. The result of this research showed 94% of studies of computer use, 91% of unspecified screen use, 86% of video game use, and 83% of mobile device use were consistently associated with negative sleep outcomes. The screen category that had the least likely association to adverse screen outcomes was TV at 76% of studies. These ratings are consistent with other studies that hypothesize that interactive screen technology is more detrimental than passive screen time (e.g. TV) (Hale & Stanford, 2015).

Screen Time and Quality of Sleep

Albaugh and Borzekowski (2016) looked at the relationship between the placement of cell phones at night and sleep quality, relationships, and academic performance. This study used a convenience sample via online survey of 353 participants between the ages of 17-24 years old across the U.S. Of the participants, about one fifth or 18.5% of the study participants slept with their phones, 71.2% slept with their phones on a table next to their bed and 80% reported that they used their cell phones as an alarm for the morning. The participants who slept with their phones in their bed reported getting significantly less duration of sleep on weeknights than those who slept with their phones in alternative locations. Sleep quality was also reported as poorer for those who slept with their phones in their beds. Individuals that reported sleeping with their phones also reported poorer health. Among students, cell phone placement at night was not reported as associated with academic performance or GPA (Albaugh & Borzekowski, 2016).

Lemola, Perkinson-Gloor, Brand, Dewald-Kaufmann, and Grob (2014) researched the use of electronic media at night, sleep disturbance, and depressive symptoms in teens. They explored adolescents' smartphone ownership and their sleep associated with that. They also examined if the adolescent's sleep was associated with electronic media use and if that was related to depressive symptoms. Participants of the research study were recruited from various public high schools in Northwestern Switzerland. Seven high schools agreed to participate in the study which included 32 individual classrooms. Within those 32 classes, 390 students agreed to participate in the study and/or had consent from their parents. Only 362 responses were used because they fell in the age range of 12-17 years old. These students were given questionnaires pertaining to sleep, utilizing technology/media prior to sleeping, and effects on

psychological health. Once the students had finished the questionnaires, they were given one of two things: they were either presented with various information on sleep related topics or they were given an "interventional lesson" on sleep hygiene. The students were also given the same questionnaires a second time, one month later. The data in this research is based on the information gathered from the first school visit (Lemola et al., 2014).

The students were asked questions pertaining to sleep duration, sleep difficulties, electronic media use before sleep, daily general electronic media use, and depressive symptoms. The researchers found that only 10 adolescents, or 2.8% of the total students, indicated not owning a phone at all and they were excluded from the comparisons of the electronic media use. Students who owned a smartphone compared to a conventional phone spent more of their time each day on Facebook and on the Internet and they utilized significantly more text messages every day. Smartphone owners used media in bed before sleep, watching videos, spending time online, and communicated by phone or text messages more often than their non-smart phone counterparts. They also typically had their phones on throughout the night and turned their lights off for the night later than teens that had conventional phones. Smartphone owners did not significantly differ from the conventional phone owners regarding symptoms of depression, sleep difficulties, or sleep duration. However, in general the electronic media use at night was found to be related to sleep disturbance. Sleep disturbance was also found to be an indicator of the relationship between depressive symptoms and electronic media use at night. Education regarding the risk of electronic media use at night and how minimizing that may improve

sleep quality might be an important role in the prevention of depression in adolescents (Lemola et al., 2014)

Woods and Scott (2016) researched how social media use via online screens related to quality of sleep, self-esteem, depression and anxiety. Participants of the study were comprised of 467 students ages 11-17. Students in middle school, ages 11-14, were either given paper and pencil questionnaires in class or had the questionnaire available online. For students in high school, ages 15-17, questionnaires were completed online, outside of class. When it was needed, the researchers provided language support for students who spoke English as a second language. After the questionnaire, students were encouraged to speak to their teacher who was assigned to them and responsible for student wellbeing about any issues or concerns related to sleep, self-esteem, and mood. The researchers measured student overall social media use, emotional investment in social media, specific social media use at night, sleep, self-esteem rating, and overall levels of anxiety and depression.

