

FACTORS PREDICTING CHANGES IN SLEEP IN NORTH CAROLINA CHILDREN DURING THE CORONAVIRUS PANDEMIC

by

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As the COVID-19 virus evolved into a global pandemic, a myriad of changes occurred for children and families worldwide. Bronfenbrenner's socio-ecological model argues that there is a complex interaction of factors impacting child development, ranging from child specific factors (i.e., personal characteristics, genetic factors) to factors close to the child like family, school or childcare, and neighborhood (i.e., the microsystem) to factors more distal such as media, social services, and government agencies (i.e., the exosystem and beyond). The purpose of the present study was to describe some of the changes resulting from the COVID-19 pandemic and to consider how systemic factors may have impacted those changes during the pandemic, which may in turn affect the child's development. Specifically, the study aimed to describe changes in media use and sleep patterns in young children and to investigate the relationship between child sex, household income, and media use on sleep changes that occurred over the course of the study. Participants in the present study were 88 children ages 4 to 7 whose caregiver completed one survey prior to the pandemic, and one survey in the early months of the pandemic. Survey results indicate there was a significant decrease in average daily sleep duration and a significant increase in average daily media use over the course of the study. While sleep

duration decreased, children in the present sample continued to obtain recommended amounts of sleep both before and during the early weeks of the pandemic. Neither household income, sex, nor media use were related to the observed changes in sleep in the present sample. Instead, only pre-pandemic sleep duration explained a significant amount of variance in sleep changes. These findings suggest that in some ways families transitioned to a “summer vacation” schedule, rather than establishing completely new routines for a global pandemic. Families may be cautiously optimistic that changes like increased media use did not significantly impact sleep in the present sample. Given that hypothesized factors like household income and sex were also not responsible for the observed decrease in sleep, additional research is needed to determine what factors explain additional variance in children’s sleep during the pandemic.

Factors Predicting Changes in Sleep in North Carolina Children During the Coronavirus
Pandemic

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CHAPTER 1: INTRODUCTION AND LITERATURE REVIEW

Humans require varying amounts of sleep depending on age and developmental stage. Based on guidelines from the National Sleep Foundation (NSF) and the American Academy of Sleep Medicine (AASM), 10-13 hours of sleep is appropriate for most preschool-aged children (aged 3-5). As children age, the number of hours of sleep that is appropriate decreases slightly such that 9-12 hours is appropriate for most school aged children. Children who sleep too much or too little are at risk for several cognitive and behavioral difficulties, which impact development across settings (James & Hale, 2017). Many health risks are also associated with disruptions to developmentally appropriate sleep totals. Other factors that contribute to short sleep duration remain unclear, as findings have been inconsistent to date. Bagley et al. (2015) found that sociodemographic factors such as parental mental health status, parental education, and family size and structure impacted sleep. Others have found that environmental factors such as day of the week and time of year are related to sleep duration (Nixon et al., 2008).

Much like expert organizations determine an appropriate amount of sleep for any given age, the American Academy of Pediatrics (AAP) determines an appropriate amount of media use for children at any given age. Although media use may have some benefits, most agree that it is only potentially useful in moderation and with supervision and co-engagement (Coyne et al., 2021). Recent survey results indicate that many school-aged children spend over three hours per day using media, equating to roughly one quarter of a child's daily awake hours (Rideout & Robb, 2020). Media use can have immediate effects on children's executive functioning and is related to long-term factors of health including sleep difficulties, obesity, and academic performance (Lillard et al., 2015; Liu et al., 2021).

The coronavirus disease 2019 (COVID-19) evolved into a pandemic that impacted families across the world. In North Carolina, childcare facilities and schools were forced to close, and many adults had to work from home to limit the spread of the virus or were terminated from their place of employment because many businesses were underutilized as people stayed home. Families in rural and low-income settings were particularly impacted by these changes (Boutzoukas et al., 2021). The closures and subsequent changes due to COVID-19 are believed to have significantly impacted both sleep and media use in children. Initial estimates suggest that children experienced shortened sleep and an increase in media use (Sharma et al., 2021; Liu et al., 2021). However, few researchers have comparison data and instead rely heavily on parent report of pre-pandemic behaviors. The current study is unique in that data on sleep and media use were collected before the pandemic began and again several months after the beginning of the pandemic. As such, the current study aims to describe the patterns of sleep and media use exhibited by school aged children in Eastern North Carolina during the COVID-19 pandemic, in addition to investigating several factors related to changes in sleep before and during the pandemic.

