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The Effects of Touchscreen Technology Usage on the Social Emotional Development of Preschool-Aged Children

Amanda Marie Sharpe
University of the Pacific

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THE EFFECTS OF TOUCHSCREEN TECHNOLOGY USAGE ON THE SOCIAL EMOTIONAL DEVELOPMENT OF PRESCHOOL-AGED CHILDREN

By

Amanda Marie Sharpe

A Dissertation Submitted to the

Graduate School

In Partial Fulfillment of the

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University of the Pacific
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2021
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By

Amanda Marie Sharpe
DEDICATION

This dissertation is dedicated to my family, without whom this would have remained an unreachable dream. To my children, Valentine, Phoenix, Scout, Mercy, and Indiana who have had to endure a computer-tethered mother for far too long. To my mother, Kristina, whose love from day one has given me the confidence to do hard things and whose letters and encouragements remind me that people out there believe in me. To my sister-in-law, Amanda, for being my best friend and for loving, holding and watching over my babies so I could complete my schoolwork. To my sister, Hilary, for her late-night memes that remind me to smile and not take life too seriously. To my brother, Billy, for making sure my children had all the snacks they could ever want while I was toiling away. To my stepmother, Karen, for showing me that motherhood does not preclude me from academia and for always showing an interest in my work. To my father, Kevin, for instilling in my younger self a curiosity that has yet to be satiated. And finally, to my husband, Ryan – your love, patience, and overwhelming support of this decade long journey has not only made me a better person, but has shown me that the world is at my fingertips and all I have to do is reach out and grab it.
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THE EFFECTS OF TOUCHSCREEN TECHNOLOGY USAGE ON THE SOCIAL EMOTIONAL
DEVELOPMENT OF PRESCHOOL-AGED CHILDREN

Abstract

By Amanda Marie Sharpe
University of the Pacific
2021

Technology plays an increasingly significant role in the lives of children and adults, and it is imperative to understand if and how it impacts the development of psychological processes and the subsequent behaviors of preschool-aged children so that we can better understand how to navigate guidelines for use and interventions for overuse. To better understand the relationship between screen time use and a child’s social emotional development, it is important to consider parent time on screens, child time on screens, and any effects an older sibling in the home or parental gender may have on their development. This study gathered screen time usage rates from parents and their preschool-aged children and then measured the social emotional development of these children using an electronic version of the Devereux Early Childhood Assessment for Preschoolers, Second Edition (eDECA-2). Results were analyzed using sequential regression models and found child and parent screen time usage to be negatively associated with the social emotional development of the child. There were no moderating effects of the presence of an older sibling in the home. There were only moderating effects for parental gender when considering primary parents, which showed that when a male is a primary parent, increased parental and child screen time leads to a steeper decrease in behavioral concerns than when the primary parent is female. Additionally, categories of screen time usage were analyzed using multiple analyses of variance and showed that parents who used tool-based applications rated their children with higher levels of social emotional development. Results that analyzed the child’s categories of use did not show delineated differences between tool-based and non-tool-based applications.
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CHAPTER 1: INTRODUCTION

Technology plays an increasingly significant role in the lives of children and adults, and it is imperative to understand if and how it impacts the development of psychological processes and the subsequent behaviors of all humankind. Specifically, with the addition of technology into the home, there are some concerns about the effect that it may have on the social and emotional development of children (Radesky & Christakis, 2016). Researchers have started to examine the relationship between smart technology and development, but there continues to be many areas to explore to create a holistic perspective of the interaction between technology and human development (Edwards et al. 2017; O’Connor & Fotakopoulou, 2016).

Background

Technology

Smart phones were invented by IBM in 1992 in the form of the Simon Personal Communicator, but their limited battery life, high cost, and small display screen led to a weak launch in 1994 with only 500,000 units sold in the first six months worldwide (Andrew, 2018). While the initial release of smart, handheld technology could be considered unimpactful, it created a platform for the creation of improved, consumer friendly alternatives that continue to flood the market today. Apple launched its famous iPhone in 2007, and although it was exclusively available to one cellular network, it sold 1.6 million units in its first year on the market. Its success proved to have staying power, and in the following year it sold 11.6 million units; those numbers continue to rise (Andrews, 2018).

The voice of the consumer has continued to demand smart, touchscreen technology as evidenced by the increase in sales of smart phones, tablets, e-readers, and multimodal laptops in the 12 years since the advent of the original iPhone (Computer History Museum, 2020). Currently, an estimated 3.5 billion people worldwide are smartphone users, suggesting that 45% of the world’s population owns a smartphone (GSMA Intelligence, 2020). This explosion in sales is speculated to continue to rise (Andrews, 2018) implying that not only will the current smart-phone-using population maintain their
smart phone use, but the market will continue to entice new users and expand the population of those who use smart phone technology.

The availability of a wide variety of applications encourage daily, even hourly use of smart device technology (Milijic, 2019) which then leads to speculation about the effect of its use on general living. As a result, researchers have attempted to analyze the relationships between smart device usage and a plethora of behaviors including but not limited to sleep (Demirci, Akgönül, & Akpınar, 2015), stress (Samaha & Hawai, 2016), depression (Alhassan et al., 2018), self-esteem (İşiklar, Şar, & Durmuşcelebi, 2013), political beliefs (Park & Karan, 2014), and anxiety (Elhai, Levine, Dvorak, & Hall, 2016). Some have examined the effect of technology on the social and emotional development of adolescents (Lee & Lee, 2017) and school aged children (Hale & Guan, 2015), but when researching younger children, the relationship is often based on the use of the parent and not the child (McDaniel & Radesky, 2018). Given the social nature of humans and the developmental processes that are dependent upon these social tendencies, the impact of child usage rates on younger children should be considered as well.

Social and Emotional Development

Much of social emotional development is dependent upon reciprocal social interaction and the development of secure attachments with primary caregivers (Gross, Stern, Brett, & Cassidy, 2017; Saunders, Kraus, Barone, & Biringen 2015). A secure attachment is developed when an infant and a caregiver have compatible temperaments, and the caregiver provides appropriate responses and attention to the infant. When a caregiver responds to an infant appropriately (i.e. picking them up when they cry, feeding them, soothing them, smiling at them, etc.), the infant learns that they can depend on the caregiver which then lays the foundation for the development of trust, emotional regulation, and help-seeking. These processes play a pivotal role in the social and emotional development in children and attachment theory research demonstrates strong links between secure attachment styles and healthy social/emotional behaviors (Kennedy & Kennedy, 2004).
From birth, a child is exposed to a variety of experiences that shape their social and emotional development, and the brain grows and changes in response to its environment (Halfon, Shulman, & Hochstein, 2001). There are several processes that are dependent upon external interactions (i.e. social interactions) including language, social referencing, and emotional regulation (Fischer, Shaver, & Carnochan, 1990). Early language acquisition is a social experience that relies on the presence and language of other speakers. During the first years of life, non-deaf infants acquire language only through social interactions or conversational repartee which highlights the importance of interacting with other people as part of early childhood development (Kuhl, et al., 2003).

Learning language and practicing verbal expression equips children with the ability to express their feelings, thoughts, needs, and emotions. Without the ability to do this, as a child grows, they may be less able to have their physical, emotional, or intellectual needs met appropriately and to the extent desired. The needs of an infant are basic – food, sleep, cleanliness, and affection (Warrick & Helling, 1997). Without specificity, infants will cry to get the attention of a caregiver, and it falls upon the caregiver to determine the infant’s need and then address it (Fuller, 1991). Given that these needs do not remain basic, the child should be learning how to verbally express themselves which should take out some of the guesswork for the caregiver.

**Brain development.** In typical children, as the brain develops, higher ordered emotions and thoughts become incorporated into their self-perceptions and needs which themselves then become more complex. According to the Lurian model, the brain develops these processes through a series of developmental progressions (Languis & Miller, 1992). The human body is made up of millions of interconnected nerves, and the ones that serve to facilitate communication within the brain and between the brain and the rest of the body are the neurons. In the brain, each neuron connects with hundreds, even thousands of other neurons to speed communication and transmission. However, these connections in the adult brain tend to look different from an infant’s brain.

An infant is born with over 50 trillion neuronal connections in the brain, much more than the adult brain (Koizumi, 2004). Over the course of early development, the brain goes through a process of
dendritic or synaptic pruning wherein the neuronal connections that get used frequently are strengthened and the ones that are used infrequently or not at all are weakened. The strengthening of the connections is often completed during a process called myelination where the “tails” of the neurons (the pieces that connect one neuron to another) become wrapped in an insulating sheath which increases the speed of conduction and therefore increases the speed of communication between the neurons. Continued weakening of these connections leads to eventual non-use in favor of other faster, stronger pathways, and as a result, when a connection in the brain goes unutilized, it eventually becomes inaccessible (Beaumont, 2008). The phrase, “Use it or lose it” is often used when describing this pruning phenomenon.

This process of pruning and strengthening is somewhat dependent upon the experiences that the child is exposed to. As an example, exposure to different types of social interactions can strengthen connections in areas of the brain that are associated with affect recognition or exposure to language can strengthen connections in areas associated with language acquisition and production. Typically, a child is exposed to a variety of experiences to strengthen multiple connections across the brain’s vast network of neurons (Beaumont, 2008).

As the child ages, different parts of the brain prepare themselves for strengthening as different parts of the brain become more accessible to the child. The limbic system, an area of the brain that is theorized to process emotions and arousal, becomes associated with areas of the brain theorized to process language, logic, planning, and reciprocity. These connections are thought to be the neurological foundations of self-regulation and emotional expression. However, the strength of these emotional connections are somewhat dependent upon the strength of the connections that existed previously. During the first years of life, the brain is pruning and growing, not in isolated steps, but rather in gradual reaction to what came before. And while the lack of isolated steps paves the way for brain plasticity, it also subsumes that there are vital times of growth and expansion that if interrupted, could have life-long consequences (Beaumont, 2008).

**Self-regulation.** As the brain grows, so does the child and with it, their need to express their ever-expanding thoughts, desires, and emotions. An ability to express these complexities and have them
understood and addressed becomes paramount in the development of self-regulation (Kopp, 1982; Lévesque, et al., 2004). Emotions and fears are often accompanied with physiological responses, and the ability to name an emotion or fear in the presence of a physical sensation is foundational for the regulation of it (Denham & Couchoud, 1990). If a child cannot distinguish between being fearful or being happy, then it will become challenging for them to express the function of their emotions in attempts to fulfill a need.

Apart from the development of language, infants and toddlers also depend upon social modeling to learn appropriate emotional expression, self-regulation, and how to interact with others (Zimmerman, 2013). Social modeling is a learning theory that suggests that humans and other animals can learn through strict observation, without interference or direct teaching (Bandura, 1961). A child can internalize an adult’s reaction to an experience, and these adult reactions may become a part of the child’s interpretation of appropriate responses, even if the response is inappropriate. A child who is unable to express their thoughts or needs but bases their reactions to situations on the inappropriate reactions of adults, may begin to develop their own inappropriate manifestations of fear, anxiety, or excitement. In the absence of appropriate social modeling, children may not develop the tools needed to not only express themselves, but to interpret the expressions of others.

Learning how to interpret the thoughts, emotions, and needs of others is a pivotal skill necessary for success in the highly complex social structure that makes up humankind. A mother listening to the cooing of her infant, making eye contact while smiling and pausing in between her own intonations not only helps solidify the bond between mother and child, but also lays a social foundation from which the child will develop skills like turn taking, reciprocity, and attunement (Feldman, 2015; Jonsson et al., 2001). These skills become increasingly important as the child begins to grow, develop, and interact with peers and adults outside of the home.

In developing children, when these skills are not practiced or polished in early life, it can lead to deficits in social skills and communication (Feldman, 2015; Lévesque, et al., 2004). However, if a child fails to develop these skills in early life, the brain’s plasticity makes space for potential interventions
through types of behavioral training (Beaumont, 2008), but these deficits require direct intervention which could have an impact on the child’s social, emotional, and educational relationships and development.

**Description of the Problem**

Technology can hinder social interaction. As the use of touchscreen technology continues to grow, people have access to multiple touchscreen devices in their daily lives (phones, watches, laptops, tablets, etc.). They continue to spend more time on screens which affords them less time to interact in their various relationships, including the parent-child relationship. With developmental processes like language and social interaction dependent upon the attention of a caregiver and reciprocity from the child, this begs the question – Is it possible for children to spend too much time on screens? Is it possible for parents to spend too much time on screens? Studies have begun to shed light on how the use of touchscreen technology interacts with child development (McDaniel & Radesky, 2018), but many of those studies focus on children in other countries and/or school-aged children and adolescents (Hale & Guan, 2015; Lee & Lee, 2017) despite the importance of the first few years of life and the access to touchscreen devices that is being granted to young children. And while the parent-child relationship is arguably important, given the social context of this exploration, it can be argued that other people in the home can provide effective social stimulation. Within this line of thinking, it should also be determined if siblings play a moderating role for parental use by acting as a substitute for parent interaction.

In a world that is becoming increasingly virtual, especially in response to the quarantine and physical distancing requirements set forth as a result of the COVID-19 pandemic, this study aims to fill in some of the gaps in the current body of research and examine the relationship between preschool-aged children, parents, and touchscreen technology.

**Theoretical Framework**

A neurodevelopmental model of learning was used to guide the research and exploration of the effects of technology on the development of social and emotional skills and regulation in young children. However, this research did not look at the microscopic neurological processes that are responsible for
self-regulation, but rather used the sequential trajectory of social and emotional development within the neurodevelopmental model as a scaffold upon which to build an understanding of the importance of attachment and social modeling in the appropriate social development of young children. Though this study does not aim to speculate about the neurological effects of touchscreen device use, a general understanding of the neurological underpinnings of social development informs the significance of the increased use of touchscreen technology in the home.

**Neurodevelopmental Model**

The neurodevelopmental model of learning is a framework through which to evaluate and intervene on the educational behalf of a student but has implications that extend beyond the classroom. This framework (see Figure 1) separates human development into seven different processes (auditory, visual, sensory motor, language, memory, attention/executive function, and social/emotional) of three blocks each; Block 1: Sensory (0-4 years old), Block 2: Integrative (4-11 years old), and Block 3: Generative (age 11-adult) (Fletcher-Janzen, 2017). The Sensory Block (Block 1) is the foundation upon which the other two blocks are built. This period of development is focused on the development of sensory and motor processes like visual, auditory, and attention processes. The Integrative Block (Block 2) is a developmental period that is characterized by the integration of the sensory processes practiced in Block 1 and basic skills like playing, academics, perspective taking, and affect regulation. The Generative Block (Block 3) is a time for mastery, creativity, and the further development of executive functions.
Figure 1. Neurodevelopmental model of learning. Adapted from Fletcher-Janzen, 2017

The social emotional processes will be the focus of this research. While the aim of this framework is to align developmental processes with educational cognitive products like reading, writing, and math, the “bottom-up” approach for those children within Block 1 and Block 2 provides a defense for the structural significance of establishing lower ordered social processes (attachment, affect recognition, and attunement) before a child is able to master higher ordered social processes (Theory of Mind, emotional regulation, and perspective taking) (Fletcher-Janzen, 2017).

The neurodevelopmental model of learning is grounded in Luria’s theory of brain functioning, a cognitive-based theory that attempts to weave together cognition and the neurological processes that guide it (Languis & Miller, 1992). Luria’s theory is used to couple brain functioning and cognition, associating specific brain patterns of functioning with cognitive products like performance and processing speed. The neurodevelopmental model of learning uses the Luria model to defend patterns of brain processing with cognitive performance and extrapolates the concrete products (i.e. reading, writing, mathematics, and performance) to abstract products like social emotional communication and self-regulation.

Attachment Theory

One of the foundational aspects of the social neurodevelopmental sequence is attachment. As a result, attachment theory will also be used to inform discussion of the relationships between parent and
child regarding both quantity and quality. Attachment theory is a developmental perspective theorizing that a nurturing bond between a caregiver and a child is a necessary component of appropriate emotional and social development (Bowlby, 1997). Developed by John Bowlby (1997) and expanded upon by Mary Ainsworth (1978), attachment theory has long been used to examine the emotional and psychological processes of both children and adults. The theory proposes that an infant can be securely or insecurely attached to their caregiver, and while many factors play a role in the quality of attachment such as the emotional and physical availability of the parent or the temperament of the child, ultimately it is this foundational relationship that can help explain and shape human social behavior. When actions or behaviors interfere with the development of this relationship, psychopathology and atypical development can occur. Given that this research will explore the relationship between touchscreens (a potential intermediating factor) and social behavior, it is logical to examine the necessity of quality caregiver relationships through an attachment lens.

Social Learning Theory

The final theoretical framework that will guide this discussion is Albert Bandura’s (1961) Social Modeling Theory which he developed through his exploration of social imitation and incidental learning. Social modeling theory was developed during a time of heightened subscription to behaviorism in attempts to demonstrate that learning can occur, even in the absence of reinforcement, a key component of behavior-based learning. In literature that will be reviewed in subsequent chapters of this work, Bandura demonstrated that learning could occur through observation, without direct instruction or teaching (1961). The theory would be expanded to suggest that some behaviors and processes (like social interaction) are best learned through modeling. Further still, the theory suggests that children often imitate caregivers when learning how to react, how to reciprocate, and how to engage with their own emotions and the emotions of others (Fernyhough, 2010).

One of the interesting applications of social modeling theory is that the modeling does not have to be provided by a caregiver for the behavior to be learned by the observer (Bandura, 1961). There is the potential for other people, viewed by the observer to be in position of power or authority, to influence the
behavior of the observer. If a child has older siblings, the modeling provided by the siblings could influence the behavior of the child (as the observer) which could lead to the speculation that the presence of older siblings may provide social interaction examples in place of the parent if the parent is unable or unavailable.

Given that using a touchscreen device is not only an observable behavior, but may also be replacing social interactions between parents and children, it is important to use social modeling theory to frame the significance of parent-child interactions and what can happen when something interferes with this interaction and replaces it with an observable, mimicable behavior. In addition, there are many applications on touchscreen devices that attempt to advertise the educational nature of their product which may reinforce a parent’s decision to let their young children play with their touchscreen phones. The more time a young child spends on a screen, the less time they have to observe, mimic, and develop their social and emotional skills. Social modeling in addition to attachment theory and grounded in the neurodevelopmental model of learning will guide this exploration of the relationship between touchscreen and smartphone technology and the importance of appropriate social interaction and development in young children.

**Purpose**

The purpose of this research is to understand the relationship between touchscreen technology usage by young children and their parents and the social/emotional development of the child.

**Research Questions**

The overarching question that guides this research examines the relationship between the social and emotional development of children between the ages of four and six years old and child and parent usage of touchscreen technology. This widely-cast inquiry will enable the exploration of several specific questions stated as follows:

**Research question 1.** What is the relationship between the time a child between the ages of four and six spends on a smart device and their social emotional development? Given the possible interrupting effect that touchscreen devices can have on the formation of social relationships and therefore social and
emotional development, it is hypothesized that as time on screen increases, appropriate expressions of social and emotional development will decrease.

**Research question 2.** Is there a difference between the types of touchscreen usage (i.e. different applications or categories thereof) by the child and that child’s social emotional development? Touchscreen devices can be used in a variety of capacities and it is theorized that there will be a difference between non-tool-based categories of use (social media, videos, and games) and tool-based use (photos, phone calls) in regards to levels of social emotional development with non-tool-based application use associated with lower levels of social emotional development.

**Research question 3.** What is the relationship between the time a parent spends on a touchscreen device and the social/emotional development of their child aged four to six? As stated for research question one, given the possible interrupting effect that touchscreen devices can have on the formation of social relationships and therefore social and emotional development, it is hypothesized that as time on screens increases, appropriate expressions of social and emotional development will decrease.

**Research question 4.** Is there a difference between types of touchscreen device usage (i.e. different applications or categories thereof) by the parent and the social emotional development of their child? Again, touchscreen devices can be used in a variety of capacities and it is theorized that there will be a difference between non-tool-based categories of use (social media, videos, and games) and tool-based use (photos, phone calls) in regards to levels of social emotional development with non-tool-based application use associated with lower levels of social emotional development.