Woods and Scott (2016) found that students who utilized social media more often, both in general and at night, as well as those that were more emotionally invested in social media, experienced greater levels of anxiety and depression, lower self-esteem levels, and poorer sleep quality. Even after controlling for anxiety, depression, and self-esteem, nighttime-specific use of social media still predicted poorer sleep quality. These research findings support other research studies that have shown that social media use, via screen time, is related to various aspects of overall wellbeing in adolescents. More specifically, when adolescents are on social media at night, compared to just social media use in general, that leads to poorer sleep. The researchers surmised that this may be due

to screen exposure and delaying the melatonin response in individuals, referenced in other studies.

Woods and Scott (2016) stated that emotional investment in social media may be a predictor of inferior sleep because teens may fear that they are not going to be available for notifications or messages. Having that fear of missing out can cause anxiety around not immediately accessing their social media and thus, those individuals may have a harder time relaxing at night and falling asleep. This may cause them to have higher levels of anxiety and higher levels of anxiety has proven to predict shoddier sleep. Poorer sleep can contribute to anxiety and depression. When the researchers controlled for depression, anxiety, and self-esteem, emotional investment in social media no longer predicted poor sleep. Screen time via social media use was also a predictor of lower self-esteem. They hypothesized that negative feedback via social media platforms, like Facebook, as well as social-comparisons may lead to the lower rates of self-esteem (Woods & Scott, 2016).

Foerster, Henneke, Chetty-Mhlanga, and Röösli, (2019) examined the effect of nighttime mobile phone-related awakenings and general screen time on adolescents' sleep problems as well as general health symptoms. Foerster et al. (2019) utilized data from a longitudinal cohort study in Switzerland; the study was conducted in high schools across Switzerland over a four-year time frame. The researchers took initial baseline data and then follow-up data was taken a year later. Adolescents and their parents filled out paper and pencil questionnaires and surveys. Participants included 843 children from 7th -9th grade. Logistic regression models were used and fitted for any confounding variables. Questions that were addressed in the questionnaire included data pertaining to the

participants use of mobile devices during the day and at night, ownership of a phone, if they have their phone turned off or on at night, and how frequently they were woken up by calls or texts. Phone records were collected and analyzed, the numbers of calls and texts were tracked, daily use of screen time was also measured and included time spent on a laptop or computer, time in front of a TV, or a tablet, and time spent on the phone. The participants were asked questions pertaining to restless sleep, troubles falling asleep, involuntary awakenings during the night and also early morning awakenings. They were divided into two categories where participants either had sleep problems or no sleep problems (Foerster et al., 2019).

Adolescents who reported one or more nocturnal awakening from their cell phone at the baseline and follow-up portions of data collection, were more likely to have problems falling asleep and were also more likely to have developed restless sleep within one year, compared to those that did not have nocturnal awakenings. Adolescents that had high screen time at the base line and the follow up portions of the study had less pronounced but still prevalent issues with falling asleep which can affect sleep duration. As well as, generalized lack of energy, exhaustibility, and lack of concentration which can happen from poor sleep. Their results suggest a significantly damaging effect of mobile-related awakenings as well as screen time on sleep problems of adolescents as well as health-related symptoms (Foerster et al., 2019).

Impact of Screen Time on Psychological Health and Well-being

The literature review continues with the examination of research surrounding a final key area of impact that users of increased screen time may experience, psychological health and well-being. For the purposes of this research, psychological

health and well-being is defined as the overall condition of an individual's mental health, which may include depression, anxiety, stress level, negative self-conceptions, behavior, and social/emotional factors.

Screen Time and Adverse Behaviors or Self-Conceptions

An increase in recreational based screen-time and poor mental health are two global concerns. Babic, Colyvas, Morgan, Plotnikoff, Lonsdale, and Lubans (2017) examined longitudinal associations between mental health and recreational screen time. They utilized data in the form of a cluster randomized control trial that also had a six-month follow-up. Structural equation modeling was used to examine longitudinal data and prediction of screen-time use and mental health factors over a period of 6-months utilizing the Adolescent Sedentary Activity Questionnaire. The researchers also administered the Physical Self-Description Questionnaire, measuring physical self-concept; the Flourishing Scale, measuring psychological well-being; and Strengths and Difficulties Questionnaire, measuring mental health outcomes. This study took place in Australia with 322 7th grade participants, 65.5% were female and 34.5% were male.