Sleep

Sleep is an essential behavior for human functioning, as it is linked to many cognitive and behavioral processes as well as health and physiological well-being. However, the amount of sleep that is appropriate may differ from person to person depending on a variety of factors. Eighteen experts from a variety of disciplines convened to form the NSF Panel, with a mission to evaluate available scientific evidence and to create sleep recommendations for each developmental stage. Representatives from a variety of professional organizations, including the AAP, were included in the Panel (Hirshkowitz et al., 2015). Ultimately, the Panel produced

recommendations for appropriate sleep durations based on an individual’s developmental stage, ranging from newborn to adult. Similarly, the AASM also published a statement on the recommended amount of sleep for each developmental stage. The AASM recommendations are similar to those of the NSF, although the AASM ranges differ by approximately one hour from the NSF recommendations (Paruthi et al., 2016). Table 1 provides a summary of sleep recommendations for infants, children, and adolescents from both organizations. While the AAP does not issue specific sleep recommendations for young children, the NSF and AASM recommendations are widely accepted and referred to across the literature. Current research suggests that between 10-33% of children have insufficient sleep when compared to these national standards (Lan et al., 2020; Williamson & Mindell, 2020; Ranum et al., 2021). However, statistics are likely more alarming when examining overall sleep health, a term coined by Daniel Buysse (2014). Buysse argued that sleep health should include assessment in five domains: sleep duration, sleep efficiency, timing, alertness, and quality, rather than simply duration. Because the term “sleep health” is relatively new and is more difficult to study, it has not been well-researched in pediatric populations. As a result, the bulk of pediatric sleep literature continues to focus exclusively on the sleep duration domain.

Table 1

Sleep Duration Recommendations from the NSF and AASM

Age Group	AASM Recommendations	NSF Recommendations
Newborns	N/A	14-17 hours
Infants (4-12m)	12-16 hours	12-15 hours
Toddlers (1-2y)	11-14 hours	11-14 hours
Preschoolers (3-5y)	10-13 hours	10-13 hours
School Aged (6-12y)	9-12 hours	9-11 hours
Teenagers (13-18y)	8-10 hours	8-10 hours

Measuring Sleep

Research involving pediatric sleep generally uses questionnaires and diaries, actigraphy, polysomnography, or electroencephalography to measure and record data regarding sleep (Mouthon & Huber, 2015).

Questionnaires. Questionnaires and diaries are arguably the least invasive and easiest method of data collection to administer and interpret. However, these measures rely exclusively on caregiver-report and do not capture all available sleep data. More specifically, questionnaires and diaries generally capture sleep onset and wake times along with qualitative information about sleep-related behaviors without capturing night wakings and other measures of sleep quality (Lewandowski et al., 2011; Mouthon & Huber, 2015). Many questionnaires focus on average or general sleep habits over a specified time-period (i.e., past week, past month, past three months), while sleep diaries often focus on 24-hour recording periods. There are nearly 200 different questionnaires available that target pediatric sleep, though researchers caution against using many of these given a lack of psychometric evaluation (Spruyt & Gozal, 2011). Of the 200 questionnaires reviewed by Spruyt and Gozal (2011), 57 were found to have been psychometrically evaluated in some capacity. The Children's Sleep Habit Questionnaire (CSHQ) (discussed later in the paper) was included as one measure with some level of psychometric evaluation and has been described as "well-established" by other reviews (Lewandowski et al., 2011).

Actigraphy. Sleep data can also be recorded via actigraphy when the child wears a sensor to measure their movement and sleep-wake patterns. This method of measurement provides information about multiple sleep-related variables but requires a minimum of five days of data collection, thus five days of the child wearing the device (Mouthon & Huber, 2015). The

data must then be transformed into meaningful measurements, using device-specific algorithms. Although actigraphy is a more expensive method of conducting pediatric sleep research given the cost of the monitoring devices, it is fairly simple and non-invasive, making it a feasible option for many pediatric sleep researchers. When used in combination with a sleep diary or questionnaire, actigraphy can provide a wealth of both physiological and behavioral information related to pediatric sleep (Lewandoswki et al., 2011).

Polysomnography and electroencephalography. Polysomnography (PSG) is the technical term for what many know as a “sleep study.” One part of this technique often includes electroencephalography, or EEG, as well as electrocardiograms, or ECG. Of the discussed methods to study pediatric sleep, PSG is the most invasive and expensive option.

Polysomnography requires multiple electrodes to be placed on the child’s head and face which allows for the recording of multiple sleep-related variables as well as cardiac and respiratory variables (Mouthon & Huber, 2015). The AAP recognizes PSG as the gold standard clinical practice for making diagnoses of many sleep disorders (Marcus et al., 2012). However, given the invasive nature of the procedure and required clinical setting, PSG is not often used for pediatric sleep research within the general pediatric population.