**Research question 5.** Does the presence of older siblings play a moderating role in the use of touchscreen devices and the social emotional development of the child? Older siblings can provide social interaction and language exposure and as a result, it is theorized that the presence of older siblings will moderate the social emotional development of their younger siblings and lessen the effect that time on screens has on a child’s social emotional development.

**Research question 6.** Does the gender of the parent play a moderating role in the use of touchscreen devices (i.e. time spent by the mother or the father) and the social emotional development of
the child? Traditionally, mothers play the role of caregiver and are the basis of attachment relationships and so it is hypothesized that the gender of the parent will play a moderating role in the social emotional development of their children, specifically that the mother’s touchscreen usage will have a more significant impact on the social emotional development of their children and that increased maternal usage will be associated with decreased development.

**Description of Study**

The current study gathered information on touchscreen device usage by both parents and children and the social and emotional development of children. The study was conducted using an electronic survey that could be reached via a link, and parents who have a child between the ages of four and six were led through three sections of a survey. The first section collected demographic information for up to two caregivers and one child including information on gender, age, income, and education of the parent completing the survey and the presence of older siblings. The second section of the survey was a set of instructions that guided the respondent through steps that provides average daily use of their phones, their top three categories of usage, and the estimated amount of time their child spends on these devices. There was an optional section for children who have access to their own devices (old phones, tablets, kindles, etc.) with instructions that lead parents to weekly and daily average screen time use for the child’s device. Respondents were asked to enter these numbers into the survey. There was also an optional section for a second parent to enter their screen-time usage.

The third section of the survey was a measure of social and emotional development. The electronic version of the *Devereux Early Childhood Assessment for Preschoolers, Second Edition* (*eDECA-2*) is a valid and reliable self-report scale completed by the parent of a preschool aged child (36 – 72 months). This 38-item survey provides information about the social and emotional development of young children as measured by four constructs: self-regulation, attachment/relationships, initiative which load into a Total Protective Factors composite and an additional construct labeled as behavioral concerns (Lebuffe & Naglieri, 2012). Once completed, respondents were entered into an optional raffle for a prize that was distributed after surveys from all participants had been collected.
The data was analyzed using sequential multiple regression and multi-analysis of variance in attempts to determine if there is a significant relationship between screen-time usage and the social and emotional development of the children, for the potential moderating effects that the presence of siblings and parental gender may have on their social emotional development, and differences between categories of use. Post-hoc t-tests were used to determine relationships between individual use factors and social emotional scores on the e-DECA 2. The statistical analysis was performed on IBM-SPSS to compute the strength of the relationships between the factors and e-DECA 2 scores. These analyses were completed to answer the proposed research questions.

Significance

Technology is becoming an increasingly integral component of several veins of modern culture including work, school, leisure, and social relationships. As society advances with the technology it produces, it is important to understand how these advancements affect the people that utilize it. Technology and the capacity at which it is available to a variety of people in a variety of stages of life is like nothing our society has witnessed before. This advancement and availability demand an examination of how this technology affects some of the most vulnerable in our population – young children. Results from this study could create a platform for the creation of screen time parameter suggestions and inform the creation of psychoeducational materials that teach parents and children how to engage with technology appropriately. Further still, it could help illuminate potential implications for differential screen time usage if there is a useful distinction between different categories of touchscreen use.

It is vital to understand if the use of smart devices plays an interfering or interrupting role in the development of young children. The theoretical framework suggests that if the developmental progression is inhibited, future growth could be stunted. If touchscreen device use interferes with the foundational processes necessary for appropriate social emotional development, informing parents about this potential harm could lead to less parent time spent using touchscreens and more time in intentional relationship with their children. The implications of these intentional relationships could manifest in a
decrease of children with language and social delays and an increase in children who are able to self-regulate appropriately.

Currently there is research that examines the relationship between the touch-screen use of school-aged children and adolescents and their social development (Hale & Guan, 2015; Lee & Lee, 2017), and more recently researchers are examining the relationship between parental technology use and early childhood development (McDaniel & Radesky, 2018). Earlier research has looked at the effects of that the time parents and children of all ages spend on television has on their child’s social and emotional development (Kildare & Middlemiss, 2017). This research fills the gaps that have been created by the advancement and the availability of touchscreen technology and provides insight into how parent and child usage of touchscreen technology affects a child’s social and emotional development along with examining the potential moderating effect that siblings may provide as substitutes for parent interaction.

Chapter Summary

This chapter explored the history of smart phones and the expansion into other forms of mobile touchscreen devices and how their usage has become commonplace in many modern homes. The explosion of smart and touchscreen device usage has garnered much attention from marketers and consumers alike which has led to an increase in use of smart devices by people of all ages. There was a discussion of the importance of social interaction in the linguistic and emotional development of children and the speculation that touchscreen device usage could be interfering with the social and emotional development of children before they enter kindergarten. It was posited that without understanding the link between touchscreen device usage and the social development of children, it could be difficult to move forward with appropriate screen time parameters.

A theoretical framework was outlined that serves as the foundation for the creation and implications of this research. Three theories created this framework – Social Modeling Theory and Attachment Theory as viewed through the lens of a Neurodevelopmental Model of Learning. Combined, these three theories guide the questions, significance, literature review, and discussion of this study in
attempts to determine if there is a relationship between time spent on smart devices by both parents and children and the social emotional development of children between the ages of four and six.

The survey-based nature of the study was described which included references to the instrumentation. A brief discussion of the statistical analyses was conducted along with the significance that these analyses held. The next chapter will be an exploration of the existent literature that undergirds this study including works that further examine the theoretical framework and research that has examined the effects of various technologies on various populations. It will also serve to demonstrate the gap in the research that this study attempts to fill.
CHAPTER 2: LITERATURE REVIEW

Researchers have studied a variety of psychological factors and how they relate to the use of cell phone and computer technology. However, that research has not focused on categorical use of screen time and the potential affects it could have development. With parents on their phones, older siblings may become the most available caregivers to younger siblings, though the moderating effect of siblings has not been researched in terms of their ability to substitute as a model for social interaction when parents are at home but occupied with screens. Screen time usage apps gives us the ability to potentially track parent and child usage rates which could be helpful in studying the implications of use. An exploration of social and emotional development through the lens of the neurodevelopmental model will illuminate an examination of the importance of early interaction from the perspective of attachment theory. Social modeling theory will then be used to make an argument that the quality of social development is dependent upon modeling provided by parents and how siblings can provide modeling as well. The history of technology development will provide a backdrop for previous research completed that examined the relationship between technology and the social/emotional development of young children. This review will demonstrate a need to explore how categories of use could explain differences in development trajectory, how child and parent usage can affect this trajectory, and the role that older siblings play in the development of their younger siblings when parents spend time on their screens.

The Neurodevelopmental Model

Outlined by Elaine Fletcher-Janzen (2017), the Neurodevelopmental Model (NDM) is a framework through which psychologists can review, analyze, and assess students on a case-by-case basis. It incorporates a biopsychosocial perspective and allows for an individualized approach to the creation of interventions and strategies for students within the school system, but can also be a helpful lens through which to view social and emotional development when attempting to understand the lower order processes and how the trajectory of the development of these lower order processes can affect the subsequent development of high order processes. While the NDM uses the biopsychosocial approach to
guide its framework, NDM emphasizes the development of the brain and how that development corresponds with the cognitive processes that are included within each block.

According to the NDM, there are three different blocks of development that correspond with the age of children as they develop – sensory (ages 0-4), integrative (ages 4-11), and generative (ages 11 and up). This sequence of development is referred to as blocks as each block creates a foundation and therefore influences and shapes the subsequent blocks. There are sequences of blocks for seven different cognitive processes including auditory, visual, sensory-motor, language, memory, attention/executive, and social/emotional processes. For the purposes of this research, the social/emotional set of blocks will be examined and explained to inform the argument that interference created by screens and technology have the potential to influence the sensory block which then shapes the integrative phrase. The logical progression follows that these would then impact the generative phrase, but the current scope of this research is focused on children between the ages of four and six.

**Block One – Sensory**

The first block in the NDM is the sensory block which focuses on the integration of sensory and perceptual processes that are necessary to develop the higher order processes that depend upon the development of lower processes. For social and emotional processes, the first block includes face recognition, facial memory, affect recognition of others, and awareness (a foundational component of theory of mind) (Fletcher-Janzen, 2017).

**Facial recognition.** Face recognition is the ability to recognize that a face is a face and to distinguish the features of a face from other shapes (McKone, Crookes, & Kanwisher, 2009). Research propagated decades earlier theorized that facial recognition was a process that took place over the course of ten years of development and was mostly dependent upon experience (McKone, Crookes, & Kanwisher, 2009). However, more recent studies agree that while experience plays a role in the development of facial recognition, genetics also plays a part, and the process appears to begin at birth (with classic studies suggesting a preference for human faces as an innate quality (Goren, Sarty, & Wu,
and develops rather quickly throughout infancy (McKone, Crookes, & Kanwisher, 2009; Taylor, Batty, & Itier, 2004; Dawson, et al., 2002).

As part of social and emotional development, face recognition is foundational for developing appropriate social interactions and responses and is the precursor to affect recognition, identification, and regulation (Kiln, et al., 1999; Ge et al., 2008). When assessing the neural differences between children with typical social development and those with atypical development, results indicate that there is a quantitative difference between socially typical and socially atypical children in recognizing faces (Dawson, et al., 2002; Weigelt, Koldewyn, & Kanwisher, 2012). Studies such as these provide further evidence to support the foundational role played by face recognition.

**Facial memory.** Closely linked to facial recognition is facial memory or the ability to recognize a face from a previous interaction (Ge, et al., 2008). For someone to recognize a face, they need to process it as a face (facial memory) and then use that ability to determine if they have seen that face before. There is evidence to support that as children age, they rely on different parts of the face for recognition. While there is conflicting data regarding when children rely on the mouth and outer areas of the face for recognition, there is general consensus that children under the age of four rely on the eyes for recognition purposes (Ge et al., 2008; Campbell et al., 1995; Campbell et al., 1999). This dependence on the eyes for recognition is problematic for children with social deficits as studies are showing that infants who are later diagnosed with Autism Spectrum Disorder are less likely to look at the eyes of another person (Thorup, et al., 2016) which could then impede the appropriate development of facial recognition which then effects the development of facial memory and affect recognition.

**Affect recognition.** Faces provide a plethora of social information (comfort, safety, fear, etc.) which makes them an essential component of social and emotional development (Kiln, et al., 1999, Ge et al., 2008). As facial recognition and facial memory develop, a child can begin to not only recognize and remember faces, they can also begin to infer affective states based upon facial expressions (Berggren, Engström, & Bölte, 2016). After decades of research, there are generally six accepted basic emotions that
people can discriminate between based upon facial expressions: happy, sad, surprised, scared, angry, and fearful (Lawrence, Campbell, & Skuse, 2015; Leppänen & Nelson, 2006).

There are competing theories and evidence that attempt to create a timeline of when humans develop the ability to recognize these emotions, and whether that recognition is tiered in regards to which emotions they can detect and at what point (Lawrence, Campbell, & Skuse, 2015; Gao & Maurer, 2010). There is research to indicate that infants as young as six months old can discriminate between some facial expressions (Serrano et al., 1992; Peltola, Leppänen, Palokangas, & Hietanen, 2008) but also data to support the misrecognition of fear in children throughout adolescence (Peltola, Leppänen, Palokangas, & Hietanen, 2008) which together suggests that the development of affect recognition, while beginning in infancy, is one of many progressing building blocks of social and emotional development throughout childhood.

Affect recognition also encompasses the ability of a child to recognize and name their own emotions (Cole, Dennis, Smith-Simon, & Cohen, 2009). Children as young as three and four years old can articulate their feelings (though this process continues to develop in Block 2), but this ability is affected by two constructs: verbal expressiveness and maternal/caregiver attunement to anger. Children who have verbal expression deficits are less able to name their emotions, and children who are left alone in their anger and frustration have difficulty when attempting to recognize or name their anger (Cole, Dennis, Smith-Simon, & Cohen, 2009). These results, together with the timeline of affect recognition development strengthens the neurodevelopmental argument that there is an interaction between the genetic influence of social and emotional processes and the environment through which they develop.

Theory of mind – awareness. Theory of mind, another foundational attribute, is a multi-faceted construct that includes a variety of different psychological, social, and emotional processes. Theory of mind is “Our ability to explain and predict other people's behaviour by attributing to them independent mental states, such as beliefs and desires” (Gallager & Firth, 2003, p. 77). Facial memory, facial recognition, and affective recognition are all components of theory of mind which is also composed of awareness and perspective taking (Fletcher-Janzen, 2017). Research suggests that there is a natural
progression toward the development of theory of mind with awareness and perspective-taking occurring in the foundational stages (Remmel & Peters, 2009; Wellman & Liu, 2004; Wellman, Fang, Liu, Zhu, & Liu, 2006), which aligns with NDM’s placement of awareness in Block 1 and perspective-taking in Block 2 (Fletcher-Janzen, 2017).

Relevant to theory of mind, awareness refers to the simple constructs that put an individual in touch with the social world within and around them (Kemp & Korkman, 2010). Using the NDM, awareness would refer to the individual’s awareness of their existence in reference to the existence of others. This would include recognizing that a reflection in the mirror is representation of the self and not another person or recognizing sadness in another person and responding with comfort or reciprocal sadness (Goldstein & Winer, 2012). The development of this awareness plays a role in the progressive development of theory of mind, which unfolds in early childhood and continues to develop throughout adolescence (Well & Liu, 2004).

The scales or stages of theory of mind appear to manifest across cultures and throughout typical and atypical development (Peterson, Wellman, & Slaughter, 2012; Remmel & Peters, 2009; Wellman, Fang, & Peterson, 2011) which further supports its fit into a neurodevelopmental model (like the NDM) and supports evidence that the mastery of higher order theory of mind tasks depends upon the mastery of lower order theory of mind tasks (Filippova & Astington, 2008; Peterson, Wellman, & Slaughter, 2012).

**Attachment & attunement.** According the NDM, two foundational processes that undergird the appropriate development of facial recognition, facial memory, affect recognition, and theory of mind awareness are attachment and attunement (Fletcher-Janzen, 2017). Attachment, a classic theory studied and further developed by Mary Ainsworth (1978), and attunement are both relational processes that develop and are exhibited starting in infancy. Attunement refers to the ability to recognize and respond appropriately to the emotions of another person (Field, 1985). This is an important developmental process that requires caregivers to be in tune with their infants and children and has important developmental implications for the relationship between the two as well as for the development of the infant (Sethre-Hofstad, Stansbury, & Rice, 2002). Attachment refers to the nature and quality of the
relationship that develops between the caregiver and the infant which in part is reflective of the attunement demonstrated by the caregiver (Haft & Slade, 1989).

Attunement plays a role in the early developmental process of facial recognition and memory and affect recognition (Jonsson, et al., 2001) and the quality of attachment that develops as a result, can affect Block 1 processes and the subsequent Block 2 processes (Fletcher-Janzen, 2017). Attachment (or the quality of the relationship between a caregiver and an infant/child) is theorized to manifest as either secure or insecure. Secure attachment styles imply that the caregiver engages in attunement, and the child has learned that their needs will be met appropriately and with minimal anxiety. Conversely, the caregiver is reinforced by the child’s responses to their attunement which decreases stress and anxiety and further reinforces the secure nature of the attachment. Insecure attachment styles are organized into three subtypes: avoidant, resistant/ambivalent, and disorganized (Ainsworth, 1978; Main & Solomon, 1986).

Insecure avoidant attachment styles can develop when a caregiver is distant or disengaged and as a result, the infant may learn that their needs will not be met consistently and so may avoid exploration and social engagement based on the belief that their needs will go unmet (Ainsworth, 1978). Research has shown that infants with insecure avoidant attachment styles struggle with making friends and engaging in social situations, are labeled as “difficult” by parents and teachers (Fagot & Kavanaugh, 1990), and suffer from an increased likelihood of sleep disorders (McNamara, Belsky, & Fearon, 2003).

Insecure resistant/ambivalent attachment styles can manifest when a caregiver is inconsistent with their responses to the child. The caregiver responses vary from appropriate, to anxious, to neglectful all of which can result in high levels of anxiety and anger in the child (Ainsworth, 1978). Children who are a part of an insecure-resistant/ambivalent attachment relationship can suffer from increases in depressive and anxious psychopathology as well as increases in cortisol levels which can affect different hormonal and neural connections (Luijik, et al., 2010).

Insecure-disorganized attachment styles can be the result of a caregiver who is erratic, frightening, or abusive to the infant. As a result, children are reactive and struggle with emotional regulation (Main & Solomon, 1986). These children are prone to become depressed, anxious (though to a
lesser degree than other insecure attachments (Baer & Martinez, 2006)), chaotic, and insensitive to others (Fearon, Bakermans-Kranenburg, Van Ijzendoorn, Lapsley, & Roisman, 2010).

While cognitive processes can develop appropriately in the presence of different attachment styles, the symptomology that can develop as a result of insecure attachment styles supports the NDM inclusion of attachment and attunement in Block 1 in reference to the development of social and emotional processes. The cross-cultural presence and sequential progression of the development of Block 1 processes alludes to a neural basis for these processes. However, the effects of attachment, attunement, and the environment suggest that the development of social and emotional processes likely depend upon both genetic and environmental influences.

**Block Two – Integrative**

The second block (ages 4-11) of the NDM is the *integrative block* – a period of development marked by the integration of lower level processes that lead to the development of more complicated higher-level processes (Fletcher-Janzen, 2017). According to the NDM, these processes include cooperation, affect expression, affect regulation, perspective taking, and the continued development of affect identification in the self and theory of mind.

**Affect regulation.** Affect identification, which can begin in Block 1, continues to develop and becomes integrated with affect expression and affect regulation. As noted previously, research suggests that levels of verbal expressiveness play a role in affect expression, and maternal/caregiver attunement can influence the degree to which children can recognize and name their own anger (Cole, Dennis, Smith-Simon, & Cohen, 2009). These findings provide support for the importance of attunement and the quality of attachment for the appropriate development of social and emotional processes given that affect identification and expression lead into the development of affect regulation – an important component of social and emotional behavior.

As a child develops, they depend less on others to determine their emotional state and more on themselves. They learn to interpret their own emotions and the emotions of others (whether appropriately or inappropriately) and then use that information to regulate their emotions both in interpretation and
expression (Schore & Schore, 2008). Affect regulation is moderated by several different processes and can be affected by the lower-level processes that come before it. Early relational trauma (i.e. the result of poor/low quality attachment relationships) can have lingering effects on the development of the right hemisphere which can lead to life-long deficits in affect regulation leading to psychopathology, post-traumatic stress disorders, neuroses, and dissociative disorders (Schore, 2001).

Apart from emotional neglect or insecure attachment styles, research suggests that while mothers often show more positive affect reciprocity when compared to father’s, the father’s positive affect reciprocity plays a stronger protective role in the development of emotional regulation which encourages appropriate social adjustment (Thomassin & Suveg, 2014). Research also shows that older siblings may play a protective role in the emotional competency of younger siblings, and the competency of an older sibling may mediate the parental responsiveness toward the younger sibling (Brody, Kim, Murry, Brown, 2003; Morris, Silk, Steinberg, Myers, & Robinson, 2007).

Given that attachment relationships are established in Block 1 and influence the development of affect recognition, awareness, and affect expression, it should follow that the effects of attachment and the progression of Block 1 processes will continue to bear influence on Block 2 and higher level processes. When children are unable to appropriately recognize or name emotions in themselves or others, they may struggle with regulating their emotions or recognizing the social context through which they are expected to express themselves or control their behaviors (Schore, 2001). The social context becomes an increasingly relevant component of individual development as perspective-taking and theory of mind continue to develop – processes that incorporate individual and environmental experiences.

**Perspective taking.** Perspective taking is a multi-tiered process that involves different levels of recognizing what others see and how others see. Classic examples of perspective taking include the Three Mountains Task experiment created by Piaget and Inhelder (1956) where they asked children to explain how other people, placed in different parts of the landscape, would see a mountain range. This study is thought to be a measure of secondary levels of perspective taking, or how others see. Other experiments attempt to measure if children can determine what other people see through the use of hidden objects that
can be seen by the child, but not by an observer (Moll & Tomasello, 2006). There is research to support that the onset of perspective taking begins early in life with the ability of young children to understand what other people see as young as 24 months of age (Moll & Tomasello, 2006); however, understanding how others see or view things is a process that takes place later in childhood (Frick, Möhring, & Newcombe, 2014) within the period of development designated by Block 2.