When examining the results, changes in total overall screen-time were positively correlated to changes in overall psychological difficulties and negatively correlated with changes in physical self-concept and psychological well-being. Changes in TV viewing were positively correlated with psychological difficulties. Changes in recreational computer use were positively correlated with psychological difficulties and negatively correlated with psychological well-being. Changes in tablet and phone use were negatively correlated with physical self-concept. The researchers stated that although this study does not have causal evidence for the damaging effect of screen time on mental

health, it does demonstrate that changes in screen time during this period of time in adolescence are associated with varied mental health outcomes. The results suggest that negative feelings may be reduced and well-being may be enhanced in adolescents if there is a reduction in screen time (Babic et al., 2017).

The study conducted by Wu et al., (2016) explored the relationship between screen time and nighttime sleep duration and the relationship that sleep and screen time have on behavioral problems. Parents or guardians of 8900 children answered questions in the form of a questionnaire about their children's exposure to screen time and the amount of time they spent sleeping at night. Additionally, they also completed the strengths and difficulties questionnaire (SDQ), related to children's behavioral problems. Data was also collected regarding gender, age, and location. The results of this study support the findings of previous studies suggesting that increased screen time might be associated with more behavioral and emotional problems in children. This study also found that some of those behavioral problems might include aggression, reduced prosocial behavior, and attention problems (Wu et al., 2016).

Behavioral problems were assessed using the Strengths and Difficulties Questionnaire (SDQ) and the Clancy Autism Behavior Scale (CABS). Multivariate analysis was used to assess the associations between ST, nighttime sleep duration, and behavioral problems. The SDQ is a validated tool to identify psychological problems in children that are preschool-aged. The study found that preschool children with long screen time exposure and short sleep duration were a lot more likely to have behavioral problems, after controlling for different factors that could have interfered with the study. More specifically, children with more exposure to screens and who spent a shorter

amount of time sleeping, had higher scores on CABS (which assessed ASD-related behaviors) compared with children with shorter amounts of screen time exposure and longer periods of sleep (Wu et al., 2016).

Social behavior can also be impacted by negative self-conceptions of physical attractiveness. Suchert, Hanewinkel, and Isensee (2016) examined the relationship between screen time and various indicators of physical health in a study with 1,228 student participants. They also analyzed the relationship of screen time and self-concepts of physical attractiveness. The students spent an average of two and a half hours each day in front of screens. Students that were classified as non-overweight by researchers scored higher in their self-concepts of physical attractiveness than students that were classified as overweight by researchers. Of the students who were classified by researchers as not overweight, 28% rated themselves as overweight and 12.5% of the students that were rated overweight by the researchers rated themselves as just right. Students who met the recommendation of spending less than two hours each day in front of screens were rated with better physical health in all areas of the study, as well as a higher positive outlook on physical attractiveness. Overall, the amount of screen time the student accessed was related to their self-concept of physical attractiveness and body dissatisfaction. They noted that this is important because dissatisfaction of your body can be linked to other psychological impairments like depression and low self-esteem (Suchert et al., 2016).

Baer, Bogusz, and Green (2011) investigated adolescents' exposure to computers, gaming consoles, other internet use, and television exposure. This study also examined functional and emotional impairments of the adolescents in their sample and whether this was a factor that contributed to the screen time, as well as the potentiality of screen

addition factors. The study included 102 adolescents between the ages of 11-17 and their parents or caregivers and included parent and adolescent responses to standardized questionnaires (Baer et al., 2011).

Parents and adolescents answered questions in the form of a questionnaire created during the study, called the Computer/Gaming-station Addiction Scale (CGAS), about their children's or their own exposure to screen time in the form of computers, gaming, internet use (not on phones), and television exposure. The participants also completed the strengths and difficulties questionnaire (SDQ) related to adolescent behavioral problems. The parents answered questions on the Weiss Functional Impairment Rating Scale-parent (WFIRS-P) which is a validated questionnaire that assesses functional impairment in children with emotional problems (Baer et al., 2011).

The conclusions of the study found that individuals are spending a lot more than the recommended amount of time in front of screens. About 94% of participants are spending more than the recommended 2 hours each day in front of screens and the average mean was 6.7 hours in front of a screen each day. There was a positive correlation between addictive indicators of screen time and overall problems or functional impairment in an adolescent's life. In spite of the relatively small sample size, it bears mention due to the lack of previous studies on this topic. There have been no previous studies on this topic focused on adolescents that are receiving psychiatric care (Baer et al., 2011).