Impacts of Sleep Duration

Sleep durations falling within the recommended guidelines are associated with better global cognitive functioning and improved health outcomes (Short et al., 2018). Children who sleep too much or too little are at risk for cognitive and behavioral difficulties, health concerns, and psychiatric symptomology (Beebe, 2011; Scharf et al., 2013; Short et al., 2018; Matriccaiani et al., 2019). One study suggests that a U-shaped association exists between sleep duration and

both behavioral problems and health problems (James & Hale, 2017), supporting the idea that both too much and too little sleep are problematic for children.

Infants, in particular, are at risk of missing out on important environmental and social interactions that may lead to advances in cognitive development if an excessive sleep duration is present (Hirshkowitz et al., 2015). In young children and school aged children, short sleep duration is sometimes correlated with inattention, hyperactivity, and/or increased emotional lability (Nixon et al., 2008; Beebe, 2011). Individuals experiencing a deprivation are thought to have impaired emotion regulation. Research suggests that sleep deprived individuals experience more excitation in the amygdala, hippocampus, and other limbic structures, thereby increasing emotional lability and reactivity (O’Leary et al., 2017; Vandekerckhove and Wang, 2017). Links between inappropriate sleep durations and elevated body-mass index (BMI) and obesity are also well documented in the literature (Bagley et al., 2015; Nixon et al., 2008; Snell et al., 2007). This relationship between sleep deficiency and increased BMI is related to leptin, an appetite suppressing hormone that is reduced during states of sleep deprivation, and grehlin, an appetite increasing hormone that is increased during states of sleep deprivation (Taheri et al., 2004).

Factors Related to Short Sleep Duration

The cause of shortened sleep duration in childhood likely varies from child to child. Some conditions linked to short sleep durations, like obstructive sleep apnea (OSA) or restless leg syndrome (RSL), are treatable and are therefore the focus of much of the research on the topic (Beebe, 2011). Other research has found significant relationships with season, weekday versus weekend sleep, and birth order, although the direction of some of these relationships is mixed (Hunt et al., 2021; Brazendale et al., 2018; Nixon et al., 2008). Nixon and colleagues found that children tend to sleep significantly less time in the summer than in other seasons.

They also found that children sleep longer on weekdays than on weekends, and sleep duration is often shorter for children with younger siblings. Other studies have found that children sleep longer during the summer months than during the school year (Hunt et al., 2021; Brazendale et al., 2018).

Studies examining associations between socio-demographic variables and sleep duration in children are less common, and findings are somewhat inconsistent, though most agree that previously cited factors do influence pediatric sleep health (Bagley et al., 2015; Meltzer et al., 2021; Ranum et al., 2021). McDonald and colleagues (2014) found that lower maternal education, ethnic minority membership, male sex, living with an older sibling, and greater than 60 minutes of evening television time were independently associated with shorter sleep durations in toddlerhood. Many of these factors were mediated by later bedtimes, such that children were more likely to have a later bedtime when maternal education was low, when the child belonged to an ethnic minority group, when an older sibling was present, and when evening television viewing exceeded 60 minutes. Short sleep duration in males was not explained by late bedtimes, but instead by earlier wake times. Ranum and colleagues' 2021 study also found evidence for sex predicting persistent short sleep, such that boys were more likely to have short sleep durations, although wake time was not evaluated. The 2021 results also indicated negative affectivity was related to short sleep, such that children high in negative affectivity may have poorer emotion regulation skills and be more resistant to bedtime. Their findings did not support the idea that socioeconomic status is related to sleep duration, however (Ranum et al., 2021). Similarly, results from another study did not support a link between short sleep durations in preschoolers and child's sex, television viewing, or maternal depressive symptoms (Scharf et al., 2013).

When examining the impacts of cumulative socio-demographic risk factors (i.e., parental employment status, parental education level, family structure, parental depression, family income, etc.) on sleep in preschoolers, Williamson and Mindell (2020) found significant associations between increased cumulative risk factors and greater sleep disturbances. Specific risk factors including lower parental educational attainment, parental depressive symptoms, single caregiver home, and crowded household were most predictive of poor sleep among preschoolers. Similar findings of cumulative risk were reported by Bagley et al. (2015) among school aged children.