The link between empathy and perspective taking has been supported throughout the literature (Demurie, De Corel, & Roeyers, 2011; Lui, Barry, & Sacco, 2016; Rehfeldt, Dillen, Ziomek, & Kowalchuk, 2007), and given that empathy is a construct based upon the ability to recognize, interpret, and respond appropriately to the emotions and behaviors of others, it could follow that if Block 1 processes are disturbed through either genetic or environmental factors, it could inhibit the subsequent processes such as perspective taking and empathy.

**Theory of mind.** Theory of mind and perspective taking are neurologically and socially linked with research supporting socio-cognitive functions in localized areas of the temporoparietal junction (TPJ) (Santiesteban, Banissy, Catmur, & Bird, 2015) and demonstrating that individuals show more maturely developed theory of mind when they are able to engage in meaningful social perspective taking (Harwood & Farrow, 2006). As theory of mind grows from awareness in Block 1 into a complex understanding of the beliefs and values of others and how those individual beliefs will affect behavior in Block 2, there are different environmental factors that can influence its development. Language ability and verbal memory can influence theory of mind with research suggesting that higher levels of theory of mind are only attained once a certain verbal capacity has been reached. The same research further suggests that children from larger families perform better on theory of mind tasks when compared to children from smaller families which supports the hypothesis that the presence of older siblings could mediate the development of social and emotional processes (Jenkins & Astington, 1996).

Meta-analysis suggests that environmental factors such as direct parental involvement and attunement, appropriate but not over-emphasized negative affective states, and teaching children about mental states relates to the development of theory of mind (Pavarini, de Hollanda Souza, & Hawk, 2013).
These evidences provide a compelling argument not only for the influence of environmental factors in the development of social and emotional processes, but also for the specific involvement of caregivers and that the quality of that involvement can influence development.

**Siblings**

Apart from parental caregivers, there are often other people present in the home that could influence the development of social and emotional processes. The effect of older siblings on the development of younger siblings can be a protective factor against the development of internalizing symptomology, despite the quality of the parental relationship (Gass, Jenkins, & Dunn, 2007). Interaction with older siblings also leads to increases in cognitive development, social awareness (including affect recognition and perspective taking), and verbal ability (Brody, 2004). However, it is important to note that these benefits are based upon the presence of typically developing siblings (Macks & Reeve, 2007) though they make a compelling argument for the mediating effects of siblings on social and emotional development.

Further evidence suggests that the quality of the sibling relationship can affect the social and emotional development of children (Yucel & Yuan, 2015). Pertinent to the current study, the relationship of an older sibling with a younger, target child can affect the behavior of the target child amongst a variety of family types (single-mother, step-families, shared and non-shared parents) (Deater-Deckard & Dunn, 2002). Together these results suggest that the presence of an older sibling can facilitate the social emotional development of a younger sibling, despite the dynamics or relationships that may exist between the target child and other family members.

**Effects of Parental Gender**

The effects of parental gender on the development of children has been explored in the research. Regarding social and emotional development, the focus on been on gender and emotional associations with male caregivers associated with sadness socialization and female caregivers associated with anger socialization (Zeman, Perry-Parrish, & Cassano, 2010). There are also differences between the how children interact with male caregivers versus female caregivers. Children are more likely to use
emotional vocabulary with their fathers than with their mothers, and parents in general were more likely to use sadness-centered vocabulary with their daughters than with their sons (Adams, Kuebli, Boyle, & Fivush, 1995). Mothers were more likely to use more emotionally toned and less informing toned speech with their children when compared to fathers, and mothers were more likely to use supportive speech with their sons than their daughters (Leaper, Anderson, & Sanders, 1998). Together these findings suggest that there are differences between how mothers and fathers interact with their children, specifically within interactions that can foster or hinder social and emotional development.

Social Learning Theory

Albert Bandura (1961) famously demonstrated that children can learn in the absence of reinforcement through incidental and imitative learning. Children in his experiment imitated unreinforced verbal and physical aggression along with engaging in non-imitative aggression suggesting that there is a certain amount of generalizability and extrapolating that can be gained from imitative learning. These findings were in opposition to the tenets of behaviorism and spurned a social-cognitive movement in psychology (Woodward, 1982). The effects of the Social Learning Theory (SLT) that was created by Bandura (1961) would be examined in subsequent decades with a wide range of implications. SLT has been used to examine crime (Akers, 2011), dental anxiety (Do, 2004), parenting interventions (O'Connor, Matias, Futh, Tantam, & Scott, 2013), cyber deviance (Holt, Burruss, & Bossler, 2010) and a range of other topics. Pertinent to this discussion is the role that social learning plays in the development of Block 1 and Block 2 processes, specifically language for emotions and emotional regulation.

Though the research is sparse with regards to affect development and SLT, the discovery and understanding of mirror neurons has created an avenue to explore affect expression and regulation through the lens of SLT. Neurological research confirms that there is a link between seeing someone express an emotion and in response, feeling that emotion. The brain reacts to the perception of another person’s feeling by activating the same areas of the brain that would indicate first-hand emotional experience (Keysers, & Gazzola, 2006). Furthermore, an individual may look to another person for confirmation of their own emotions and how to regulate them, especially when they are experiencing a
challenging or negative emotional state (Järvenoja, Volet, & Järvelä, 2013). Our brains develop in response to the social context in which we live (Lamm & Singer, 2010), and for a young child, that social context is mostly made up of their home and who lives inside of it. This supports the use of SLT when considering the importance of the social context when examining Block 1 and 2 of the NDM and how familial influences can affect social and emotional development.

Technology

The presence of media technology has impacted the development of children through a variety of mechanisms. Research in the early 1990s implied that increased technology in the home had led to a 40% decrease in time parents spent with their children when compared to the previous 20 years (Castro & Hewlett, 1991), time that could have an impact the development of secure and appropriate parent-child relationships. More recent research demonstrated that an increasing number of infants are showing low tone and decreased motor activity (Jennings, 2005) which implies that they are not receiving adequate exposure to movement which should be facilitated by caregivers. Pair this finding with the increased time on screens and it could be suggested that parents are spending less time with their infants and more time on screens.

Current recommendations from the American Academy of Pediatrics dictate that children should not be exposed to television before the age of 24 months (Pediatrics, 2018); however, in 60% of homes, the television is reported to be on throughout the entire day (Rideout, Vandewater, & Wartella, 2003) implying that children of all ages are exposed to screens, many from as early as infancy.

Television exposure in early childhood has been linked to increased aggression and externalizing symptomology with effects lasting through adolescence (Anderson, et al., 2001). Exposure to television at a young age also affects language development with some type of programming correlated with increases in vocabulary and other types of programming correlated with decreases in vocabulary (Linebarger & Walker, 2005) which provides early support for the categorical effects of media. As noted previously, language expression plays an important role in affect expression, regulation, perspective
taking, and theory of mind. These findings suggest that exposure to television can not only influence vocabulary, but also the subsequent development of higher level social and emotional processes.

Along with televisions, cell phones and touch screen mobile devices have become commonplace in many homes. The direct effects of mobile touch screen use and early childhood social development has yet to be thoroughly explored though there is evidence to suggest that there a link between parent and child touch screen use and stunted social and emotional development. Studies have shown that parents react more harshly to their children’s misbehavior when the parent is highly absorbed with their device. These results may indicate that the screen absorption led to missed cues from their children that then escalated into misbehavior that necessitated reprimand (Radesky, et al., 2009). Erratic responses such as these are representative of insecure-ambivalent attachment styles which could lead to childhood depression and decreases in social exploration (Ainsworth, 1978).

Research further indicates that along with their parents, infants and young children also interact with touchscreen technology (Cristia & Siedl, 2015); however, the focus of cyber effects has been on sensory, motor, and cognitive development and not social emotional development. These studies indicate that infant and early childhood use of touch screen technology can lead to delayed motor milestones, impaired sensory abilities, attentional and memory problems, and delayed cognitive development (Cai, 2019; Haughton, Aiken, & Cheevers, 2015). Though implications of the effects of parent and child touch screen usage and attachment relationships have been examined by-proxy through an exploration of the effects of media in the home (Aiken, 2016) and the conclusions are logical, evidence-based assumptions are sparse.

**Implications for Current Research**

Given that the development of higher order social and emotional processes is dependent upon earlier processes and attachment styles that are influenced by the environment, it is important to consider the effects that a cyber-culture can have on child development. As parents become increasingly absorbed with screens and as a result, more aggressive in their response to a child’s behavior, they are providing models for what children interpret to be appropriate behavior necessitating an examination of both child
and parent usage of screens when attempting to further understand the complicated development of social
and emotional processes. Media absorption can then affect the attachment relationship which further
affects social and emotional development, but given the potential relationships that can develop between
secondary caregivers and siblings in the home, it is important to understand the effect they can have on a
child’s development and if their presence is protective when a primary parent or caregiver is absorbed
with a screen.

Furthermore, preliminary television research previously outlined suggests that the negative
effects of screen viewing is dependent upon what type of programming is viewed. As a response to this
finding, categorical use of touch screens should be examined to determine if different types of use can
have different levels of effects on the child’s social and emotional development.
CHAPTER 3: METHODOLOGY

As technology plays an increasingly significant role in the lives of children and adults, it becomes imperative to understand if and how it impacts the development of psychological processes and subsequent behaviors. Specifically, with the addition of technology into the home, there is some concern about the effect that it may have on the social and emotional development of children (Radesky & Christakis, 2016). Researchers have begun to examine the relationship between technology and development, but there continues to be many areas to explore to create a holistic perspective of the interaction between technology and humanity (Edwards et al. 2017; O’Connor & Fotakopoulou, 2016).

Much of social emotional development is dependent upon reciprocal social interaction and the development of secure attachments with primary caregivers (Gross, Stern, Brett, & Cassidy, 2017; Saunders, Kraus, Barone, & Biringen 2015). Secure attachment is developed when an infant and a caregiver have compatible temperaments and the caregiver provides appropriate response and attention to the infant. When a caregiver responds to an infant appropriately (i.e. picking them up when they cry, feeding them, soothing them, smiling at them, etc.), the infant learns that they can depend on the caregiver which lays the foundation for the development of trust, emotional regulation, and help-seeking. These processes play a pivotal role in the social and emotional development in children, and attachment theory research demonstrates strong links between secure attachment styles and healthy social/emotional behaviors.

Social emotional development is a construct that covers a multitude of processes. LeBuffe and Naglieri (2012) developed the Devereux Early Childhood Assessment for Preschoolers Second Edition (DECA P2) to measure attachment/relationships, self-regulation, and initiative (see Table 3.1) – all components supported by the literature that make up components of social emotional development. The electronic version (e-DECA P2) combines scores for these components, creating a composite score known as the Total Protective Factors, that indicates the level of social emotional development of the child who is being rated with higher scores indicating more protective factors and therefore more social-
emotional skills. The e-DECA P2 also provides information that relates to behavioral concerns that are referenced as an area of need when compared to a same-aged peer with higher scores indicating more behavioral concerns and therefore decreased social-emotional skills.

Table 3.1
Definitions of Social-Emotional Protective Factors as Defined by the e-DECA P2

<table>
<thead>
<tr>
<th>Domain</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Attachment/Relationships</td>
<td>The child’s ability to promote and maintain mutual, positive connections with other children and significant adults.</td>
</tr>
<tr>
<td>Self-Regulation</td>
<td>The child’s ability to express emotions and manage behaviors in healthy ways.</td>
</tr>
<tr>
<td>Initiative</td>
<td>The child’s ability to use independent thought and action to meet his or her needs.</td>
</tr>
</tbody>
</table>

Given that secure attachments can be the foundation for the development of appropriate social/emotional behaviors and parent response plays a pivotal role in the development of that attachment, it is important to examine potential barriers to healthy parent responses: namely, technology. The use of touchscreen technology is on the rise as people have access to multiple touchscreen devices in their daily lives (phones, watches, laptops, tablets, etc.). As people spend more time on screens, it affords them less time to interact in their various relationships, including the parent-child relationship. This begs the question – Is it possible to spend too much time on screens? Studies have begun to shed light on how the use of touchscreen technology interacts with child development, but many of those studies focus on children in other countries and/or school-aged children and adolescents. This study aimed to fill in some of the gaps in the current body of research and examine the relationship between preschool-aged children, parents, siblings, and touchscreen technology. The following questions were addressed:

**Research Questions**

Research Question 1: What is the relationship between the time a child between the ages of four and six spends on a smart device and their social emotional development?
Research Question 2: Is there a difference between the types of smart device usage (i.e. different applications or categories thereof) by the child and that child’s social emotional development?

Research Question 3: What is the relationship between the time a parent spends on a smart device and the social/emotional development of their child aged four to six?

Research Question 4: Is there a difference between types of smart device usage (i.e. different applications or categories thereof) by the parent and the social emotional development of their child?

Research Question 5: Does the presence of older siblings play a moderating role in the use of smart devices and the social emotional development of the child?

Research Question 6: Does the gender of the parent play a moderating role in the use of smart devices (i.e. time spent by the mother or the father) and the social emotional development of the child?

**Inquiry Approach**

These questions were explored quantitatively using a non-experimental survey to determine if there are correlations or relationships that exist between parent use, child use, presence of siblings, and the gender of the parent and the social/emotional development of children as delineated by the e-DECA P2. The collection of quantitative data to measure relationships allowed for an analysis of possible predictors of social/emotional development.

A quantitative approach gives space for a larger sample size and multiple control variables which helped to illuminate possible relationships while controlling for extraneous factors. Collecting data using a survey expedited data collection and allowed for a wide range of participants to partake in the study. While this approach attempts to be replicable to encourage further exploration and a continued examination of the effects of screen time on child development, the current COVID-19 pandemic interfered with absolute replicability given the recruitment strategies that were employed (see Chapter 5 for further discussion on this).
Design and Methodology

Participants

The population for this study consisted of preschool-aged children and their parents. However, the accessible population was made up of preschoolers and their families that were able to be reached via online platforms given the nature of the COVID-19 pandemic. As a result, the sample was one of convenience, created by a variety of networking and outreach opportunities. The sampling unit was the individual, and there were several outreach attempts including using ad time and social media blocks to reach as many viewers as possible in attempts to encourage as much participation as possible. This was completed by creating a social media account and paying for targeted advertising that captured parents with children in the desired age range. The link to the survey was shareable to encourage participants to share the survey with others, increasing the sample size. However, given that most touchscreen technology requires some sort of internet access, keeping the survey in an online format created a sample that was representative of families who use technology and not necessarily all families.

Using all predictors (as described in demographics) and including the three constructs of the e-DECA P2, a sample size of 178 would be sufficient to capture a moderate effect ($f^2 = .15$; predicted by G*power Software). As the study stands, there is no need for grouping. However, grouping for characteristics such as type of touchscreen app usage, certain demographic variables, and enrollment or non-enrollment in a day-care/preschool facility was completed after data collection. Human rights were protected given that no data was collected until the study was reviewed and approved by IRB.

Instrumentation

To analyze the relationship between parent and child technology use and social emotional development, three different groups of variables were collected: control, predictor, and criterion variables. Control variables were demographic in nature and include household income, parent level of education, parental gender, child gender, age of the child, and age of the parent. Predictor variables were parent average daily time on touchscreen technology, types of usage (social networking, reading and reference, and other categories based upon classification in application stores), the child’s average daily usage of
touchscreen technology and types of use, and the presence of older siblings in the home. The social/emotional criterion variables were measured using the electronic version of the Deveraux Early Childhood Assessment for Preschoolers – Second Edition (e-DECA P2).

**Demographics.** To analyze relationships between screen time and social emotional development, a series of demographic information was collected including: Household Annual Income, Parental Level of Education, Gender of Parents, Gender of the Child, Age of Parent in years, Age of Child in months. Children aged 48-72 months meet the age criteria given that these ages fit within required ages for preschools and are also developmentally within the integrative Block 2 of the neurodevelopmental model.

**Measures of screen time.** To create data for the predictors, parents were led through a series of steps that walked them through gathering screen time statistics on their various devices (See Appendix A). They were given the opportunity to enter information for multiple devices with the option to assign ownership to each device. These steps captured the daily average of time on screens for parents and children as well as categories of usage. To capture child usage, ownership of device was specified. If devices were shared, parents were led through steps that brought them to usage rates on apps used by their children. The presence of older siblings in the houses was also collected.

**Measure of social emotional development.** The Deveraux Early Childhood Assessment – Second Edition (e-DECA P2) was standardized using 3,553 children ages 3-5 with care given to appropriate representation of the United States’ population. Research suggests high internal reliability and consistency for parent raters (.92), high test-rest reliability for parent raters (.88), and acceptable inter-rater reliability for parents (.51). Content validity is high considering a review by the National Advisory Committee that considered current social and emotional resilience in the literature. Criterion validity was demonstrated by showing significant differences between typical populations and populations with emotional and behavioral disturbance. Construct validity was demonstrated by showing strong convergent validity between the e-DECA P2 and the Preschool Emotional and Behavioral Rating Scale and the Connors Early Childhood assessment. Though the subsets of the total composite could be
considered interrelated, the total composite score provides a reliable and valid measure of social emotional development in young children (Yetter, 2020). Of particular interest is the e-DECA P2’s ease of use. The assessment is noted to take less than ten minutes to complete which encourages full completion and therefore more accurate scoring.

The e-DECA 2 is considered atheoretical given the lack of theoretical orientation mentioned in the instruction manual (LeBuffe & Naglieri, 2012). However, though there is no overarching theoretical framework from which the test was constructed, its use of attachment, self-regulation, and initiative as measurable constructs fit well within the neurodevelopmental framework that posits these constructs as components of appropriate social emotional development.

**Procedures**

With current COVID-19 pandemic precautions in place, canvassing and completion of the survey was completed entirely online. In response to this, to reach a variety of participants, accounts were created for the social media sites Facebook and Instagram. Additionally, emails with links to the surveys were sent out to preschools, churches, and school districts.

Parent and caregivers had access to the survey through a direct link posted on social media or one that was shared via email. Once the accessible population was canvassed, those who choose to participate in the study were able to access the study. There was an incentive prize of a $100 Amazon gift card given through a random drawing of those who completed the survey in its entirety and chose to leave their email addresses for the purposes of the raffle. After providing informed consent, parents were asked to answer the background questions that make up the control variables. The survey was five pages long. The first page was the parameters of the experiment and a place to indicate informed consent. The second page provided drop-down boxes to indicate gender, household income, parent level of education, the presence of siblings, age of parent (in years), and age of child (in months).

Once the demographic variables were collected, the participants continued to the third page which led them through a series of steps to collect screen time information for both Apple and Android devices. Both of these devices provide daily, weekly, and average daily screen time information which parents
were asked to input. They were able to select who uses the device (self or child) and if the device was shared by both parent and child, parents were led through another series of instructions that brought them to specific app usage and were asked to enter usage information for apps used only by their children. After entering touchscreen-usage information, they continued to the next part of the survey which brings them to the e-DECA 2 where they completed the 38-item questionnaire. Once the survey was completed, they were led to the final page where they were thanked for their participation and asked to enter an email address if they wanted to be entered into a drawing for the $100 Amazon gift card. The survey was kept open for up to two months in attempts to create a large sample size.

Data Analysis & Presentation

All information that was gathered was input into SPSS including aggregates created for time spent across multiple devices. This data was analyzed using multiple regression techniques that examined the relationship between touchscreen usage and the criterion variables necessitating multiple regression models. This technique not only looked at the general relationship between social emotional development and touchscreen technology, but it also looked at specific domains of social emotional development to determine if certain domains were more susceptible or resilient to time spent on devices. Multiple regression is appropriate given that the premise of the research is to determine if there is a predictive relationship between time spent on touchscreen technology and a child’s social/emotional development. A correlation matrix was created to examine the strength and direction of relationships between control variables and criterion variables as well as predictor and criterion variables. Checking to be sure that all values between predictors are below .80 will ensure that the multicollinearity assumptions have been met. Homoscedasticity was checked by creating a scatterplot of the residuals and the predicted values and checking for even distribution.