Screen Time and Depression, Anxiety, and/or Stress

Khouja et al. (2019) conducted a two-year longitudinal study in the UK that analyzed associations between screen time, anxiety, and depression. There were 1869

participants that completed the study. Khouja et al. (2019) began the study by measuring screen time on weekdays and weekends through the administration of a questionnaire to 16-year-old participants. The screen time measures included: TV, computer, and cell phone texting. Anxiety and depression were then measured to the same participants at 18 years of age using the Revised Clinical Interview Schedule.

The researchers found that more time using a computer on weekdays was associated with a small increased risk of anxiety and a similar association to computer use on the weekends and anxiety. Increased time spent on the computer on the weekend was only associated with a small increased depression risk. It was found that there was not strong evidence for associations with texting or TV watching.

In their research, Gupta, Khan, Rajoura, and Srivastava, (2018) discovered that many undergraduate students in India are exposed to screen time and spend a significant amount of time in front of screens or on the internet. This study specifically investigated undergraduate students' exposure to computers, tablets, phones, and other internet use or exposure. Gupta et al. (2018) also examined if these individuals had indicators of internet addiction. Furthermore, this study also considered the potential correlation of depression, anxiety, and stress in individuals and investigated if there was a connection to internet addiction or screen exposure.

The study included 380 undergraduate students that were 18 or older, from three different universities in Northern India. The students were randomly selected by a computer generator and were contacted and then answered standardized questionnaires, relating to the study. The participants answered questions from four different sections. The questions in the first section pertained to demographic information. The questions in

the second section pertained to participant internet usage and patterns. They were asked how many hours each week they used a device or the internet, how many years they have been exposed to computers or the internet, what types of smart devices they or their families owned, and if they were typically always logged into their devices or logged off. The third part of the questionnaire was related to the internet that utilized a scale to see if they had indications of internet addiction. The fourth scale was the depression, anxiety, and stress scale, which measured the degree in which an individual is depressed, anxious, or stressed. The study found that there was a positive correlation between screen time, depression, anxiety, stress disorders, and internet addiction. The study suggested that other studies have confirmed results that are similar to this study (Gupta et al., 2018).

Screen Time and Internet Addiction

In their research, Gupta et al. (2018) discovered that about one fourth of the participants had Internet Addiction (IA). Additionally, if an individual was continuously logged into their online apps or if they spent longer hours in front of a screen, they had a higher likelihood of potential internet addiction. There was a positive correlation between screen time, depression, anxiety, stress disorders, and internet addiction. There was a strong positive association between IA and depression, IA and anxiety, and between stress and risk of AI. Higher income levels were also associated with higher rates of AI (Gupta et al., 2018).

Baer et al. (2001) looked at the relationship between screen time and functional and emotional impairments. They found that children who spent more time gaming, on social media apps, and on the computer, had higher rates of addictive behaviors. There was a positive relationship between functional impairment of youth and between

addictive patterns of use. There were differences noted between children whose screen time use was increasingly problematic and children who just filled their free time on a screen (Baer et al., 2011).

Sevelko et al. (2018) examined the impact of comorbid psychopathology and self-esteem with a lifetime of internet addiction (IA). They utilized population-based samples of excessive internet users that also had clinical diagnoses and narrowed the group to individuals that fit their search criteria to 196 participants. They utilized The Compulsive Internet Use Scale (CIUS), which helped identify participants with elevated engagement on the internet. The also looked at internet addiction relevant to the DSM-5, and administered the Rosenberg Self Esteem scale and the Munich-Composite International Diagnostic Interview (M-CIDI), a standardized diagnostic interview that helps identify mental disorders along with specific symptoms (Sevelko et al., 2018).

Sevelko et al. (2018) found that, of the participants in the study, 41.8% were identified as having internet addiction. There was no significant difference found in employment status, gender, age, or migration background between groups. Of the participants that stated that online gaming was their primary activity online, 82.2% were male, while social networking was the primary focus of female participants. activity 80.6% were female. Of the 82 participants with IA, 61 of them or 74.4% had comorbidities. Within this group, mood disorders and substance use disorders were the most common mental disorders. IA was associated with self-esteem, even after adjustment for substance-use disorders, mood disorder, and eating disorder. “People with low self-esteem are more prone toward developing IA or vice versa; individuals with IA

have lower self-esteem. For each unit increase in self-esteem, the probability of IA decreases by 11%." (Sevelko, et al., 2018, par. 27).