Media Use

The scope of media use has broadened over the past decade. Whereas media use previously referred primarily to watching movies and television, the definition of media use now includes watching movies and television, engaging with apps on tablets, gaming, and using computers to play games or watch videos. In 2016, the AAP updated their recommendations on media use for children to suggest that children under the age of two avoid screen-based media use with the exception of video-chatting. Further, the AAP suggests that children aged 2-5 years use a maximum of 60 minutes of high-quality screen-based media per day, co-engaging with adults to maximize understanding and learning. The AAP encourages parental discretion when making decisions about media use for school aged and older children and also encourages parents to set clear boundaries surrounding screens, such that screens are not present during meals, during playtime, in bedrooms, or one hour prior to a child's bedtime.

Current estimates indicate that many children are exceeding the AAP's recommendations. The Common Sense Research Program publishes a report on media use for children aged zero to eight approximately every three years, based on a survey administered to a

nationally representative sample of US families. The most recent survey of media use concluded data collection on March 13, 2020, just before the start of the COVID-19 pandemic. Parent responses to this survey indicated that children under age two spend approximately one hour using media per day, while children aged two to four spend at least two hours engaging with media per day. Children in the five to eight age range are reported to use over three hours of media per day (Rideout & Robb, 2020).

Factors such as sex, race/ethnicity, parental education, parental marital status, socioeconomic status, number of siblings in the home, and the presence of a television in the preschool-aged child's bedroom account for some variance in preschool-aged children's media usage (Rideout & Robb, 2020; Tandon et al., 2011). For school-age children, time of year accounts for variance in media use, such that children use more media in the summer months than during the academic year (Hunt et al., 2021; Brazendale et al., 2018; Nixon et al., 2008). The most recent Common Sense survey found that boys engage with 30 additional minutes of media per day in comparison to girls, while children from low-income families (<\$30,000/yr) engage with media at approximately double the rate of higher income families (>\$75,000/yr). Significant differences in media use by race/ethnicity were also documented, such that children belonging to a minority group used media for at least one hour more than their White counterparts. Regardless of race/ethnicity and income, respondents from the sample indicated that media devices were most often used for pleasure, rather than to complete homework or to engage in any form of reading (Rideout & Robb, 2020). Interestingly, duration of media use has also been linked to the care setting in which a child is placed during the day. Children in home-based care centers were found to engage in significantly more media use than children in preschool centers, Head Start, and parent-care settings. Head Start centers were shown to act as a

potentially protective factor for children from low-income families due to a significantly lower proportion of exposure to media in comparison to children in home-based or parent-care settings (Tandon et al., 2011).

Many young children also have televisions or other media devices in their bedrooms, which is contrary to the AAP's recommendations (Rideout, 2017). Results of the 2020 survey found that nearly all respondents with children under age 8 endorsed having at least one television and one mobile device in the home, while almost half indicated that their child had their own tablet (Rideout & Robb, 2020). Another survey found that most children begin interacting with mobile devices prior to age 1, where the devices are used as a form of entertainment to allow parents and caregivers to complete household chores (Kabali et al., 2015).

Measuring Media Use

Studies focusing on media use in children and adolescents have increased in the past decade as technology expands and becomes a common phenomenon around the country. Some argue that media use is nearly impossible to measure with accuracy, given the wide variety of devices available to children in the current times. Nonetheless, most researchers agree that attempting to quantify media use is crucial in children, as researchers continue to learn about the impact of media on varying aspects of child development. To date, there is no standardized or widely accepted method of measuring media use.

The AAP once published a media history form that was intended for parents to complete at general well-child checkups, but a 2004 survey of Minnesotan pediatricians found that most pediatricians were unfamiliar with the form. Although unfamiliar with the form, most pediatricians surveyed did indicate that they were familiar with the AAP recommendations and sometimes provided parents with those recommendations (Gentile et al., 2004). More recent and

nationally representative survey results suggest that pediatricians are rarely talking to parents about the AAP recommendations, however. Approximately 80-85% of parents surveyed suggest that their pediatrician has not spoken with them about media use (Rideout, 2017; Vandewater et al., 2007). (Notably, this question was removed from the 2020 media use survey from.) Given the lack of pediatrician-led discussion of media use based on recent family report, it is reasonable to assume that the media history form is not in use today.

Unable to collect data from pediatricians about media use and with limited use of a standardized form, many researchers turn to alternative methods of data collection including 24-hour time-use diaries and other (unstandardized) surveys and questionnaires (Garrison et al., 2011; Linebarger et al., 2014; Rideout & Robb, 2020). Regardless, researchers must rely on parent reports of media use for young children.