Parent and child screen usage and their children’s social/emotional development was examined using a sequential multiple regression. The first block consisted of background demographics (Annual Household Income, Parental Level of Education, Age of Parent and Age of Child). The second block consisted of amount of time parent and child spends on screens. The criterion variable for the initial
The model was the Total Composite Score and analyzed for p values < .05. The same model was used to analyze each domain on the e-DECA P2 by replacing criterion variable with one of the four domains. Follow-up sequential multiple regressions were conducted to analyze the individual impact of parent usage on the four different domains of the e-DECA P2 as well as the individual impact of child usage on the same domains.

These results helped illuminate any potential predictive relationship that might exist between time spent on touchscreens and the development of the preschooler’s social/emotional development.

Grouping based upon type of screen time was completed to determine possible differences between e-DECA P2 scores and categorical use of the devices. Participants were placed in groups based upon their most used category, and differences between these groups were analyzed for both total e-DECA P2 score and domains of development. A multi-analysis of variance (MANOVA) was conducted to analyze the different levels of the independent variable (most used category) and the multiple dependent variables (domains and total scores of received on the e-DECA P2).

To determine if siblings played a moderating role in a child’s social emotional development, the continuous variables were centered and an interaction term was created using the cross-product of the centered time on screens and the presence of siblings. These terms were analyzed using the regression models that incorporated demographics and predictors. The same process was used to analyze the moderating effects that parental gender had on the child’s social emotional development. However, for this purpose, four regression models were used: one that examined the effect of the primary parent gender and primary parent time on screens, one that examined the effects of primary gender and child time on screens, one the examined secondary parent gender and secondary time on screens, and one that examined secondary parent gender and child time on screens.

**Assumptions & Limitations**

Certain assumptions were met before the analysis of the multiple regression was completed or interpreted. Tests of multicollinearity and homoscedasticity have previously been mentioned. Further assumptions require the relationship between the predictors and the criterion to be linear and the
distribution of the criterion variable to be normal. The normality of the criterion variables was checked using the Shapiro-Wilk test (checking for non-significance).

There are some limitations to this research. Throughout the pandemic, families and children have been kept indoors and their screen time usage may be increasing, and instead of screen time hours being indicative of general use, it may instead be capturing momentary or temporary use. Even so, the information may still be a forecast of what is to come as educational settings may become increasingly virtual in the future, making it all the more important to determine how screens affect child development. Gathering a representative sample without accessing an existing database made it difficult to reach the proper variety of people that reflect the population of interest. This data is also based upon self-reporting which means that there is an assumption of honesty and therefore limitations of accuracy. People may not have gone through the steps or understood the steps to access actual usage rates and may have guessed instead. This could have led to over or underestimates of screen time which could create false positive or false negative associations.

**Ethical Considerations**

This research received IRB approval before data collection which helped maintain accountability for the privacy and consideration of the participant. No identifying information was collected, apart from the voluntary contribution of an e-mail address if the participants wished to be entered into a drawing. The e-mail addresses that were associated with their answers were not migrated with the data and was instead entered into a separate document that consisted only of email addresses that were entered in the drawing and was deleted immediately after the winner was chosen.

**Chapter Summary**

This chapter included an explanation of the topic of inquiry and how that inquiry was addressed. Six different research questions attempted to explore the relationship between caregiver gender, screen time usage for both parent and child, and the presence of siblings and how those factors interacted with the social and emotional development of young children. Multiple regression analyses and t-tests were used to examine potential relationships between the independent variables and scores on the e-DECA P2.
While there may be some limitations to the study, results should further expand upon the existing literature and lead to future developments and discussion regarding best practices for young children and screen time.
CHAPTER 4: RESULTS

Requests to complete the online survey were sent out by contacting school districts, day care facilities, preschools, and parent groups. A total of 183 participants began the survey and out of that, 105 participants completed the survey (n=105), for a completion rate of 57.5%.

Demographics

The survey allowed for the input of information from two parents and out of the 105 participants, 79 entered information for two parents. Primary Parent refers to parent/guardian who spends the most time with the child, and and Secondary Parent refers to information from an additional parent. Out of the 105 primary parent responses, there were 51 females and 54 males with an average age of 25-35 years old and with an average education that included some college. Data collected for secondary parents showed 41 females and 37 males with an average age of 25-35 and an average education that included some college (Parent Age: 1 = 18 – 25; 2 = 25 – 35; 3 = 35 – 45; 4 = 45+; Education: 1 = Did not complete high school; 2 = High school graduate; 3 = Some college; 4 = college graduate; 5 = some graduate school; 6 = complete graduate school). The average annual household income for all participants was between $75,000 and $99,999 (1 = $0 - $24,999; 2 = $25,000 - $49,999; 3 = $50,000 - $74,999; 4 = $75,000 - $99,999; 5 = $100,000 - $124,999; 6 = $125,000 - $149,999; 7 = $150,000 - $174,999; 8 = $175,000 - $199,999; 9 = $200,000 and above). Child demographics revealed an average age of 50-51 months with 49 females, 52 males, and with 4 responses marked as “decline to answer” (Child Age in Months: 1 = 48 – 49; 2 = 50 – 51; 3 = 52 – 53; 4 = 54 – 55; 5 = 56 – 57; 6 = 58 – 59; 7 = 60 – 61; 8 = 62 – 63; 9 = 64 – 65; 10 = 66 – 67; 11 = 68 – 69; 12 = 70). For these children, it was indicated that 55 participants had older siblings in the home, 48 did not, and 2 declined to answer (see Tables 4.1, 4.2).

Primary parents spend an average time of 209.48 minutes on screens per day; secondary parents spend an average of 172.43 minutes on screens per day; and the children spend an average of 83.57 minutes on screens per day. Scores on the e-DECA P2 were measured with an average Total Protective
Factors Composite of $t = 36.79$; Attachment/Relationships $t = 34.43$; Self-Regulation $t = 42.29$; Initiative $t = 38.13$; and Behavioral Concerns $t = 53.22$ (see Table 4.1).

Table 4.1
Sample Demographics & Variable Averages and Variance

<table>
<thead>
<tr>
<th>Variable</th>
<th>M</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Income</td>
<td>4.49</td>
<td>1.648</td>
</tr>
<tr>
<td>Primary Parent Age</td>
<td>2.14</td>
<td>0.929</td>
</tr>
<tr>
<td>Primary Parent Education</td>
<td>3.48</td>
<td>1.435</td>
</tr>
<tr>
<td>Primary Parent Screen Time</td>
<td>209.48</td>
<td>102.57</td>
</tr>
<tr>
<td>Secondary Parent Age</td>
<td>2.16</td>
<td>0.823</td>
</tr>
<tr>
<td>Secondary Parent Education</td>
<td>3.46</td>
<td>1.196</td>
</tr>
<tr>
<td>Secondary Parent Screen Time</td>
<td>172.43</td>
<td>90.82</td>
</tr>
<tr>
<td>Child Age</td>
<td>7.07</td>
<td>3.310</td>
</tr>
<tr>
<td>Child Screen Time</td>
<td>108.08</td>
<td>76.76</td>
</tr>
<tr>
<td>Total Protective Factors Score</td>
<td>36.79*</td>
<td>9.07</td>
</tr>
<tr>
<td>Attachment/Relationships</td>
<td>34.43*</td>
<td>9.08</td>
</tr>
<tr>
<td>Self-Regulation</td>
<td>42.29*</td>
<td>9.21</td>
</tr>
<tr>
<td>Initiative</td>
<td>38.13*</td>
<td>9.64</td>
</tr>
<tr>
<td>Behavioral Concerns</td>
<td>53.22*</td>
<td>9.95</td>
</tr>
</tbody>
</table>

N = 105 (completed child profiles), * = t-scores

Table 4.2
Sample Demographics – Counts of Gender and Presence of Siblings

<table>
<thead>
<tr>
<th>Variable</th>
<th>Females</th>
<th>Males</th>
<th>Decline to answer</th>
<th>Total</th>
<th>Siblings</th>
<th>Yes</th>
<th>No</th>
<th>Decline to answer</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parent 1</td>
<td>51</td>
<td>54</td>
<td></td>
<td>105</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Parent 2</td>
<td>41</td>
<td>37</td>
<td></td>
<td>79</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Child</td>
<td>49</td>
<td>52</td>
<td>4</td>
<td>105</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Siblings</td>
<td></td>
<td></td>
<td></td>
<td>55</td>
<td>48</td>
<td>2</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Correlations were examined to ensure variable independence (see Table 4.3 – next page). Income was significantly correlated with Parent Education, Parent Age, Child Age, Child Device Time, Total Protective Factors scores, Self-Regulation scores, Initiative Score, and Behavioral Concerns. The existing correlations between income and these demographic variables along with social emotional development is supported by the literature (Jensen, Berens, & Nelson, 2017).
|   | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 |
|---|---|---|---|---|---|---|---|---|---|----|----|----|----|----|----|
| 1. Income       |   | - |   |   |   |   |   |   |   |     |     |     |     |     |     |     |
| 2. Primary Parent Ed | .364" | - |   |   |   |   |   |   |   |     |     |     |     |     |     |     |
| 3. Primary Parent Age | .230' | .104 | - |   |   |   |   |   |   |     |     |     |     |     |     |     |
| 4. Secondary Parent Education | .273' | .356" | .163 | - |   |   |   |   |   |     |     |     |     |     |     |     |
| 5. Secondary Parent Age | .321" | .105 | .389" | .179 | - |   |   |   |   |     |     |     |     |     |     |     |
| 6. Child Age    | .259" | .034 | -.006 | .162 | .099 | - |   |   |   |     |     |     |     |     |     |     |
| 7. Siblings     | -.155 | -.025 | -.083 | .071 | -.143 | .019 | - |   |   |     |     |     |     |     |     |     |
| 8. Child Gender | .069 | .188 | -.061 | .198 | .098 | .069 | -.027 | - |   |     |     |     |     |     |     |     |
| 9. Primary Parent Device Time | -.118 | .245 | -.071 | .326 | -.008 | .046 | -.017 | .068 | - |   |     |     |     |     |     |     |
| 10. Secondary Device Time | .290 | .513 | .322 | .111 | .335 | .261 | -.108 | -.081 | .864' | - |   |     |     |     |     |     |
| 11. Child Device Time | -.231' | -.110 | -.053 | -.194 | -.189 | .057 | -.123 | .010 | .514" | -.488 | - |   |     |     |     |     |
| 12. Total Protective Factors | .244' | .384" | .010 | .345" | .246' | -.138 | .013 | .107 | -.120 | .207 | -.510" | - |   |     |     |     |
| 13. Attachment Relationships | .137 | .315" | .100 | .188 | .286' | -.196' | -.043 | .127 | -.141 | .123 | -.472" | .725" | - |   |     |     |
| 14. Self- Regulation | .204' | .248' | .006 | .228 | .052 | -.106 | .029 | -.076 | -.199 | .250 | -.520" | .670" | .549" | - |   |     |
| 15. Initiative   | .233' | .323" | -.017 | .295' | .185 | -.160 | -.046 | .074 | -.188 | .207 | -.529" | .803" | .679" | .664" | - |     |
| 16. Behavioral Concerns | -.211' | -.171 | -.024 | -.313" | -.118 | .108 | -.116 | .098 | .389" | .021 | .508" | -.565" | -.401" | -.599" | -.592" | - |     |

* p < .05; ** p < .001
As a result, income will be entered as a control variable for all statistical tests. Primary and secondary parent education and age are also significantly correlated with scores on the measures of social emotional development (Total Protective Factors, Attachment/Relationships, Self-Regulation, Initiative, and Behavioral Concerns) as well as correlated with each other, and these findings are also congruent with the literature, and as a result, parent education and age will be used as control variables in appropriate statistical analyses. The measures of social and emotional development are all significantly correlated with each other which supports the validity of the e-DECA. Of note is the significant correlation between the age of the child and their scores on the Attachment/Relationships Index. The scores on the e-DECA P2 are standardized with an age group of 36-72 months, and this correlation could represent an increase in the appropriateness of attachment and relationships as the child ages. Apart from these correlations, the remaining variables are not significantly correlated and indicate that analysis can proceed.

**Research Question 1**

What is the relationship between the time a child between the ages of four and six spends on a smart device and their social emotional development?

To analyze the relationship between the time a four to six-year-old child spends on touch screen devices and their social emotional development, first measures of child screen time were reported by parents either directly from the child’s device or from an estimate of the child’s time on the parent’s device (estimations were given after parents examined the most commonly used applications by their children and the time spent on these applications). Then parents completed the e-DECA P2 survey and results were inputted into the scoring software to determine t-scores for three indices (Attachment/Relationship, Self-Regulation, Initiative) that composed a Total Protective Factors composite and a fourth index, Behavioral Concerns, that did not load into the Total Protective Factors. Higher scores on the Attachment/Relationship, Self-Regulation, Initiative, and Total Protective Factors indicate strengths while higher scores on the Behavioral Concerns indicate weaknesses.
After data collection, a regression analysis was completed using Income, Primary Parent Education, Primary Parent Age, and Child Age as controlling variables and Child Time on Devices as the predictor of performance on the e-DECA P2 indices and total composite. Regression results (see Table 4.4) suggest a significant relationship between the time a child spends on touch screen devices and their scores of social emotional development with an unstandardized regression coefficient of -0.055 ($t[5] = -5.508$, $p < .001$). These findings suggest that for each additional minute a child spent on screens, their scores on the Total Protective Factors composite decreased by .055 points indicating that as screen time increases, social-emotional skills decrease. Specifically, for every additional 60 minutes a child spends on screens, their eDECA scores will decrease by 3.3 points. The time a child spends on screens is approaching a strong effect ($r = -.461$) suggesting that the relationship between time spent on screens and the social emotional development is strong.

Table 4.4

<table>
<thead>
<tr>
<th>Variables</th>
<th>X</th>
<th>B</th>
<th>SE</th>
<th>β</th>
<th>t</th>
<th>p</th>
<th>Part</th>
<th>ΔR²</th>
</tr>
</thead>
<tbody>
<tr>
<td>Block 1: Income</td>
<td>4.49</td>
<td>0.170</td>
<td>0.542</td>
<td>0.031</td>
<td>0.314</td>
<td>.755</td>
<td>.026</td>
<td>.186**</td>
</tr>
<tr>
<td>Block 1: Parent Ed</td>
<td>3.48</td>
<td>2.044</td>
<td>0.583</td>
<td>0.318</td>
<td>3.505**</td>
<td>&lt;0.001</td>
<td>.293</td>
<td>.186**</td>
</tr>
<tr>
<td>Block 1: Age (parent)</td>
<td>2.14</td>
<td>-0.896</td>
<td>0.834</td>
<td>-0.92</td>
<td>-1.075</td>
<td>0.286</td>
<td>-.090</td>
<td>.107</td>
</tr>
<tr>
<td>Block 1: Age (Child)</td>
<td>7.07</td>
<td>-0.318</td>
<td>0.250</td>
<td>-0.114</td>
<td>-1.273</td>
<td>0.206</td>
<td>-.107</td>
<td>.212**</td>
</tr>
<tr>
<td>Block 2: Child Time</td>
<td>109.50</td>
<td>-0.055</td>
<td>0.010</td>
<td>-0.480</td>
<td>-5.508**</td>
<td>&lt;0.001</td>
<td>.461</td>
<td>.212**</td>
</tr>
</tbody>
</table>

* $p < .05$; ** $p < .01$

Regression analysis was also conducted to determine the relationship between the time a child spent on touch screen devices and their scores on the individual indices. All index regressions were significant, which further validates the regression results that indicated a significant relationship between the time a child spends on screens and their scores on the e-DECA P2 total composite (see Table 4.5). For Attachment/Relationships, there was an unstandardized regression coefficient of -0.051 ($t[5] = -4.832$, $p < .001$) indicating that for every additional minute a child spends on screens, their scores within the
Attachment/Relationship index decrease by -.051 points indicating that as time on screens increases, the quality of their attachment/relationships decreases. For Self-Regulation, there was an unstandardized regression coefficient of -.061 (t[5] = -5.666, p < .001) which indicates that for every additional hour a child spends on touch screen devices, their scores within the Self-Regulation index decrease by 3.66 points, indicating that as their time on screens increases, their self-regulation decreases. For Initiative, there was an unstandardized regression of -.063 (t[5] = -5.809, p < .001) which indicates that for every additional hour a child spends on touch screen devices, their scores within the Initiative index decrease by 3.78 points, indicating that as their time on screens increases, their initiative decreases. For the Behavioral Concerns index, there was an unstandardized regression coefficient of .063 (t[5] = 5.539, p < .001) indicating that for every additional hour a child spends on touch screen devices, their scores within the Behavioral Concerns index increase by 3.78 points, indicating that as a child’s time on screens increases, their behavioral concerns increase as well. The effect size for all indices were moderate to large – Attachment/Relationships (r = -.425); Self-Regulation (r = -.496); Initiative (r = -.487); and Behavioral Concerns (r = .482) – indicating that not only were these relationships significant, but that the relationships were strong.

These results confirm the hypothesis that there is a negative relationship between the amount of time a child spends on screens and their social and emotional development.

<table>
<thead>
<tr>
<th>Index/Composite</th>
<th>B</th>
<th>β</th>
<th>t</th>
<th>Sig.</th>
<th>Part</th>
<th>Confidence Interval</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Upper</td>
</tr>
<tr>
<td>Attachment Relationships</td>
<td>-.051</td>
<td>-.443</td>
<td>-4.832**</td>
<td>&lt; .001</td>
<td>-.425</td>
<td>-.072</td>
</tr>
<tr>
<td>Self-Regulation</td>
<td>-.061</td>
<td>-.517</td>
<td>-5.666**</td>
<td>&lt; .001</td>
<td>-.496</td>
<td>-.082</td>
</tr>
<tr>
<td>Initiative</td>
<td>-.063</td>
<td>-.508</td>
<td>-5.809**</td>
<td>&lt; .001</td>
<td>-.487</td>
<td>-.084</td>
</tr>
<tr>
<td>Behavioral Concerns</td>
<td>.063</td>
<td>.503</td>
<td>5.539**</td>
<td>&lt; .001</td>
<td>.482</td>
<td>.040</td>
</tr>
</tbody>
</table>

* p < .05; ** p < .01
Research Question 2

Is there a difference between the types of smart device usage (i.e., different applications or categories thereof) by the child and that child’s social emotional development?

To analyze the difference between different types of smart device usage (different application categories), the most frequently used applications by the child were collected and grouped, and the means of scores (see Table 4.6) on the e-DECA within these groups were analyzed.