Eysenbach, Becker, Hasson, Khalili-Mahani, Smyrnova, and Kakinami (2019) examined the relationship between screen addiction and stress. They performed a multivariate analysis and examined the link between the participants' subjective perceptions of various types of stress, screen addiction, and pattern of screen usage. Eysenbach et al. (2019) conducted a multifactorial web-based survey and gathered data pertaining to screen-related behaviors. Those screen behaviors included: internet addiction, screen time, and importance of various types of screens and screen related activities. The researchers then examined different sources of stress, which included: health problems, emotional states, perceptual risks, and general life satisfaction. They examined group comparisons between whether or not participants reported that they were addicted to internet use and games (A1), if they were not addicted (A0), and whether the participants had experiences with major life stressors (S1) or if they did not (S0).

Of the survey responders, 459 submitted were complete responses. Of those 459 surveyed, 44.6% were in the S1A0 group (had major life stress and not addicted to internet/games), 25.9% were in the S0A0 group (no major life stress and not addicted to internet/games), 19.8% were in the S1A1 group(had major life stress & addicted to internet/games), and 9.5% were in the S0A1 group (no major life stress & addicted to internet/games).

Eysenbach et al. (2019) found that participants that were dependent on screens for social networking and entertainment had up to 19% more emotional stress. It was also found that perceptual stress increased 14% in this group. The participants that utilized

screens for professional networking and work had up to 10% of higher life satisfaction. They showed a strong but heterogeneous link between emotional and perceptual stress and screen dependency (Eysenbach et al., 2019).

Przepiorka and Blachnio (2016) studied the relationship of time perspective, internet addiction, and Facebook intrusion on a group of 756 Polish citizens who had Facebook accounts. Of the participants, 59% were women and 41% were male. The age range of participants was 18-58 years and the mean age was 21.38 years. The participants surveyed had used the internet for an average of 9.52 years and spent an average of 4.45 hours per day on Facebook or online.

They utilized the Facebook Intrusion Questionnaire, the Facebook Intensity Scale, the Zimbardo Time Perspective Inventory, and the Internet Addiction Test. The Zimbardo Time Perspective Inventory measures time perspective (TP), which Przepiorka and Blachnio (2016) define as a person's concentration on particular dimensions of time. They mention five different perspectives of time, which include: Past Positive (thinking back to events that were positively evaluated in the past), Past Negative (negative attitude about the past and frequently thinking back to events that were negatively evaluated), Present Hedonistic (focus on pleasure experienced and a disregard of past experience as well as the future consequences of actions), Present Fatalistic (focus on present combined with a belief that fate determines your life or you have no influence on the future), and Future (focus on the formulation of future plans and on goals). They stated that with these time perspectives, individuals classify and divide life experiences or events into these categories. Time perspective is made up of individuals ideas about the world, about

oneself, about others, as well as the individual's expectations and goals (Przepiorka & Blachnio, 2016).

The researchers analyzed associations that were similar between time perspective and internet and Facebook addiction. They found that the daily amount of time spent online and age were predictors of Facebook intensity, Facebook Intrusion, and Internet addiction. The results of this study showed past negative and present fatalistic orientations of time perspective were both positive predictors of Facebook and internet addiction. The future time perspective was a negative predictor. The present hedonistic orientation had a negative predictor of Internet addiction only. This study demonstrated that starting at a young age, having long periods of daily time spent online, combined with either a fatalistic view of the present, a negative evaluation of the past, or not thinking about the future at all, are predictors for both Facebook addiction and internet addiction (Przepiorka & Blachnio, 2016).

CHAPTER III: DISCUSSION AND SUMMARY

Summary of Literature

There are several overarching key themes that emerged throughout the literature pertaining to the impacts of screen time and they have been compiled to provide the basis of this paper. The first key theme that is evident is the negative impact that increased screen time has on physical health. Individuals with some form of increased screen time have a risk of developing indicators of obesity and increased instances of sedentary behavior. Increased indicators of obesity that have been linked to higher rates of various forms of screen time include: cardiometabolic risk factors or decreased physical fitness (Cureau et al., 2017; Tremblay et al., 2011), unhealthy diet (Iannotti & Wang, 2013), increased fat/BMI, unfavorable body composition, or waist circumference (Hamer & Stamatakis, 2019; Suchert et al., 2016; Tremblay et al., 2011; Wang et al., 2019). Increased sedentary behavior and/or lower physical activity has also been linked to some forms of increased screen time (Cureau et al., 2017; Hamer & Stamatakis, 2019; Iannotti & Wang, 2013).