Table 4.6
Means of Index and Composite Scores on the eDECA by Child’s Most Frequented Categories of Use

<table>
<thead>
<tr>
<th>Domain</th>
<th>Attachment Relationship</th>
<th>Self-Regulation</th>
<th>Initiative</th>
<th>Behavioral Concerns</th>
<th>Total Protective Factors</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>F = 1.487</td>
<td>F = 2.975**</td>
<td>F = 2.000*</td>
<td>F = 1.494</td>
<td>F = 1.959*</td>
</tr>
<tr>
<td></td>
<td>M(SD)</td>
<td>M(SD)</td>
<td>M(SD)</td>
<td>M(SD)</td>
<td>M(SD)</td>
</tr>
<tr>
<td>AR Apps</td>
<td>30.25 (3.862)</td>
<td>25.00 (13.638)</td>
<td>35.50 (7.724)</td>
<td>57.50 (13.626)</td>
<td>33.00 (5.715)</td>
</tr>
<tr>
<td>n=4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Books</td>
<td>42.00 (17.78)</td>
<td>40.33 (11.930)</td>
<td>40.33 (11.150)</td>
<td>53.00 (12.530)</td>
<td>40.00 (14.798)</td>
</tr>
<tr>
<td>n=3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Education</td>
<td>34.93 (9.327)</td>
<td>41.77 (5.101)</td>
<td>37.259 (6.254)</td>
<td>53.33 (7.306)</td>
<td>36.59 (6.295)</td>
</tr>
<tr>
<td>n=27</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Entertainment</td>
<td>31.37 (4.935)</td>
<td>40.40 (9.188)</td>
<td>36.27 (7.746)</td>
<td>53.19 (10.088)</td>
<td>34.77 (6.272)</td>
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<tr>
<td>n=54</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Games</td>
<td>32.48 (7.645)</td>
<td>40.21 (7.891)</td>
<td>35.76 (5.720)</td>
<td>53.55 (8.757)</td>
<td>34.95 (5.591)</td>
</tr>
<tr>
<td>n=42</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Kids</td>
<td>31.56 (6.628)</td>
<td>42.00 (7.304)</td>
<td>36.18 (6.198)</td>
<td>53.13 (9.810)</td>
<td>35.06 (5.918)</td>
</tr>
<tr>
<td>n=32</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Music</td>
<td>32.60 (8.566)</td>
<td>38.00 (4.966)</td>
<td>34.90 (4.653)</td>
<td>57.00 (6.864)</td>
<td>33.60 (5.541)</td>
</tr>
<tr>
<td>n=10</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Navigation</td>
<td>36.50 (12.021)</td>
<td>52.00 (16.970)</td>
<td>48.50 (14.849)</td>
<td>40.00 (16.971)</td>
<td>45.50 (16.263)</td>
</tr>
<tr>
<td>n=2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Photo &amp; Video</td>
<td>37.50 (10.134)</td>
<td>47.66 (9.750)</td>
<td>41.33 (12.628)</td>
<td>47.33 (10.405)</td>
<td>41.00 (10.334)</td>
</tr>
<tr>
<td>n=6</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Productivity</td>
<td>32.44 (5.961)</td>
<td>44.22 (7.726)</td>
<td>42.44 (10.690)</td>
<td>47.89 (10.517)</td>
<td>38.44 (8.017)</td>
</tr>
<tr>
<td>n=9</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Social Network</td>
<td>30.73 (3.228)</td>
<td>37.90 (6.503)</td>
<td>33.00 (3.492)</td>
<td>58.091 (6.862)</td>
<td>31.90 (3.300)</td>
</tr>
<tr>
<td>n=11</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* p < .05; ** p < .01
For the Total Protective Factors composite, Box’s Test of Equality of Covariances was significant ($F[105] = 3.028, p < .001$), and so a more conservative measure, Pillai’s Trace, was used to evaluate the significance of the overall MANOVA which was significant ($F[50] = 1.379, p = .044$). This suggests that there are significant differences between categories of use and scores on the difference indices and overall Total Protective Factors composite, which indicate that all indices should be examined to determine the location of the differences.

Tests for homogeneity of variance indicate that equal variances can be assumed for Self-Regulation ($F[10] = 1.432, p = .169$) and Behavioral Concerns ($F[10] = .720, p = .706$), while equal variances cannot be assumed for Attachment Relationship ($F[10] = 2.671, p = .004$), Initiative ($F[10] = 2.807, p = .003$), or Total Protective Factors ($F[10] = 2.470, p = .008$) (see Table 4.7). The relationship between Self-Regulation ($F[100] = 2.975, p = .002$), Initiative ($F[10] = 2.000, p = .035$), Total Protective Factors ($F[10] = 1.959, p = .040$) (see Table 4.8) and categories of use were significant, suggesting that there were significant mean differences between scores within these composites and the children’s most frequently used categories. The effect sizes of these relationships were fairly small – Self-Regulation ($r = .136$), Initiative ($r = .096$) and Total Protective Factors ($r = .094$). Neither the relationship between Attachment Relationships and categories of use ($F[10] = 1.487, p = .147$) nor the relationships between Behavioral Concerns and categories of use ($F[10] = 1.494, p = .144$) were significant. While this lack of significance among the Attachment/Relationships and Behavioral Concerns indices are incongruent with the hypothesis that social networking and entertainment applications will negatively impact a child’s social emotional development, exploration into other indices and the composite showed a different relationship.
Table 4.7

Tests for Homogeneity of Variance Based on Means for Child Categories of Use and Score on the eDECA

<table>
<thead>
<tr>
<th>Index/Composite</th>
<th>Levene Statistic</th>
<th>df</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Attachment/Relationship</td>
<td>2.671**</td>
<td>10</td>
<td>.004</td>
</tr>
<tr>
<td>Self-Regulation</td>
<td>1.432</td>
<td>10</td>
<td>.169</td>
</tr>
<tr>
<td>Initiative</td>
<td>2.807**</td>
<td>10</td>
<td>.003</td>
</tr>
<tr>
<td>Total Protective Factors</td>
<td>2.470**</td>
<td>10</td>
<td>.008</td>
</tr>
<tr>
<td>Behavioral Concerns</td>
<td>.707</td>
<td>10</td>
<td>.717</td>
</tr>
</tbody>
</table>

* p < .05; ** p < .01

Table 4.8

Differences Between Child’s Categories of Use and Scores on the eDECA Indices and Composite

<table>
<thead>
<tr>
<th>Index/Composite</th>
<th>F</th>
<th>df</th>
<th>Sig.</th>
<th>Partial Eta Squared</th>
</tr>
</thead>
<tbody>
<tr>
<td>Attachment/Relationship</td>
<td>1.487</td>
<td>10</td>
<td>.147</td>
<td>.073</td>
</tr>
<tr>
<td>Self-Regulation</td>
<td>2.975**</td>
<td>10</td>
<td>.002</td>
<td>.136</td>
</tr>
<tr>
<td>Initiative</td>
<td>2.000*</td>
<td>10</td>
<td>.035</td>
<td>.096</td>
</tr>
<tr>
<td>Total Protective Factors</td>
<td>1.959*</td>
<td>10</td>
<td>.040</td>
<td>.094</td>
</tr>
<tr>
<td>Behavioral Concerns</td>
<td>1.494</td>
<td>10</td>
<td>.144</td>
<td>.073</td>
</tr>
</tbody>
</table>

* p < .05; ** p < .01

For Self-Regulation scores, post-hoc LSD tests indicate that the category that demonstrated the most difference from other apps in terms of self-regulation scores was the use of AR (Augmented Reality) applications, as the differences were significant when compared to all other categories of usage. The negative mean differences suggest that those who used AR Apps more frequently had lower Self-Regulation scores than those children who used other categories of applications more frequently – Books (-15.3333, p = .013); Education (-16.7778, p < .001); Entertainment (-15.4074, p < .001); Games (-15.2143, p < .001); Kids (-17.000, p < .001); Music (-13.000, p = .007); Navigation (-27.000, p < .001); Photo & Video (-22.6667, p < .001); Productivity (-19.2222, p < .001); and Social Networking (-12.9091, p = .006). There were other significant mean differences between categories within the Self-Regulation scores including differences between Entertainment and Navigation (-11.5926, p = .046), Entertainment and Photo & Video (-7.2598, p = .036), Games and Navigation (-11.7857, p = .043), Games and Photo & Video (-7.4524, p = .036), Music and Navigation (-14.000, p = .025), Music and Photo & Video (-9.6667, p = .020), Social Networking and Navigation (-14.0909, p = .023) and Social Networking and Photo &
Video (-9.75776, p = .017). These negative mean differences suggest that children who spent more time on Entertainment, Games, Music, and Social Networking scored lower within the self-regulation index when compared to children who spent more time using Navigation and Photo & Video applications. These results confirm the hypothesis that there is a negative relationship between increased usage of social networking and entertainment applications and a child’s social and emotional development.

For Initiative and Total Protective Factors scores, post-hoc Dunnet’s T3 was used because equal variances could not be assumed, and as a result, no significant differences were found between categories of use and a child’s score within the Initiative index nor the Total Protective Factors composite. While the MANOVA was significant, individual mean differences were not significant. This may be due to the conservative estimates of variance, because equal variances could not be assumed.

**Research Question 3**

What is the relationship between the time a parent spends on a smart device and the social/emotional development of their child aged four to six?

To examine the relationship between the time a parent spends on their touch screen devices and their child’s social emotional development, parent-collected screen time numbers from their devices were analyzed with their child’s scores on the e-DECA P2 while controlling for household income, primary parent education and age, and the age of the child. Primary parent and secondary parent screen time was analyzed separately here and throughout to avoid multicollinearity. Regression results (see Table 4.9) indicate that there was not a significant relationship between the time a parent spends on screens and their child’s scores within the Total Protective Factors composite ($t[5] = -.983, p = .332$), indicating that there was not a relationship between the time a primary parent spends on screens and the development of positive social-emotional skills.
Regression analyses were conducted on the indices that make up the Total Protective Factors composite – Attachment/Relationships ($t[5] = -0.831, p = .411$); Self-Regulation ($t[5] = -1.432, p = .160$); and Initiative ($t[5] = -1.171, p = .249$). There were no significant relationships between primary parent time on screens and the indices that load into the Total Protective Factors composite. However, there was a significant relationship between the time a primary parent spends on devices and their child’s scores within the Behavioral Concerns index. For this relationship there was an unstandardized regression coefficient of $0.039$ ($t[5] = 2.570, p = .014$) (see Table 4.10) which indicates that for every additional minute a parent spends on their touch screen devices, their child’s scores within the Behavioral Concerns index increases by $0.039$ points, suggesting that as the primary parent’s time on screens increases, their child’s behavioral concerns increase. The relationship was significant and moderately strong ($r = .376$), and the unstandardized regression coefficient ($B = .039$) suggests a somewhat meaningful relationship given that for every additional hour a primary parent spends on a screen, a child’s score on Behavioral Concerns increases by $2.34$ points.
The survey collected information from secondary parents as well, and regression results indicated that the relationship between the amount of time a secondary parent spends on screens and their child’s scores within the Total Protective Factors composite is significant ($t[5] = 2.584, p = .030$) and with a large effect size ($r = .616$). The unstandardized regression coefficient was positive (.075) which indicates that with each additional minute of time spent on screens by the secondary parent, the child’s scores on the Total Protective Composite goes up by .075 points (or 4.5 points for each additional hour), indicating that as a secondary parent’s time on screens increases, their child’s social-emotional skills increase. (See Table 4.11). These results were not only significant but showed a strong relationship ($r = .616$) indicating a strong correlation between secondary parent time on screens and a child’s total protective factors.

Table 4.11
Sequential Analysis of Effects of Secondary Parent Time on Screen and Child Scores Within the Total e-DECA P2 Protective Composite

<table>
<thead>
<tr>
<th>Variables</th>
<th>$X$</th>
<th>B</th>
<th>SE</th>
<th>$\beta$</th>
<th>$t$</th>
<th>p</th>
<th>Part</th>
<th>$\Delta R^2$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Block 1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Income</td>
<td>4.49</td>
<td>-1.212</td>
<td>1.548</td>
<td>-0.318</td>
<td>-0.738</td>
<td>.454</td>
<td>-.187</td>
<td></td>
</tr>
<tr>
<td>Parent Ed</td>
<td>3.45</td>
<td>1.913</td>
<td>2.550</td>
<td>0.256</td>
<td>0.750</td>
<td>.454</td>
<td>.179</td>
<td></td>
</tr>
<tr>
<td>Age (parent)</td>
<td>2.16</td>
<td>2.386</td>
<td>3.780</td>
<td>0.272</td>
<td>0.631</td>
<td>.544</td>
<td>.150</td>
<td>0.009</td>
</tr>
<tr>
<td>Age (Child)</td>
<td>7.07</td>
<td>-0.501</td>
<td>.838</td>
<td>-0.200</td>
<td>-0.598</td>
<td>.564</td>
<td>-1.43</td>
<td></td>
</tr>
<tr>
<td>Block 2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Parent Time on Screens</td>
<td>172.43</td>
<td>.075</td>
<td>.029</td>
<td>.708</td>
<td>2.584*</td>
<td>.030</td>
<td>.616</td>
<td>0.332</td>
</tr>
</tbody>
</table>

*p < .05; ** p < .01*
When examining the relationship between the amount of time a secondary parent spends on screens and their child’s scores within the indices of the e-DECA, only the Attachment/Relationships index showed a significant relationship \((t[5] = 2.341, p = .044)\) (see Table 4.12). With a positive unstandardized regression coefficient (.061), these results indicate that for every additional hour a secondary parent spends on screens, the scores within the Attachment/Relationships index go up by 3.66 points, suggesting that as secondary parent screen time increases, a child’s attachment/relationship skills increase. The effect size here is considered large \((r = .575)\). The relationships between the time a secondary parent spends on screens and scores within the Behavioral Concerns index \((t[5] = -.332, p = .747)\), Self-Regulation index \((t[5] = 2.198, p = .056)\), or the Initiative index \((t[5] = 2.068, p = .069)\) were not significant.

Table 4.12

<table>
<thead>
<tr>
<th>Index/Composite</th>
<th>B</th>
<th>(\beta)</th>
<th>(t)</th>
<th>Sig.</th>
<th>Part</th>
<th>Upper</th>
<th>Lower</th>
</tr>
</thead>
<tbody>
<tr>
<td>Attachment Relationships</td>
<td>.061</td>
<td>.661</td>
<td>2.341*</td>
<td>.044</td>
<td>.575</td>
<td>.002</td>
<td>.119</td>
</tr>
<tr>
<td>Self-Regulation</td>
<td>.068</td>
<td>.616</td>
<td>2.198</td>
<td>.056</td>
<td>.536</td>
<td>-.002</td>
<td>.139</td>
</tr>
<tr>
<td>Initiative</td>
<td>.074</td>
<td>.612</td>
<td>2.068</td>
<td>.069</td>
<td>.532</td>
<td>-.007</td>
<td>.155</td>
</tr>
<tr>
<td>Behavioral Concerns</td>
<td>-.014</td>
<td>-.109</td>
<td>-.332</td>
<td>.747</td>
<td>-.095</td>
<td>-.109</td>
<td>.081</td>
</tr>
</tbody>
</table>

\* \(p < .05\); ** \(p < .01\)

These results are of interest because they are both incongruent and supportive of the hypothesis, indicating that while increased primary parent screen time leads to increases in behavioral concerns, increased secondary parent screen time leads to increases in social emotional skills.

**Research Question 4**

Is there a difference between types of smart device usage (i.e. different applications or categories thereof) by the parent and the social emotional development of their child?
To analyze the difference between different types of smart device usage (different application categories), the most frequently used applications by the primary parent were collected and grouped and the means of scores (see Table 4.13) on the e-DECA within these groups were analyzed.

Table 4.13
Means of Index and Composite Scores on the eDECA by the Primary Parent’s Most Frequent Categories of Use

<table>
<thead>
<tr>
<th>Domain</th>
<th>Attachment Relationship</th>
<th>Self-Regulation</th>
<th>Initiative</th>
<th>Behavioral Concerns</th>
<th>Total Protective Factors</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>F = 2.818**</td>
<td>F = 1.836*</td>
<td>F = 1.920*</td>
<td>F = 1.109</td>
<td>F = 1.932*</td>
</tr>
<tr>
<td>AR Apps</td>
<td>39.50 (4.949)</td>
<td>33.00 (1.414)</td>
<td>38.00 (2.828)</td>
<td>63.00 (4.242)</td>
<td>35.00 (2.828)</td>
</tr>
<tr>
<td>Books</td>
<td>52.00 (11.296)</td>
<td>45.00 (11.366)</td>
<td>46.50 (9.481)</td>
<td>48.50 (13.590)</td>
<td>47.50 (10.425)</td>
</tr>
<tr>
<td>Business</td>
<td>33.66 (4.041)</td>
<td>27.66 (20.840)</td>
<td>43.33 (6.429)</td>
<td>55.00 (12.767)</td>
<td>38.66 (4.932)</td>
</tr>
<tr>
<td>Developer</td>
<td>48.50 (7.778)</td>
<td>40.00 (8.485)</td>
<td>47.50 (10.606)</td>
<td>54.00 (8.485)</td>
<td>44.50 (10.606)</td>
</tr>
<tr>
<td>Education</td>
<td>38.00 (16.462)</td>
<td>33.66 (27.574)</td>
<td>43.66 (10.692)</td>
<td>51.00 (8.660)</td>
<td>43.00 (14.106)</td>
</tr>
<tr>
<td>Entertainment</td>
<td>32.25 (6.908)</td>
<td>40.80 (6.987)</td>
<td>33.67 (8.874)</td>
<td>57.25 (8.041)</td>
<td>34.41 (6.751)</td>
</tr>
<tr>
<td>Food &amp; Drink</td>
<td>31.00 (2.828)</td>
<td>25.50 (28.991)</td>
<td>40.50 (8.485)</td>
<td>51.50 (14.849)</td>
<td>38.50 (3.535)</td>
</tr>
<tr>
<td>Games</td>
<td>32.50 (4.973)</td>
<td>45.85 (10.151)</td>
<td>39.71 (10.343)</td>
<td>48.42 (10.404)</td>
<td>38.00 (7.942)</td>
</tr>
<tr>
<td>Health &amp; Fitness</td>
<td>30.60 (5.813)</td>
<td>39.60 (8.763)</td>
<td>37.20 (12.557)</td>
<td>58.20 (9.444)</td>
<td>34.40 (9.555)</td>
</tr>
<tr>
<td>Magazine</td>
<td>49.00 (11.313)</td>
<td>54.00 (0.000)</td>
<td>59.50 (0.707)</td>
<td>50.00 (5.656)</td>
<td>54.50 (4.949)</td>
</tr>
<tr>
<td>Music</td>
<td>34.86 (9.755)</td>
<td>47.181 (9.940)</td>
<td>40.63 (13.702)</td>
<td>52.18 (11.240)</td>
<td>40.40 (10.266)</td>
</tr>
<tr>
<td>News</td>
<td>34.07 (8.645)</td>
<td>43.38 (8.221)</td>
<td>37.84 (7.998)</td>
<td>49.30 (10.934)</td>
<td>33.69 (11.484)</td>
</tr>
</tbody>
</table>
(Table 4.13 Continued)

<table>
<thead>
<tr>
<th>Domain</th>
<th>Attachment Relationship</th>
<th>Self-Regulation</th>
<th>Initiative</th>
<th>Behavioral Concerns</th>
<th>Total Protective Factors</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>F = 2.818**</td>
<td>F = 1.836*</td>
<td>F = 1.920*</td>
<td>F = 1.109</td>
<td>F = 1.932*</td>
</tr>
<tr>
<td></td>
<td>M(SD)</td>
<td>M(SD)</td>
<td>M(SD)</td>
<td>M(SD)</td>
<td>M(SD)</td>
</tr>
<tr>
<td>Photo &amp; Video</td>
<td>50.14 (13.728)</td>
<td>50.85 (10.383)</td>
<td>51.57 (9.829)</td>
<td>49.57 (11.573)</td>
<td>50.85 (10.899)</td>
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<tr>
<td>n=7</td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Productivity</td>
<td>35.05 (9.528)</td>
<td>44.00 (9.147)</td>
<td>39.00 (9.481)</td>
<td>53.05 (9.752)</td>
<td>35.85 (11.581)</td>
</tr>
<tr>
<td>n=20</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reading</td>
<td>40.50 (6.363)</td>
<td>46.00 (16.970)</td>
<td>40.00 (11.313)</td>
<td>48.00 (14.142)</td>
<td>41.00 (12.727)</td>
</tr>
<tr>
<td>n=2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Shopping</td>
<td>34.50 (13.000)</td>
<td>42.50 (7.000)</td>
<td>36.25 (2.362)</td>
<td>53.00 (5.773)</td>
<td>36.50 (7.141)</td>
</tr>
<tr>
<td>n=4</td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Social Networking</td>
<td>37.56 (11.110)</td>
<td>43.512 (8.355)</td>
<td>38.26 (11.193)</td>
<td>55.07 (9.127)</td>
<td>37.70 (10.893)</td>
</tr>
<tr>
<td>n=41</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sports</td>
<td>30.25 (3.862)</td>
<td>40.00 (5.887)</td>
<td>31.25 (2.127)</td>
<td>60.25 (6.344)</td>
<td>32.00 (2.160)</td>
</tr>
<tr>
<td>n=4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Weather</td>
<td>41.00 (18.384)</td>
<td>46.00 (0.000)</td>
<td>46.50 (12.020)</td>
<td>50.00 (2.828)</td>
<td>44.00 (11.313)</td>
</tr>
<tr>
<td>n=2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* p < .05; ** p < .001

When analyzing the results of the MANOVA, Box’s M was significant \( F[105] = 2.962, p < .001 \), and so a more conservative measure, Pillai’s Trace, was used to determine MANOVA significance which showed significant differences between the scores on the eDECA-P2 and the different categories of use \( F[95] = 1.664, p = .001 \). There were also differences among the indices scores and categories of use, specifically Attachment Relationship \( F[19] = 2.818, p < .001 \), Self-Regulation \( F[19] = 1.836, p = .022 \), Initiative \( F[19] = 1.920, p = .015 \), and the Total Protective Factors composite \( F[19] = 1.932, p = .015 \) (see Table 4.14). The effect sizes for these relationships were small – Self-Regulation \( r = .172 \), Initiative \( r = .178 \), and Total Protective Factors \( r = .179 \) – with the effect size for Attachment/Relationships approaching moderate \( r = .242 \). These findings suggest that there are differences between a primary parent’s type of device usage and their child’s social-emotional skills.
index \( (F[19] = 1.109, p = .346) \) (see Table 4.14) suggesting that there was no relationship between the primary parent’s type of device use and their child’s behavioral concerns.

Table 4.14

\textit{Differences Between Primary Parent’s Categories of Use and Scores on the eDECA Indices and Composite}

<table>
<thead>
<tr>
<th>Index/Composite</th>
<th>F</th>
<th>df</th>
<th>Sig.</th>
<th>Partial Eta Squared</th>
</tr>
</thead>
<tbody>
<tr>
<td>Attachment/Relationship</td>
<td>2.818**</td>
<td>19</td>
<td>&lt; .001</td>
<td>0.242</td>
</tr>
<tr>
<td>Self-Regulation</td>
<td>1.836*</td>
<td>19</td>
<td>0.022</td>
<td>0.172</td>
</tr>
<tr>
<td>Initiative</td>
<td>1.920*</td>
<td>19</td>
<td>0.015</td>
<td>0.178</td>
</tr>
<tr>
<td>Total Protective Factors</td>
<td>1.932*</td>
<td>19</td>
<td>0.015</td>
<td>0.179</td>
</tr>
<tr>
<td>Behavioral Concerns</td>
<td>1.109</td>
<td>19</td>
<td>0.346</td>
<td>0.111</td>
</tr>
</tbody>
</table>

\* \( p < .05 \); ** \( p < .01 \)

Tests for homogeneity of variance suggest that equal variances can be assumed for the Initiative index \( (F[19] = 1.527, p = .082) \) and the Total Protective Factors composite \( (F[19] = 1.183, p = .278) \), but not for Attachment Relationships \( (F[19] = 1.953, p = .013) \) or Self-Regulation \( (F[19] = 3.290, p < .001) \) (see Table 4.15).

Table 4.15

\textit{Tests for Homogeneity of Variance Based on Means for Primary Parent Categories of Use and Score on the eDECA}

<table>
<thead>
<tr>
<th>Index/Composite</th>
<th>Levene Statistic</th>
<th>df</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Attachment/Relationship</td>
<td>1.953*</td>
<td>19</td>
<td>0.013</td>
</tr>
<tr>
<td>Self-Regulation</td>
<td>3.290**</td>
<td>19</td>
<td>&lt; .001</td>
</tr>
<tr>
<td>Initiative</td>
<td>1.527</td>
<td>19</td>
<td>0.082</td>
</tr>
<tr>
<td>Total Protective Factors</td>
<td>1.183</td>
<td>19</td>
<td>0.278</td>
</tr>
<tr>
<td>Behavioral Concerns</td>
<td>0.864</td>
<td>19</td>
<td>0.628</td>
</tr>
</tbody>
</table>

\* \( p < .05 \); ** \( p < .01 \)

Post-hoc LSD tests for the Total Protective Factors composite indicate that the significant differences between categories of use were generally founded upon differences between Books, Magazines, Photo & Video and other categories. Specifically, there were significant mean differences between Books and Entertainment \( (13.0806, p = .003) \), Health & Fitness \( (13.1000, p = .030) \), News
(13.8077, p = .005), Productivity (11.6500, p = .012), Social Networking (9.7927, p = .025), Sports (15.5000, p = .016); between Magazines and Entertainment (20.0806, p = .006), Games (16.5000, p = .029), Health & Fitness (20.1000, p = .016), News (20.8077, p = .006), Productivity (18.6500, p = .012), Shopping (18.000, p = .012), Social Networking (16.7927, p = .020), Sports (22.5000, p = .009); and between Photo & Video and AR apps (15.8571, p = .047), Entertainment (16.4378, p < .001), Games (12.8571, p = .006), Health & Fitness (16.4571, p = .005), Music (10.4481, p = .016), News (17.1648, p < .001), Productivity (15.0071, p < .001), Shopping (14.3571, p = .022), Social Networking (13.1498, p .001), and Sports (18.8571, p = .003). Additionally, there was a significant difference between the use of Music applications and Entertainment applications (5.9897, p = .031). These positive mean differences imply that parents who spent more time on applications within the Books, Magazines, and Photo & Video categories had children who scored higher within the Total Protective Factors Composite when compared to other applications (Entertainment, Health & Fitness, News, Productivity, Social Networking, Sports, Games, and Music), suggesting that those parents who used the Books, Magazines, and Photo & Video applications more frequently had children with better social emotional skills than those who did not. Additionally, primary parents who spent more time using Music applications compared to those who spent more time using Entertainment applications had children who showcased more social-emotional skills.

Post-hoc LSD tests within the Initiative index showed significant mean differences based out of categories similar to the Total Protective Factors composite – Books, Magazines, and Photo & Video with an additional significant mean difference between Music and Entertainment categories (6.9589, p = .017). Specifically there were significant mean differences between Books and Entertainment (12.8226, p = .006), Sports (15.2500, p = .024); significant mean differences between Magazines and AR Apps (21.5000, p = .040), Entertainment (25.8226, p < .001), Games (19.7857, p = .013), Health & Fitness (22.3000, p = .011), Music (18.8636, p = .015), Navigation (20.1667, p = .035), News (21.6538, p = .007), Productivity (20.5000, p = .009), Shopping (23.2500, p = .011), Social Networking (21.2317, p = .005), Sports (28.2500, p = .002); and significant mean differences between Photo & Video and

For the Attachment Relationships index and the Self-Regulation index, equal variances cannot be assumed, and post-hoc Dunnet’s T3 showed no significant differences between categories of use within the Attachment Relationship index; but it did show significant mean differences between categories of use within the Self-Regulation index. There were significant mean differences between AR Apps and Music (-14.1818, p = .003), Productivity (-11.0000, p = .030), Social Networking (-10.5122, p = .023); between Magazines and Entertainment (13.1935, p < .001), Productivity (10.0000, p = .015), Social Networking (10.4878, p < .001); and between Entertainment and Weather (-5.1935, p = .041). The negative mean differences suggest that the children of parents who spent more time on AR Apps when compared to Music, Productivity, and Social Networking applications and more time on Entertainment applications when compared to Weather applications scored lower within the Self-Regulation index or had fewer self-regulation skills. The positive mean differences suggest that the children of parents who spent more time on Magazines when compared to Entertainment, Productivity, and Social Networking scored higher within the Self-Regulation index suggesting that these children had more self-regulation skills.

In general, these results support the hypothesis that there is a negative relationship between increased parent time on social networking and entertainment applications and their child’s social and emotional development.

**Research Question 5**

Does the presence of older siblings play a moderating role in the use of smart devices and the social emotional development of the child?

To determine if the presence of an older sibling played a moderating role in the use of smart devices and the social emotional development of the child, the control variables of Primary Parent Education and Household Income were centered along with the predictor of Child Device Time in an effort to control for multicollinearity. The interaction term (cross-product) was created by multiplying the
sibling variable and the centered child-time-on-screens variable. Though the ANOVA (see Table 4.16) suggests that the full regression was significant for Total Protective Factors Composite ($F[5] = 10.612, p < .001$), Attachment Relationships ($F[5] = 8.172, p < .001$), Self-Regulation ($F[5] = 8.493, p < .001$), Initiative ($F[5] = 10.393, p < .001$) and Behavioral Concerns ($F[5] = 7.454, p < .001$), the interaction terms were not significant for Total Protective Factors ($t[5] = -.864, p = .390$), Attachment Relationships ($t[5] = -.495, p = .622$), Self-Regulation ($t[5] = .118, p = .906$), Initiative ($t[5] = -.943, p = .348$) or Behavioral Concerns ($t[5] = .335, p = .738$) (see Table 4.17). These findings suggest that the presence of an older sibling in the home does not significantly moderate the relationship between a child’s time on touch screen devices and their social emotional development scores. These findings do not support the hypothesis that the presence of an older sibling would moderate the relationship between the time a child spends on screens and the social emotional development.

Table 4.16
ANOVA Results Examining Moderating Effects of Siblings on the Relationship Between Child Time on Devices and Scores on the e-DECA P2

<table>
<thead>
<tr>
<th>Index/Composite</th>
<th>F</th>
<th>df</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Attachment Relationships</td>
<td>8.172**</td>
<td>5</td>
<td>&lt; .001</td>
</tr>
<tr>
<td>Self-Regulation</td>
<td>8.493**</td>
<td>5</td>
<td>&lt; .001</td>
</tr>
<tr>
<td>Initiative</td>
<td>10.393**</td>
<td>5</td>
<td>&lt; .001</td>
</tr>
<tr>
<td>Behavioral Concerns</td>
<td>7.454**</td>
<td>5</td>
<td>&lt; .001</td>
</tr>
<tr>
<td>Total Protective Factors</td>
<td>10.612**</td>
<td>5</td>
<td>&lt; .001</td>
</tr>
</tbody>
</table>

* $p < .05$; ** $p < .01$
Table 4.17
Regression Results of the Effect of the Interaction Term (Presence of Siblings and Centered Child Time on Screens) and Scores on the e-DECA P2

<table>
<thead>
<tr>
<th>Index/Composite</th>
<th>B</th>
<th>β</th>
<th>t</th>
<th>Sig.</th>
<th>Confidence Interval</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Upper</td>
</tr>
<tr>
<td>Attachment Relationships</td>
<td>-.011</td>
<td>-.138</td>
<td>-.495</td>
<td>.622</td>
<td>-.055</td>
</tr>
<tr>
<td>Self-Regulation</td>
<td>.003</td>
<td>.033</td>
<td>.118</td>
<td>.906</td>
<td>-.042</td>
</tr>
<tr>
<td>Initiative</td>
<td>-.021</td>
<td>-.251</td>
<td>-.943</td>
<td>.348</td>
<td>-.066</td>
</tr>
<tr>
<td>Behavioral Concerns</td>
<td>.008</td>
<td>.095</td>
<td>.335</td>
<td>.196</td>
<td>-.6.129</td>
</tr>
<tr>
<td>Total Protective Factors</td>
<td>-.018</td>
<td>-.229</td>
<td>-.864</td>
<td>.390</td>
<td>-.060</td>
</tr>
</tbody>
</table>

* p < .05; ** p < .01

Research Question 6

Does the gender of the parent play a moderating role in the use of smart devices (i.e. time spent by the mother or the father) and the social emotional development of the child?

To analyze the potential moderating role that the gender of the parent plays within the relationship between the time spent on screens and their child’s social and emotional development, a four-pronged approach was taken. The time a child spent on screens and their scores on the Total Protective Factors composite and Behavioral Concerns from the e-DECA was analyzed first with the gender of the primary parent and secondly with the gender of the secondary parent. Third, the relationship between the time the primary parent spent on screens and Total Protective Factors and Behavioral Concerns scores on e-DECA was looked at with the moderating role of the gender of the primary parent. Fourth, the relationship between the time the secondary parent spent on screens and Total Protective Factors and Behavioral Concerns scores on the e-DECA was looked at with the moderating role of the gender of the secondary parent. To address multicollinearity, the continuous control variables (income and education) were centered along with the predictor (child time spent on screens or parent time spent on screens).

Child Time and Primary Parent Gender

Regression results indicate that there is no moderating role of primary parental gender when examining the relationship between the time a child spent on the touchscreen devices and their Total Protective Factors composite scores ($t[5] = 1.055, p = .294$) (see Table 4.18); however, primary parent
gender does play a moderating role in the relationship between the time a child spent on screens and their scores on the Behavioral Concerns index (the index that does not load into the Total Protective Factors composite) ($t[5] = 2.140, \ p = .035$) (see Table 4.19). The unstandardized regression coefficient for the effect of gender is negative ($b = -3.094$), and with females coded as 0 and males coded as 1, this indicates that as the gender goes down (i.e. gets more “female”) the scores on the Behavioral Concerns index go up. The unstandardized regression coefficient for the interaction term (created as a cross product of center child time on screens primary parent gender) is positive ($b = .048$) which indicates that as screen time goes up, the effect of gender becomes more positive (male). Together these findings suggest that as a child’s time on screens increase, when the primary parent is male, this leads to faster increases in scores on the Behavioral Concerns index (i.e. more behavioral concerns) compared to female primary parents. Part correlation statistics indicate that this effect is small ($r = .186$).

Interestingly, when the interaction term is added to the regression model, the direct effect of a child’s time on touch screen devices is no longer significant (see Research Question 1). A child’s time on devices is strongly correlated with the interaction term ($r = .947$), which suggests that the interaction between primary parent gender and a child’s time on screens explains a larger amount of variance than a child’s time on screens alone. However, it should be noted that this model is not considered significant ($F[2] = 1.678, p = .193$) and only explains 1.5% of the variance.

Table 4.18
**Regression Analysis of Moderating Effect of Primary Parent Gender on the Relationship Between Child Time on Screens and the Total Protective Factors Composite**

<table>
<thead>
<tr>
<th>Variable</th>
<th>B</th>
<th>β</th>
<th>t</th>
<th>Sig.</th>
<th>Part</th>
</tr>
</thead>
<tbody>
<tr>
<td>Income (centered)</td>
<td>-.068</td>
<td>-.012</td>
<td>-.133</td>
<td>.894</td>
<td>-.011</td>
</tr>
<tr>
<td>Education (centered)</td>
<td>2.050</td>
<td>.320</td>
<td>3.523**</td>
<td>&lt; .001</td>
<td>.295</td>
</tr>
<tr>
<td>Child Screen Time (centered)</td>
<td>-.086</td>
<td>-.067</td>
<td>-2.858**</td>
<td>.005</td>
<td>-.239</td>
</tr>
<tr>
<td>Parent Gender</td>
<td>-1.219</td>
<td>-.067</td>
<td>-.777</td>
<td>.440</td>
<td>-.065</td>
</tr>
<tr>
<td>Child Time x Parent Gender</td>
<td>.021</td>
<td>.277</td>
<td>1.055</td>
<td>.294</td>
<td>.088</td>
</tr>
</tbody>
</table>

* $p < .05$; ** $p < .01$
Table 4.19
Regression Analysis of Moderating Effect of Primary Parent Gender on the Relationship Between Child Time on Screens and the Behavioral Concerns Index

<table>
<thead>
<tr>
<th>Variable</th>
<th>B</th>
<th>β</th>
<th>t</th>
<th>Sig.</th>
<th>Part</th>
</tr>
</thead>
<tbody>
<tr>
<td>Income (centered)</td>
<td>.220</td>
<td>.037</td>
<td>.381</td>
<td>.704</td>
<td>.033</td>
</tr>
<tr>
<td>Education (centered)</td>
<td>-.843</td>
<td>-.120</td>
<td>-1.276</td>
<td>.205</td>
<td>-.113</td>
</tr>
<tr>
<td>Child Screen Time (centered)</td>
<td>.000</td>
<td>.001</td>
<td>.004</td>
<td>.997</td>
<td>.000</td>
</tr>
<tr>
<td>Parent Gender</td>
<td>-3.094</td>
<td>-.156</td>
<td>-1.735</td>
<td>.086</td>
<td>-1.511</td>
</tr>
<tr>
<td>Child Time x Parent Gender</td>
<td>.048</td>
<td>.582</td>
<td>2.140</td>
<td>.035</td>
<td>.186</td>
</tr>
</tbody>
</table>

* p < .05; ** p < .01

Follow-up regression analyses separated primary parent gender to better understand the relationship between primary parent gender, child time on screens, and behavioral concerns (see Table 4.20). When the primary parent was female, there was a significant relationship between child time on screens and behavioral concerns (t[3] = 2.830, p = .007). The unstandardized coefficient for child time on screens was positive (.046), which suggests that as a child’s time on screens increases, behavioral concerns increase. The effect was small (r = .399) with results indicating that for every additional hour a child spent on screens, their behavioral concerns scores increased by .046 when the primary parent was female. When the primary parent was male, the relationship between child time on screens and behavioral concerns was also significant but to a higher degree than with female primary parents (t[3] = 5.952, p < .001). The effect was moderate (r = .649) with a positive unstandardized coefficient (.098) suggesting that as child time on screens increases, scores within the Behavioral Concerns index increase. For every additional hour a child spent on screens, their behavioral concerns scores increased by 5.88 points when the primary parent was male.
Table 4.20
Regression Analysis of the Relationship Between Child Time on Screens and Behavioral Concerns Separated by Primary Parent Gender

<table>
<thead>
<tr>
<th>Primary Parent Gender</th>
<th>Variable</th>
<th>B</th>
<th>β</th>
<th>t</th>
<th>Sig.</th>
<th>Part</th>
</tr>
</thead>
<tbody>
<tr>
<td>Female n = 45</td>
<td>Income</td>
<td>-.163</td>
<td>-.031</td>
<td>-.186</td>
<td>.853</td>
<td>-.026</td>
</tr>
<tr>
<td></td>
<td>Education</td>
<td>-.513</td>
<td>-.070</td>
<td>-.434</td>
<td>.667</td>
<td>-.061</td>
</tr>
<tr>
<td></td>
<td>Child Screen Time</td>
<td>.046</td>
<td>.411</td>
<td>2.830</td>
<td>.007**</td>
<td>.399</td>
</tr>
<tr>
<td>Male n = 48</td>
<td>Income</td>
<td>.612</td>
<td>.090</td>
<td>.768</td>
<td>.447</td>
<td>.084</td>
</tr>
<tr>
<td></td>
<td>Education</td>
<td>-.997</td>
<td>-.146</td>
<td>-1.277</td>
<td>.208</td>
<td>-.139</td>
</tr>
<tr>
<td></td>
<td>Child Screen Time</td>
<td>.098</td>
<td>.678</td>
<td>5.952</td>
<td>&lt;.001**</td>
<td>.649</td>
</tr>
</tbody>
</table>

*p < .05; **p < .01

Together these results suggest that while there is a significant relationship between the time a child spends on screens and their behavioral concern scores despite the gender of the primary parent, when the primary parent is male, the behavioral concerns scores increased faster.