The second overarching key theme that is evident in the literature and research is the negative impact that increased screen time has on sleep. Individuals with increased screen time have a risk of experiencing a shorter duration of sleep (Albaugh & Borzekowski, 2016; Foerster et al., 2019; Munezawa et al., 2011; Twenge et al., 2019) and a risk for interrupted or poorer/less restful sleep (Albaugh & Borzekowski, 2016; Foerster et al., 2019; Munezawa et al., 2011; Woods & Scott, 2016).

The third key theme that is evident in the literature is the negative impact that increased screen time has on psychological health and wellbeing. Individuals with

increased screen time have a risk of developing negative issues surrounding mental and psychological health, impacting their overall sense of well-being. Increased instances of some forms of screen time has been linked to having higher negative self-concept, Self-esteem, or higher body dissatisfaction (Iannotti & Wang, 2013; Sevelko et al., 2018; Suchert et al., 2016; Woods & Scott, 2016) higher rates of behavioral issues (Wu et al., 2016), higher rates of depressive symptoms (Gupta et al., 2018; Hamer & Stamatakis, 2019; Lemola et al., 2014; Wang et al., 2019; Woods & Scott, 2016), anxiety (Gupta et al., 2018; Khouja et al., 2019; Woods & Scott, 2016), or stress (Eysenbach et al., 2019; Gupta et al., 2018), risk of internet addiction (Baer et al., 2011; Gupta et al., 2018; Przepiorka & Blachnio, 2016; Sevelko et al., 2018;), and/or decreased sense of wellbeing (Babic et al., 2017; Gupta et al., 2018).

Limitations of the Research

Due to the exponential growth of technology in the past century, and more specifically the technological advancements pertaining to screens and smart devices; there is a resounding amount of research devoted to this topic of study. There are hundreds of research studies that surround technology use through screens and the various effects it may have on users relating to health and wellbeing. The scope of my research is narrow compared to the plethora of research and information available on screen time. I had to narrow my topic's scope considerably when considering various aspects of technology.

I initially was going to focus on a specific age group of participants within studies, but found there were many studies in many age groups. I then considered writing specifically about factors that may predict individuals to have increased screen time and

what that looked like; whether it was- access to technology and how many devices were located in a home, what parental employment status was, or various aspects of personal data and demographics. However, there was a vast amount of information available. I decided that I was most interested in, and what my primary research question was: what are some of the negative impacts of increased levels of screen time? I then narrowed my topic into that theme of research. Three overarching themes emerged relating to screen time and they were: impacts of screen time on physical health, impacts of screen time on sleep, and impacts of screen time on psychological health and well-being.

It is important to examine the parameters of the current research and also examine topics related to the research that was limited. Many of the studies and literature pertaining to the impacts of screen use were survey based. Although surveys are useful tools and they may show that screen time is associated with various behaviors or outcomes, they cannot always establish a firm causality. Although their study may still be valid, results may be slightly skewed by personal bias or study procedures. Even when statistically adjusting for specific factors, such as socioeconomic status, specific stressors, or other moderating factors, it is not always possible to eliminate all confounding variables. Are there other specific ways of testing whether screen time affects individuals differently in different contexts?

Another gap in the literature pertaining to screen time is lengthy, longitudinal studies. Although there are longitudinal studies utilized in various areas of research surrounding this topic, it would be interesting to see how results may change over decades. If there was the ability to fund and study how individuals are impacted by screen time over decades, and if the sample size was large and available until the end of the

study, that would yield more long-term and specific impact results, demonstrate how screen time may change over time and what the long-term impacts would be. The ever-changing technology, and access to it through screens, creates a need for continual research and investigation on many areas to be continued for decades to come in order to get a true scope of the impacts of technology and screen time.