**Child Time and Secondary Parent Gender**

Regression results indicate that there is no moderating effect of the gender of the secondary parent on neither the relationship between the time a child spends on screens and their scores on the Total Protective Factors composite as demonstrated by examining the interaction term (the cross product of secondary gender and centered child time on screen) ($t[5] = -1.256$, p = .214) (see Table 4.21) nor on the relationship between the time a child spends on screens and their scores on the Behavioral Concerns index as indicated by the interaction term ($t[5] = -.866$, p = .389) (see Table 4.22).
Table 4.21
Regression Analysis of Moderating Effect of Secondary Parent Gender on the Relationship Between Child Time on Screens and the Total Protective Factors Composite

<table>
<thead>
<tr>
<th>Variable</th>
<th>B</th>
<th>β</th>
<th>t</th>
<th>Sig.</th>
<th>Part</th>
</tr>
</thead>
<tbody>
<tr>
<td>Income (centered)</td>
<td>.314</td>
<td>.054</td>
<td>.505</td>
<td>.615</td>
<td>.049</td>
</tr>
<tr>
<td>Education (centered)</td>
<td>2.036</td>
<td>.258</td>
<td>2.535*</td>
<td>.014</td>
<td>.246</td>
</tr>
<tr>
<td>Child Screen Time (centered)</td>
<td>.001</td>
<td>.008</td>
<td>.020</td>
<td>.984</td>
<td>.171</td>
</tr>
<tr>
<td>Parent Gender</td>
<td>3.263</td>
<td>.175</td>
<td>1.762</td>
<td>.083</td>
<td>.002</td>
</tr>
<tr>
<td>Child Time x Parent Gender</td>
<td>-.030</td>
<td>-.456</td>
<td>-1.256</td>
<td>.214</td>
<td>-.122</td>
</tr>
</tbody>
</table>

* p < .05; ** p < .01

Table 4.22
Regression Analysis of Moderating Effect of Secondary Parent Gender on the Relationship Between Child Time on Screens and the Behavioral Concerns Index

<table>
<thead>
<tr>
<th>Variable</th>
<th>B</th>
<th>β</th>
<th>t</th>
<th>Sig.</th>
<th>Part</th>
</tr>
</thead>
<tbody>
<tr>
<td>Income (centered)</td>
<td>.314</td>
<td>.050</td>
<td>.456</td>
<td>.650</td>
<td>.045</td>
</tr>
<tr>
<td>Education (centered)</td>
<td>-2.259</td>
<td>-.264</td>
<td>-2.544*</td>
<td>.013</td>
<td>-.251</td>
</tr>
<tr>
<td>Child Screen Time (centered)</td>
<td>.103</td>
<td>.831</td>
<td>2.216*</td>
<td>.030</td>
<td>.040</td>
</tr>
<tr>
<td>Parent Gender</td>
<td>.824</td>
<td>.041</td>
<td>.402</td>
<td>.689</td>
<td>.218</td>
</tr>
<tr>
<td>Child Time x Parent Gender</td>
<td>-.023</td>
<td>-.320</td>
<td>-.866</td>
<td>.389</td>
<td>-.085</td>
</tr>
</tbody>
</table>

* p < .05; ** p < .01

Primary Parent Time and Primary Parent Gender

Regression results indicate that there was no significant moderating effect of the primary parent gender on the relationship between the time the primary parent spends on screens and their child’s scores on the Total Protective Factors composite as determined by examining the interaction term (the cross product of centered primary parent time on screens and primary parent gender) ($t[5] = .649$, $p = .520$) (see Table 4.23). However, there was a significant moderating effect of the primary parent’s gender on the relationship between the time the primary parent spends on screens and their child’s scores on the Behavioral Concerns index as indicated by examining the interaction term ($t[5] = 2.207$, $p = .049$) (see Table 4.24) though the overall model is not significant ($F[2] = .315$, $p = .731$).
Table 4.23
Regression Analysis of Moderating Effect of Primary Parent Gender on the Relationship Between Primary Parent Time on Screens and the Total Protective Factors Composite

<table>
<thead>
<tr>
<th>Variable</th>
<th>B</th>
<th>( \beta )</th>
<th>t</th>
<th>Sig.</th>
<th>Part</th>
</tr>
</thead>
<tbody>
<tr>
<td>Income (centered)</td>
<td>.798</td>
<td>.140</td>
<td>.987</td>
<td>.330</td>
<td>.132</td>
</tr>
<tr>
<td>Education (centered)</td>
<td>3.086</td>
<td>.399</td>
<td>2.683*</td>
<td>.011</td>
<td>.359</td>
</tr>
<tr>
<td>Parent Screen Time (centered)</td>
<td>-0.045</td>
<td>-0.450</td>
<td>-0.968</td>
<td>.339</td>
<td>-0.129</td>
</tr>
<tr>
<td>Parent Gender</td>
<td>-5.401</td>
<td>-0.257</td>
<td>-1.894</td>
<td>.066</td>
<td>-0.253</td>
</tr>
<tr>
<td>Child Time x Parent Gender</td>
<td>.025</td>
<td>.297</td>
<td>.649</td>
<td>.520</td>
<td>.087</td>
</tr>
</tbody>
</table>

* \( p < .05; ** p < .01 \)

Table 4.24
Regression Analysis of Moderating Effect of Primary Parent Gender on the Relationship Between Primary Parent Time on Screens and the Behavioral Concerns Index

<table>
<thead>
<tr>
<th>Variable</th>
<th>B</th>
<th>( \beta )</th>
<th>t</th>
<th>Sig.</th>
<th>Part</th>
</tr>
</thead>
<tbody>
<tr>
<td>Income (centered)</td>
<td>-.357</td>
<td>-.067</td>
<td>-.456</td>
<td>.651</td>
<td>-.063</td>
</tr>
<tr>
<td>Education (centered)</td>
<td>-1.286</td>
<td>-.177</td>
<td>-1.153</td>
<td>.256</td>
<td>-.159</td>
</tr>
<tr>
<td>Parent Screen Time (centered)</td>
<td>-.049</td>
<td>-.512</td>
<td>-1.069</td>
<td>.292</td>
<td>-.147</td>
</tr>
<tr>
<td>Parent Gender</td>
<td>3.210</td>
<td>.162</td>
<td>1.162</td>
<td>.252</td>
<td>-.160</td>
</tr>
<tr>
<td>Child Time x Parent Gender</td>
<td>.075</td>
<td>.957</td>
<td>2.027*</td>
<td>.049</td>
<td>-.27</td>
</tr>
</tbody>
</table>

* \( p < .05; ** p < .01 \)

The unstandardized regression coefficient of gender is positive \( (b = 3.210) \), and with females coded as 0 and males coded as 1, this indicates that as the gender goes up (i.e. gets more “male”) the scores on the Behavioral Concerns index go up. The unstandardized regression coefficient for the time a parent spends on screens is negative \( (b = -0.045) \), which indicates that as parent time on screens goes up, scores on the Behavioral Concerns go down. The unstandardized regression coefficient for the interaction term is positive \( (b = 0.075) \), which indicates that as screen time goes up, the effect of gender becomes more positive (male). Together these findings suggest that as a primary parent’s time on screens increases, when the primary parent is male, this leads to faster increases in scores on the Behavioral Concerns index (i.e. more behavioral concerns) than when compared to female primary parents. Part correlation statistics indicate that this effect is a small one \( (r = .279) \).
It should be of note that using this model, neither the time the primary parent spends on screens nor the gender of the parent significantly impacted scores on the Behavioral Concerns index, but the interaction term is significant. This suggests that the interaction between gender of the primary parent and the time spent on screens explains more of the variance than either of those predictors alone, and even though the time on screens may not be significant and the model is not significant, it may be helpful for painting a broader picture of how gender and time on screens effects a child’s social and emotional development.

Follow up regression analyses were completed to better highlight the relationship between primary parent gender, primary parent time on screens, and their child’s behavioral concerns (see Table 4.25). When the primary parent was female, there was a significant relationship between the time a primary parent spends on screens on their child’s scores within the behavioral concerns index ($t[3] = 2.375, p = .028$). The unstandardized coefficient for parent time on screens was positive (.042), suggesting that as parent time on screens increases, behavioral concerns increase. This effect was approaching moderate ($r = .463$), and for every additional hour of time a female primary parent spent on screens, their child’s behavioral scores increased by 2.52 points. When the primary parent was male, the relationship between the time the primary parent spent on screens and their child’s behavioral concern scores was also significant ($t[3] = 2.974, p < .001$). The unstandardized coefficient for parent screen time was again positive (.099), indicating that as parent time on screens increases, behavioral concerns scores increase. This (male primary parent) effect was stronger than the female parent effect ($r = .649$), and indicated that for each additional hour a male primary parent spent on screens, their child’s behavioral concern scores increased by 5.94 points.
Table 4.25
Regression Analysis of the Relationship Between Primary Parent Time on Screens and Behavioral Concerns Separated by Primary Parent Gender

<table>
<thead>
<tr>
<th>Primary Parent Gender</th>
<th>Variable</th>
<th>B</th>
<th>$\beta$</th>
<th>t</th>
<th>Sig.</th>
<th>Part</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Female</strong></td>
<td>Income</td>
<td>.888</td>
<td>.185</td>
<td>.745</td>
<td>.465</td>
<td>.145</td>
</tr>
<tr>
<td>n = 23</td>
<td>Education</td>
<td>-4.316</td>
<td>-.572</td>
<td>-2.121</td>
<td>.047</td>
<td>-.413</td>
</tr>
<tr>
<td>Parent Screen Time</td>
<td>.042</td>
<td>.572</td>
<td>2.375</td>
<td>.028*</td>
<td>.463</td>
<td></td>
</tr>
<tr>
<td><strong>Male</strong></td>
<td>Income</td>
<td>-.601</td>
<td>-.100</td>
<td>-.510</td>
<td>.616</td>
<td>.084</td>
</tr>
<tr>
<td>n = 22</td>
<td>Education</td>
<td>.040</td>
<td>.006</td>
<td>.030</td>
<td>.977</td>
<td>-.139</td>
</tr>
<tr>
<td>Parent Screen Time</td>
<td>.099</td>
<td>.590</td>
<td>2.974</td>
<td>.008**</td>
<td>.649</td>
<td></td>
</tr>
</tbody>
</table>

* $p < .05$; ** $p < .01$

Together, these results suggest that although the relationship between primary parent time on screens and their child’s behavioral concerns scores were significant despite primary parental gender, when the primary parent was male, as primary parent time on screens increased, their child’s behavioral concerns scores increased faster than when compared to females.

Secondary Parent Time and Secondary Parent Gender

Finally, regression analysis results indicate that there was no significant moderating effect of the gender of the secondary parent and the relationship between the time a secondary parent spends on screens and a child’s scores on either the Total Protective Factors composite as indicated by examining the interaction term (the cross product of centered secondary parent time on screens and secondary parent gender) ($t[5] = 1.082, p = .307$) (see Table 4.26) or the Behavioral Concerns index ($t[5] = .146, p = .887$) (see Table 4.27).
These results do not support the hypothesis that it is a mother’s time on screens or the mother herself that moderated the relationship between the time either a parent or a child spends on screens and a child’s social emotional development. These results indicate that when a father is the primary parent, as the child’s time on screens increases, their social emotional development decreases at a faster rate when compared to having a mother as a primary parent. Secondly, as the father’s time spent on screens increases (when he is the primary parent) this also causes a faster decrease in their child’s social emotional development though both of these effects would need to be further analyzed because neither of the models were significant.
CHAPTER 5: DISCUSSION

This study sought to better understand the relationship between parent and child time on touch screen devices and the social emotional development of children, specifically focusing on preschool-aged children (aged 4-5 years old). Current literature has examined the effects of child television watching and their social emotional development (Kildare & Middlemiss, 2017) and parent time on hand-held mobile devices and their child’s social emotional development (Radesky, et al., 2009). Further studies have looked at the relationship between social media usage and adolescents (İşiklar, Şar, & Durmuşcelebi, 2013; Lee & Lee, 2017); however, this study is unique in that it gathers touchscreen time usage rates for both child and parent while examining the social emotional development of the preschool-aged child during a time when the foundations for social emotional development are being created (Fischer, Shaver, & Carnochan, 1990; Halfon, Shulman, & Hochstein, 2001; Kennedy & Kennedy, 2004). In general, this study aligns with the extant literature as it revealed a negative relationship between technology and the social emotional development of the child (Anderson, et al., 2001; Castro & Hewlett, 1991; Cai, 2019; Haughton, Aiken, & Cheevers, 2015; Linebarger & Walker, 2005; Radesky, et al., 2009). Specifically, it found negative relationships between the time spent on touch screen devices by both the parent and the child and the child’s social and emotional development though these relationships were varied.

The Impact of the COVID Pandemic

Given the current nature of the COVID pandemic during which these survey responses were taken, it is important to acknowledge the changes in lifestyle that may be affecting the results. To measure social and emotional development, parents were asked to look back at the previous two weeks when completing the survey, two weeks which were taking place during lockdowns, or stay-at-home orders, or quarantine, or simply during “pandemic living”. As a result, it is plausible that children were spending more time on screens than before the pandemic and that tensions and anxieties may have been elevated within home settings. It could be argued that these findings may capture a brief moment in time and so could be more representative of a pandemic lifestyle as opposed to general living; however, as a
result of the pandemic, schools, vocations, and leisure activities have become increasingly more virtual, and so understanding the impact that screens can have on children is of the utmost importance. By harnessing the increased time indoors and therefore on screens, a more thorough understanding of how screens relate to the social emotional development of children can be captured. Although it resulted in quarantine, stay-at-home orders, and school closures, the COVID pandemic created a helpful platform from which to analyze the relationship between screen time and development. Despite this benefit, the pandemic brings a myriad of extraneous stressors (joblessness, anxiety, financial hardships, food insecurity, etc.) that could be affecting the relationship between screen time usage and the social emotional development of young children. In light of these interconnected factors, it will be important to consider these stressors when discussing the relationships found between screen time and social emotional development.

**Child Time on Screens**

This study found a negative relationship between the time a child spends on screens and their social emotional development. As a child spends more time on screens, their scores within the protective factors indices and composites decrease and their behavioral concerns scores increase. These findings support the hypothesis that screens can potentially act as a disruptor to attachment and the development of self-regulation and initiative (Block 1 processes in the neurodevelopmental model) which then potentially lead to the manifestation of increased inappropriate behaviors as demonstrated by the positive association between child time on screens and scores on the Behavioral Index. The current research on the effects of touchscreen technology on the social emotional development of young children is sparse (Herodotou, 2018). and this study remains unique in its examination of touchscreen use and the emotional development of young children. However, these results align with the general idea that screen time has an adverse effect on a child’s psychological and physiological development (Cheung, Bedford, De Urabain, Karmiloff-Smith, & Smith, 2017; Lin, et al., 2020; Lissak, 2018). Further exploration into the current literature and implications are discussed below.
Relationships among children’s categorical usage of touchscreens were also examined, and overall, there were differences among categories of use and scores within the Total Protective Factors composite which suggests that in terms of a child’s social emotional development, how they are using touch screen devices makes a difference. Analysis of categories of use and the Self-Regulation index scores were able to show that children who used more tool-based applications such as Photo & Video applications scored higher within the Self-Regulation index than children who used entertainment or social networking applications. These findings suggest that children who use their device more as a tool (or perhaps do not have access to social networking or entertainment applications) have stronger self-regulation skills than their peers who use their devices for entertainment and games. Additionally, children who used AR applications scored lower within the Self-Regulation index when compared to a variety of applications including books, education, entertainments, music, navigation, photos, and social networking, suggesting that their self-regulation skills are impaired in comparison to children who spend less time using AR applications.

There is very limited literature that examines the differential effects that various categories of screen usage can have on a child’s social emotional development, but there is some evidence that suggests that education-based applications on touchscreens led to increased levels of delayed gratification and better working memory skills when compared to cartoon or educational television show viewing (Huber, Yeates, Meyer, Fleckhammer, & Kaufman, 2018). This could imply that interactive, educational applications are less of a disruptor to neurological development than the passive media applications that appear in entertainment categories. However, the current study did not find significant differences between educational or book-based applications when compared to entertainment-based applications.

While these findings support the hypothesis that children who use their device as a tool (or who do not have access to entertainment, social networking, or games on their devices) showed more appropriate expressions of social emotional development, they do not necessarily agree or disagree with the current literature, indicating that further research would need to be conducted to better understand these relationships.
Conclusions and Implications

One of the main implications from this area of the current research is the finding that the amount of time a child spends on screens is negatively related to their social and emotional development. This relationship fits with the current literature that indicates that a child needs direct social interaction to develop appropriate social and emotional development skills and that technology can act as a disruptor of child social emotional development (Cai, 2019; Haughton, Aiken & Cheevers, 2015; Sethre-Hofstad, Stansbury, & Rice, 2002). Given that the relationships between a child’s time on screens and all areas of social emotional development (attachment/relationships, self-regulation, and initiative) were negative and the relationship between a child’s time on screens and behavioral concerns was positive, it is possible that a child’s time on screens could detract from their ability to interact with other people. Social interaction is a vital component of a variety of lower level developmental processing including language, affect identification and recognition, attachment, and attunement (Fischer, Shaver, & Carnochan, 1990; Kuhl, et al., 2003), and as these children spend more time on screens, they are afforded less time with peers and adults, and their social emotional development may be suffering as a result of this discrepancy.

Through the lens of the Lurian model, if the social interactions necessary for brain growth are not being provided to the child, then it is possible that the complicated process of myelination and dendritic pruning may not be completed efficiently (Beaumont, 2008). These experience-dependent processes are potentially being interrupted by touchscreen devices, and although the brain is plastic, such stunted brain development may lead to challenges in school, relationships, and self-regulation given that the lower level processes necessary for appropriate social emotional development are not being fulfilled (Feldman, 2015; Lévesque, et al., 2004; Fletcher-Janzen, 2017).

An interesting find was that the time spent using AR applications was associated with fewer self-regulation protective factors than children who used most other types of applications. Augmented Reality is a broad category and can encompass games, entertainment, education, video, and productivity applications and more. Given that AR Apps encompass a wide variety of applications, the association between AR Apps and self-regulation may be indicative of general time spent on screens as opposed to
this type of category specifically which would be congruent with general screen time findings from this study. Affect-regulation is a higher level social emotional skill in the neurodevelopmental model (Fletcher-Janzen, 2017), and given that there were no significant differences between categories and scores on Attachment/Relationships (a lower level process necessary for the development of self-regulation), it could be implied that these results indicate an increase in screen time as the child gets older, or makes an argument for the ability of screens to disrupt the course of self-regulatory development. However, children who spent more time on photo and video applications and other tool-based applications exhibited more protective social emotional factors than children who spent more time using games, social networking or entertainment applications, which bolsters the idea that non-tool-based use may also act as an interrupter of social emotional development. Together, these findings imply that when touchscreens are used for gaming and entertainment they have a more powerful interrupting effect on social emotional development than they do when they are used as tools. As stated previously, this study is unique in regards to its exploration of a child’s categorical use of touchscreens, and so there is minimal research to which to compare these findings aside from research that compares cartoon and educational television watching to touchscreen educational application usage in which they found educational applications to be associated with higher levels of executive functioning (skills that are necessary for building appropriate regulatory development) in young children (Huber, Yeates, Meyer, Fleckhammer, & Kaufman, 2018) which is congruent with the findings here.

It is difficult to determine causality from this study, but it is possible that screens and non-tool-based applications may act as a disruptor of the social interaction necessary for children to progress through the stages of social development. If the social emotional development of children is disrupted during the early stages of attachment and attunement, it can be difficult for them to develop the self-regulation needed to exhibit control over inappropriate externalizing behaviors, the same types of inappropriate behaviors that were elevated in the children who spent more time on screens.

However, this study was cross-sectional and captured a moment in time which makes it difficult to understand the effects of screen time starting before the age of four and whether exposure to screens
leads to a cascading effect or becomes a disruptor of previously appropriate development. Given that the Attachment/Relationships index was negatively impacted by time on screens and according to the neurodevelopmental model, attachment is the foundation for social emotional development, it could be implied that these children had been exposed to screens from early on in development, but these conjectures are beyond the capacity of this study.

It is also necessary to examine the potential impact that the COVID pandemic may be having not only on the amount of time children are spending on touchscreen devices, but the added stress that may be contributing to poor social emotional development. As outlined in the neurodevelopmental model (Fletcher-Janzen, 2017) and notated within social learning theory (Bandura, 1961; Fernyhough, 2010), appropriate social modeling and interaction is a necessary component in the development of healthy regulation and relationship skills. The added stress induced by the COVID pandemic may be mediating the relationship between screen time usage and child development. Stressed parents may encourage their children to spend more time on screens or may not have the mental capacity to reduce a child’s time on screens which could lead to more uninterrupted, unsupervised, and non-tool-based screen time for their children. The added stress may also be affecting the quality of their parenting and as a result they may not be modeling or teaching appropriate regulation or relationship skills which could be affecting the child’s social emotional development.

Further information would need to be gathered to understand causality and whether children with high levels of social emotional development have less access to non-tool-based applications or if children who choose non-tool-based applications are more likely to manifest inappropriate social emotional development or whether extraneous stress from the COVID pandemic may be influencing these results.

**Parent Time on Screens**

Screen time for both the primary and secondary parents were analyzed separately to better understand the relationship between parent time on screens and the social emotional development of their child. Interestingly, there was a difference between the impact that the time a primary parent spends on the screens and the time a secondary parent spends on screens. While there was no relationship between
primary parent screen time and protective factors, the more time a primary parent spent on screens, the more behavioral concerns were exhibited by their children. This supports research that found that parents respond more harshly to their children when they are absorbed with their screens because of missed cues given by their children that indicate that the child’s behavior may be escalating (Radesky, et al., 2009). This could imply that the parents who spent more time on screens may have rated their children more harshly because their child’s problem behaviors were either more memorable or that their children’s behavior may escalate more quickly because they have been reinforced to do so by an inattentive parent.

The presence of increased behavioral concerns is also supported by literature that suggests that when children are left alone in their anger, they are less likely to be able to name their anger (Cole, Dennis, Smith-Simon, & Cohen, 2009) which then makes it more difficult for them to get the help they need to learn how to self-regulate (Schore, 2001). With the screen as a distractor, vital language and social interactions could be minimized which may be manifesting in these increased behavioral concerns. Touchscreens may also be interrupting or affecting the attachment relationship between the primary parent and the child, creating less than secure attachment relationships and leading to poor social emotional development.

Interestingly, the time a secondary parent spent on screens appeared to positively affect the development of protective factors but not behavioral concerns. However, when looking at the specific indices that load into the total protective factors, only the relationship between Attachment/Relationships index and the time a secondary parent spent on screens was significant. These findings indicate that as a secondary parent’s time on screens increases, the quality of their children’s relationship skills increase. Though this particular phenomenon has not been examined, the general finding that a potentially distracted parent encourages the development of their child’s social emotional skills is incongruent with current literature which states that parent-child interactions suffer when parents disengage from their children and are distracted by technology (Kildare & Middlemiss, 2017; McDaniel, 2019).

There were significant differences between parental categories of use and the protective factors associated with their child’s social and emotional development, but not with their child’s behavioral
concerns. When examining the relationship between parental categories of use and the measured protective factors as a composite, parents who spent more time using books, magazines, or photo and video had children who exhibited more protective factors than parents who spent more time using entertainment, social networking, shopping, augmented reality, music, and sports applications. However, parents who spent more time using applications within some of the tool-based categories like productivity, news, and health and fitness had children who showed fewer protective factors when compared to the children of parents who used applications within the books, magazines, and photo and video categories. Categorical usage has not been examined on the literature, but these findings support general findings that suggest that a technology absorbed, distracted parent will have fewer meaningful interactions with their children and their children’s emotional development may suffer (Kildare & Middlemiss, 2017, McDaniel, 2019).

In general, these findings suggest that there is a difference between how parents use their phone and their child’s social emotional development, but these results did not support the hypothesis that there would only be differences between tool-based and non-tool-based categories of use.

**Conclusions and Implications**

These findings are especially interesting because the data showed that the time a primary parent spends on screens is not associated with protective factors, only behavioral concerns. *When* devices were being used was not collected as part of this research; therefore, it is possible that parents may be spending time on the screens in the evenings when their children are already in bed or during times when their children are not around. This makes it possible for parents to be spending enough time with their children to develop some protective factors, but also spending enough time on screens to miss or misread escalating behavior cues from their children (Radesky, 2009). However, the fact that the child’s behavioral concerns increase when a primary parent’s time on screens increases, but the total protective factors are not affected, imply there is a complicated relationship between the time a parent spends on screens and their child’s development.
To further complicate the findings, the time a secondary parent spends on screens is positively associated with total protective factors but not at all with behavioral concerns. This speaks to the complicated nature of technology and parenting. There are several different factors that could be at play here including a lack of relationship between the secondary parent and the child, whether the secondary parent is sharing the device with the child and practicing reciprocity, or even when the secondary parent is spending their time on screens. It could be that the secondary parent is using the screen as a leisure device after the child is in bed or while the child is at school and the more time the parent spends on screens is indicative of self-care which can create a less stressed parent (Chaplin et al., 2018). As discussed with the primary parent, when the device is being used is unknown. The secondary parent may be using their screens at work and as time at work increases, perhaps finances increase as well which again, could lessen the stress a parent feels and therefore increase their confidence in their parenting and the quality of the parent-child relationship.

The lack of relationship between the secondary parent and a child’s behavioral concerns could imply that the primary parent is the main disciplinarian and so therefore, the primary parent may be more aware of their child’s externalizing behaviors or the primary parent may simply view the child more negatively than the secondary parent. These findings are supportive of recent literature that suggests that working parents (i.e. secondary parents) are less likely to be aware of the social emotional needs of their children (Snyder, Rech, Masuda, & Dinkel, 2021) and so may be less in tune with the behavioral concerns of their child which may affect how they rated their children within this study. Ultimately, touchscreens may be inhibiting different aspects of parenting, both for primary and secondary parents, in a complicated, but measurable way.

When examining how a parent uses their screens, the categories of use are associated with the development of all protective factors but not with behavioral concerns. Parents who spent more time using their devices to read books or magazines or used more photo and video applications rated their child’s social emotional development as more appropriate than parents who spent more time using entertainment, music, games, or social networking applications. These findings could imply that the
entertainment and social networking applications result in a technology-absorbed parent, and so even though the time on screens did not play a role, a parent who is deeply absorbed with their device by way of highly interactive games or social networking, may not be as in tune with their child even though their time on screens was comparable to other users. The literature supports these findings (Kildare & Middlemiss, 2017; Radesky, 2009) having found that mobile devices can be a source of distraction for parents and detract from the parent-child relationship. These missed interactions could imply that a parent is poorly attuned to their child, and strong attunement is foundational to appropriate social emotional development (Sethre-Hofstad, Stansbury, & Rice, 2002). Poor attunement can result in insecure attachment styles which could impede a child’s social emotional development (Sethre-Hofstad, Stansbury, & Rice, 2002) and lead to the types of child behavioral ratings provided by the entertainment and social media users within this study. Books, magazines, and photo and video applications do not require active participation from the parent in comparison to games or social networking, and this active participation with their screens could be captivating the parent’s attention and dulling their attunement to their child.

The difference between parent and child screen time usage is unexpected and interesting. Touchscreen usage by the child appears to have a stronger effect than touchscreen usage by the parent, especially considering the fact that social emotional skills increased when a secondary parent’s time on screens increased. Parents may be more adept at multitasking or may be using screens for work or after their children are asleep and so it may not be simply how much they use their touchscreens that affects the parent-child relationship. The categories of use studied presently would be a better platform to understand the effects of touchscreen devices given that there were differences between how parents used their screens and the development of their children. Parents who used applications that required more attention and could be highly absorbing (games, entertainment, social media) reported their children to have fewer social emotional skills.

On the other hand, any amount of time a child spends on screens is less of an opportunity to engage in the social interaction necessary to develop the skills needed to progress up through the blocks
of neurodevelopmental learning (Fletcher-Janzen, 2017). This gives further support that screens can interrupt the typical trajectory for social emotional development as more time on screens equates to fewer social interactions, less opportunities to practice language, less time to reinforce the parent-child relationship, and fewer opportunities for parents to model appropriate social behaviors and emotional regulation.

As discussed with child time on screens, the effects of the COVID pandemic need to be addressed. The pandemic has ensured that parents are under increasing amounts stress and anxiety from joblessness, loss of childcare, stay-at-home learning, financial uncertainty, and the strain of living through a global crisis (Chung, Lanier, & Wong, 2020). These stressors may be affecting the quality of their parent-child interactions as well as their perceptions of their children’s behavior. The uncertain environment in which they have been living, exacerbated by pandemic-induced anxiety and depression, may lead parents to view their children more negatively which could be affecting the behavioral ratings of their children. The quarantine-style living conditions may also be encouraging more time on screens, and parents may be attempting to stay connected to friends, family, and society at large through the use of touchscreen technology, increasing a parent’s reliance on social media and entertainment applications. The COVID pandemic may be influencing the results of this study, but given its extended nature and the resulting vocational and educational reliance on touch screen technology, the presence of the pandemic does not necessarily detract from the conclusion that increased parental screen time can lead to the inappropriate social emotional development of their children.

**The Presence of Siblings**

Older siblings can provide social interaction and language exposure (Brody, 2004), and so for the purposes of this study, it was theorized that the presence of older siblings would moderate the social emotional development of their younger siblings and lessen the effect that time on screens has on a child’s social emotional development given the research that supports the protective nature of older siblings (Gass, Jenkins, & Dunn, 2007).
However, the data showed that the presence of an older sibling in the home did not moderate the relationship between the time a child spends on screens and their social emotional development. While research has not yet looked specifically at the relationship between older siblings and their younger sibling’s social emotional development and screen time, these findings were incongruent with the current body of research that indicates that older siblings can play a protective role in the emotional and relational development of their younger siblings (Gass, Jenkins, & Dunn, 2007; Macks & Reeve, 2007).

Conclusions and Implications

The study showed that the presence of a sibling did not moderate the relationship between a child’s time on screens and their social emotional development. While the literature suggests that older siblings can be a protective factor against the development of internalizing symptoms regardless of the parent-child relationship (Gass, Jenkins, & Dunn, 2007), these findings do not confirm this idea. A possible explanation for this incongruency is that this study did not determine the screen time usage of the older sibling, so while an older sibling may be present, they may be just as distracted and technology-absorbed as their parents. Subsequently, the literature that supports the presence of older siblings as a protective factor in development is based upon typically developing children (Macks & Reeve, 2007), and the development of the siblings in this study is unknown. Given the results of this study, it is plausible that the older sibling is also susceptible to the effects of screen time on their social emotional development and therefore may not be present enough to play a role in the relationship between the target child’s time spent on screens and their social emotional development.

Additionally, this survey did not determine the quality of or age difference in the sibling relationship; current research suggests that the quality of the sibling relationship plays an important part of the social emotional development of the child (Yucel & Yuan, 2015). Without qualifying the quality of the sibling relationship, it is difficult to ascertain the true relationship between these siblings, a child’s time on screens, and their subsequent social emotional development. However, this study does indicate that the mere presence of an older sibling does not appear to moderate the relationship between screen time and a child’s social emotional development.
In light of COVID, older siblings may be stressed and expected to take on more responsibility as parents are being worn thin by the pandemic. With this added responsibility, isolation from peers, and virtual learning, older siblings may not be appropriate models of self-regulation under these COVID-specific circumstances. With parents at work and children learning from home, older siblings have been tasked with caring for their younger siblings and may be modeling their parent’s stressed and anxious behavior, and while they may not be hurting the social emotional development of their younger siblings, perhaps they are also no longer serving as a protective factor.

**Parental Gender**

This study showed that there are a few moderating relationships between screen time and a child’s social and emotional development. When the primary parent is male and a child’s time or the parent’s time on screens increases, the child’s behavioral concerns increase faster than when the primary parent is female. There were no moderating effects of the gender of the secondary parent and the relationship between the time a child or parent spends on the screens and the development of the child’s protective factors. These findings support the current body of research that indicates that it is the father’s emotional reciprocity that plays a stronger role in the emotional development of the child (Thomassin & Suveg, 2014).

There were no moderating effects of the gender of the secondary parent on the relationship between the time a child or secondary parent spends on screens and the social emotional development of the child which implies that males and females as secondary parents have equal effects on the development of their children. This is not supported by the literature which indicates that males and females interact differently with their children and have different levels of awareness of the children’s needs (Leaper, Anderson, & Sanders, 1998; Thomassin & Suveg, 2014; Zeman, Perry-Parrish, & Cassano, 2010).

Additionally, there is research that indicates that male caregivers are more strongly associated with sadness socialization and female caregivers are more strongly associated with anger (Zeman, Perry-Parrish, & Cassano, 2010). Sadness could be viewed as an internalizing construct and anger as an
externalizing construct. If so, the finding that males play a stronger role in behavioral concerns (or externalizing concerns) when compared to females would be in opposition to the finding that males are more strongly associated with internalizing symptoms.

**Conclusions and Implications**

The gender of the primary parent appeared to play a role in the relationship both between a child’s time on the screens and their social emotional development as well as in the relationship between the parent’s time on screens and their child’s social emotional development while the gender of the secondary parent did not. These results, which hail the father as having a stronger effect on the child, are congruent with studies that suggest that it is the father’s positive affect reciprocity that plays a stronger protective role in a child’s emotional regulation development (Thomassin & Suveg, 2014), and that a father’s tone plays a stronger role in their behavioral development (Leaper, Anderson, & Sanders, 1998). Coupled with findings from the current study, a variety of suggestions could be formulated as to the reason behind this moderating relationship. These findings could support the idea that females are better at multi-tasking and so are able to better juggle screen time with parenting; however, the research surrounding sex differences in multi-tasking abilities is mixed (Hirnstein, Larøi, & Laloyaux, 2019; Ren, Zhou, & Fu, 2009; Ward, et al., 2013) and so cannot be used to validate this line of thinking. More likely is that these findings support the idea that a father’s positivity, involvement, and permissiveness have a stronger effect on their children than do their mother’s (Gryczkowski, Jordan, & Mercer, 2010; Jewell, Krohn, Scott, Carlton, & Meinz, 2008; Thomassin & Suveg, 2014), and so when the father is disconnected from the primary parent-child relationship, the child’s social emotional development is more likely to suffer.

Given the primary parent findings and the body of research to support it, it is surprising that the gender of the secondary parent did not play a moderating role in the social emotional development of the child. The nature of the relationship between the secondary parent and the child was not made clear in this study, and so it is possible that the secondary parent had very little interaction with the child and so had very little effect on their development. According to the results of this study, secondary parents spent
less time on screens and had smaller variances in their screen time than did primary parents, and so it is also possible that in general, secondary parents across the board have similar and less interaction with technology, and so a moderating effect could not be found. Ultimately, it could be implied that it is the status of the parent (either as primary or secondary) along with parental gender that plays a role in the social emotional development of their children.

The COVID pandemic could be affecting primary parents differently than secondary parents. The stay-at-home father role is a relatively new social construct (Rushing & Powell, 2015), and as a result, stay-at-home fathers may not have the strong social and peer support to help them navigate the extreme external stressors propagated by COVID. Stay-at-home fathers who find support from other stay-at-home fathers are more likely to be less stressed and more satisfied with their relationships than stay-at-home fathers without a support system (Rochlen, Suizzo, McKelley, & Scaringi, 2008). Therefore, it is possible that these stay-at-home fathers are experiencing the stress of COVID without the strong support system that their female stay-at-home counterparts are receiving, and as a result, their view of their children may be more negative and result in higher ratings of behavioral concerns for their children.

**Limitations**

Despite the fact that the COVID pandemic created a helpful stage from which to cast this study, it made recruitment fairly difficult. Before the pandemic, parents could be recruited in person or with postings in public places that would have captured a wider audience. Parents also could have completed the survey in person and so could have been led through the steps required to collect screen time information from their devices rather than just exiting the survey if they did not understand the directions (which may have affected the survey completion rate). Because of COVID-based constraints, people were only recruited online which may have skewed the results to include parents who were comfortable with technology and therefore spent more time on screens and had children who spent more time on screens.
As stated previously, this study was cross-sectional, and so it is impossible to know how the previous development of the child affected the relationship between screen time and their social emotional development. It is possible that the children who exhibit more behavioral concerns may be considered “difficult” by their parents, and so they may be given devices as a way to reduce the chaos in the home. It is possible that their behavioral concerns and lack of protective factors led to increased screen time as opposed to their increased screen time leading to their stunted social emotional development.

It was beyond the scope of this survey to collect information concerning when parents were spending time on their screens, and so even though the time a parent spends on screens did not affect the child’s protective social emotional factors within the current model, it is possible that the timing of the use may need to be considered as opposed to the just the amount of time spent on screen.

Online survey completion rates are a topic of interest and research given the increase of virtual platforms from which information is collected. The stated length of a survey affects completion rates with longer stated lengths leading to fewer survey completions despite the actual length of the survey (Galesic & Bosnjak, 2009). A pilot study was not conducted to determine how long the survey would take participants to complete and so the stated length of 30 minutes was based upon the survey’s software creation online platform suggestions. In reality, the average participant spent 15-17 minutes on the survey, but the stated length of 30 minutes may have discouraged participants from completing the survey. Additionally, many of the participants filled out the demographics section but when asked to investigate their screen time use by accessing collection software installed on their phone, they would exit the survey. Larger and immediate incentive rates induce higher motivation to complete a survey (Stanley, Roycroft, Amaya, Dever, & Srivastav, 2020), and even though there was a $100 gift card incentive, the pay-off was not immediate (i.e. it was a raffle which would be completed after data collection was complete). As a result, participants may have felt that the energy and time it would take to look up information on their phones would not be worth the small chance they had of winning a prize in the distant future.
While these findings may have helpful implications for future research, the generalizability of these results may be limited to this specific time and place or within the certain population of parents who are comfortable with technology, who spend time on screens and allow their children to do the same. However, given the high rates of device use across most populations, further research may prove these findings applicable to larger populations.

**Recommendations for Future Research**

Given the limitations of the current study and some of the more complicated relationships that were identified from it, it would be pertinent to create a longitudinal study that begins in infancy and collects screen time and social emotional information to better understand the interplay between the two. As stated previously, from this study it is impossible to know if the behavioral concerns came before the screen time, if it was the other way around, or what the child’s exposure to screen time looked like earlier in life. A longitudinal study may help untangle some of the enmeshed aspects of the relationship between screen time and social emotional development.

Follow-up studies that recruit parents in-person as well as online may increase the generalizability of these results. This may need to occur once pandemic regulations are loosened or lifted, but capturing a wider audience may paint a clearer picture of the how screen time affects children from all backgrounds. In the future, it may be helpful to recruit participants from a variety of settings including parks, playgrounds, coffee houses, libraries, and grocery stores both in urban and rural areas in addition to the virtual recruitment that occurred in this study.

Future research that includes when parents spend time on screens could be helpful to better understand how their screen time and interactions with their children affect the child’s social emotional development. Within the scope of this study, it was not known when parents spent time on their screens, only the amount. It is possible that some parents spent longer periods of time on their phones when their children were not around, and not knowing what these time frames look like may be precluding the current study from clearly understanding the relationship between parent screen time and their child’s development.
Conclusion

The results of this study provided an interesting look into the relationship between a touchscreen device and a child’s social and emotional development. Not only was there a clear relationship between the time a child spends on a touchscreen device and their social emotional development, but also a clear relationship between the time a parent spends on a touchscreen device and their child’s behavioral concerns. The more time a primary parent or child spends on touchscreen devices, the fewer protective factors and the more behavioral concerns the child exhibits. Subsequently, the more time spent on entertainment or social media apps by both parents and children, the poorer the child’s social emotional development. These relationships make a strong claim for the interrupting effects that touchscreens can have on the social emotional development of young children. Increased screen time may be leading to decreases in vital social interactions that affect language development, self-regulation, and the quality of attachment relationships. Poor parent-child attachment relationship facilitated by the addition of touchscreen use in the home may be leading to poor social emotional development and increases in behavioral concerns. While no casual relationships can be determined from this work, the existence of the associative relationships between increased screen time and decreased social emotional development paves the way for conversations regarding touch screens as a potential disruptor of social emotional growth.
REFERENCES


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APPENDIX A: SCREEN TIME MEASURE AND INSTRUCTIONS

For the following section, use the appropriate set of directions to complete the measure of screen time.

For Apple device users:
1. Go to Settings
2. Select “Screen Time”
3. Select “See All Activity”
4. At the top of the page, click “Week”
5. Enter your Daily Average use (in minutes) in the box below labeled “Daily Average”
6. On the same page, click “Show Categories”
7. From the drop-down menus below, choose the first three categories of use in order from most used to least used. If you do not see your category listed, choose “not listed” and write the name of the category in the box beneath the drop-down menu.
8. Repeat these steps if you are entering information from multiple devices
9. If the device is shared between parent and child, estimate how much time your child spends on the touch-screen device per day.

For Android device users:
1. Go into Settings
2. Click on “Digital Well-Being and Parental Control”
3. Click on “Show Your Data”
4. Click on the circle graph
5. Click on the left-pointing arrow next to today’s date until all bars populate on the graph above the date. You should see a blue bar above each day of the week.
6. Choose the third tallest blue bar and enter the time (in minutes) that appears above the graph in the box below.
7. Underneath the bar chart is a list of most frequently used apps. Enter the top five apps used in the boxes below.
8. Repeat these steps if you are using multiple devices.
9. If the device is shared between parent and child, scroll through the most frequently used apps and enter times for the first three apps used exclusively by your child.
10. Additionally, estimate the amount of time your child spends on touch-screen devices throughout the day.