Implications for Future Research

Technology is on the rise and it will continue to grow for years to come. With the installation and implementation of 4G networks and the move to 5G, individuals from all over the world are connecting to the internet and screens via their smart devices at an exponentially growing rate. It is important to examine the amounts of time that we as individuals spend in front of a screen and make sure that we are finding balance in our lives. It would be ideal if there was research conducted on how individuals might use technology in various ways to aid in decreasing screen time itself. Many studies ended their research stating that parents, teachers, and service providers should all advocate for and encourage less sedentary-based screen time. It would be helpful if there was additional long-term longitudinal research on early interventions for excessive screen time use in youth. What can parents, service providers, and teachers do to help encourage students to utilize screen time in moderation and also to embrace other healthy aspects of life? Early sedentary behavior is shown to be a predictor of adult sedentary behavior. As a global society, we should encourage ourselves, and each other, to get outside, play sports, and do other healthy activities, in addition to using screens and technology in moderation, to have a well-rounded and healthy lifestyle.

Implications for Professional Application

When thinking about my career as a teacher and working with students, there is a fine line between how much is too much and how much is too little when it comes to technology and screen time. Technology offers a wide range of information, assistive technology, and software that can help educators and students with curriculum and course content and a lot of that technology is accessed through smart devices or screens. I use technology in my teaching to further assist in lesson content, for assistive technology for students, and to aid in student connection and engagement. Technology and screens are also used in my classroom as educational tools and calming tools.

Some educational tools that students use may be online programs or software, or assistive technology. There are various online programs that I utilize in my classroom to further develop students' skills and abilities by encouraging interactive learning. I have used programs on computers, such as, Successmaker or Read180 which are interactive programs that students can learn from and many students enjoy. Some students use Chromebooks or computers to type their assignments, use word processing programs for help with spelling and grammar, to take notes, do research, or sometimes to participate in hands-on learning.

Technology can also be used as a calming tool. I work at a Setting IV, behavioral school and many students utilize screen time as an option for a coping skill. They may take a five-minute break on an iPad or listen to a song on a Chromebook to help calm down. Students are taught many coping skills that do not include technology use, but many students still prefer that option. I believe that technology and screen time should be

utilized in the classroom, and that screen time should be enjoyed during times of leisure as well, but in moderation.

I believe this research is applicable to me and other educators because excessive screen time is so prevalent in our society and technology and access to screens continues to grow. Technology can be essential in the classroom in times of learning and it may be a preferred activity of students, in times of leisure. Oftentimes, students bring their personal devices into schools and teachers need to navigate and moderate that and how it may impact learning.

This research suggests to all educators that we need to take steps to moderate some of the technology use in the classroom. In the school where I work, students' mobile devices are turned in at the beginning of the school day and are returned to them at the end of the school day. While this may not be feasible in all schools, I believe that classrooms should be a mobile-free zone and students' and teachers' phones should not be utilized during class. There may be other ways to help minimize technology use in the classroom. Some areas of the classroom could be technology or screen-free zones. For example, a reading area with bean bags or alternative seating options, near bookshelves, could be a technology-free zone that encourages students to read in that area. Or, there may be an alternative location in the classroom that encourages creativity and art and that could be a technology-free zone.

Educators could also reduce screen time in the classroom by modifying how much technology is used within each lesson or in times of leisure. Educators could limit themselves to a certain number of minutes per subject or an allotted amount of time per week, depending on the content of the lessons and what is appropriate for the classroom

based on the curriculum and the students' ages. Educators could also establish classroom rules that allow students to utilize technology at designated break times, but not during other designated break times. During those other designated break times educators could encourage physical, creative, and social activities, to maintain balance.

Our job as educators will be to figure out how to improve our ability to navigate technology use and how to utilize it, as well as how to keep a healthy balance. Teaching our students how to establish healthy habits with screens, use technology in moderation, how to enjoy other aspects of life, to navigate those areas on their own, and employ good decision-making surrounding technology is an important life skill. Educators should be contributing to that growth in our students and helping them to want that healthy life balance.

Conclusion

With technology on the rise and screen time at an all-time high, many individuals around the world are exposed to excess screen time on a daily basis. When individuals experience too much screen time, there are various negative consequences that may occur. Three key areas of impact of increased screen time are: impacts of screen time on physical health, impacts of screen time on sleep, and impacts of screen time on psychological health and wellbeing. Although there are some negative consequences of technology use and screen time, technology and screen time are still progressively used in places of work, education, and in times of leisure. As a global community, we should try and mitigate some of that technology and screen use while still accessing it in moderation to optimize a balance of healthy lifestyle choices.

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