Potential Impacts of Media Use

When developing their recommendations, the AAP relied on information from a variety of sources and considered varying aspects of child development. The AAP recognizes that media has its place and can be beneficial in limited quantities. Age-appropriate media has been shown to improve cognition, vocabulary, and school readiness, particularly when an adult is co-using media with the child (Courage & Setliff, 2009; Dore et al., 2020). Some types of interactive media have been shown to increase cognition and literacy, and promote appropriate social skills for young children, although the gains from media-based learning typically do not exceed those from face-to-face learning opportunities (Coyne et al., 2021; Kirkorian et al., 2008; Radesky et al., 2015). Media can also be a useful tool available to families in specific situations such as during medical procedures or on long flights.

Media use in preschool and school aged children has been researched regarding its impact on social-emotional development, behavioral outcomes, academic outcomes, executive functioning, and overall health and well-being (Bozzola et al., 2018; Lillard et al., 2015; Liu et al., 2021, Russ et al., 2009). Research indicates that children who engage with more media tend to have poor health outcomes ranging from deficits in motor skills, obesity, and sleep difficulties (Felix et al., 2020). Given the potential long-term health effects of these deficits, a considerable amount of research has been conducted to better understand the influence of screens and media on health behaviors. Generally, increased media use is correlated with a more sedentary lifestyle which is linked to increased rates of obesity and poor physical health. Media use has also been associated with greater bedtime resistance and delayed bedtimes. In some cases, this results in delayed sleeping patterns where children are resistant to initiate sleep but are then sleeping later to account for the resistance. In other cases, the bedtime resistance results in shortened sleep duration due to specific time constraints applied to sleep and wake hours (e.g., school or parent work start times; Cain & Gradisar, 2010; Hale & Guan, 2015; Lan et al., 2020; Nathanson & Beyens, 2018; Beyens & Nathanson, 2019). A 2016 meta-analysis found that simply having access to a media device, not explicitly using the device, was associated with inadequate sleep duration, poor quality of sleep, and increased daytime sleepiness (Carter et al., 2016).

Additional research has found that preschool aged children using higher levels of media tend to have more externalizing behaviors, inattention problems, lower inhibitory control skills, and poorer self-regulatory and prosocial behaviors (John et al., 2022; Kim & Hwang, 2017; McNeill et al., 2019; Tamana et al., 2019). Results of a meta-analysis by Adelantado-Renau et al., (2019) indicated that television viewing and video-game playing were negatively associated with academic performance in children and adolescents. Overall, findings suggest that when

media is used for long-term periods or as a soothing strategy, difficulties in emotion regulation may later arise (Council on Communications and Media, 2016; Coyne et al., 2021; McQueen et al., 2012).

While much of the research on the impacts of media use focuses simply on the duration of media use, other factors of media use have also been found to impact outcomes in child development. Content of children's programming may be as important if not more important than the length of time children spend engaged, as indicated by Zimmerman and Christakis (2007). Content of children's media can be described by considering the degree to which the program is fantastical and/or educational. Existing research suggests that media with more fantastical components are more detrimental to children's executive function skills while viewing educational content is related to improved executive functioning skills, although the pacing of the programming may be a confounding factor (Huber et al., 2018; Lillard et al., 2015). Lillard and Peterson (2011) examined the immediate impacts of the pace of the programming on executive function by exposing preschoolers to fast and slow-paced programming for nine minutes and then giving them a series of tasks designed to measure different properties of executive function. The children exposed to fast-paced programming performed significantly worse on the executive function measures than those in the slow-paced and control groups, indicating that the content and pacing of media is important to consider. Another important aspect of media use to consider is the level to which parents engage with their child when the child is consuming media. Research surrounding the video deficit effect—the theory that infants and toddlers are unable to learn from videos in the same way that they learn from face-to-face interaction—suggests that human interaction can help toddlers and young children overcome the video deficit effect (Courage & Setliff, 2009; Kirkorian et al., 2008). Not only do findings

support the idea that co-viewing compensates for the video-deficit hypothesis, but there is also evidence that co-viewing can mitigate risks of exposure to violent media and enhance the positive effects of prosocial media, or media that is intended to display helping behaviors and positive social interactions. (Nathanson & Cantor, 2000). Despite a number of studies providing evidence for the benefits of parental engagement, findings from a naturalistic study on family media use indicates that parents are not often engaging with children and are instead simultaneously consuming other forms of media (Domoff et al., 2019). Many factors are thought to influence the way that parents and caregivers use media themselves and monitor their children's use of media.

Given the widespread access to various media, it has become a parenting tool for many. Families indicate that media is often used for babysitting, calming, rewarding, background noise, mealtime distractions, and bedtime routines (Domoff et al., 2019; Elias & Sulkin, 2019). While media can promote learning and be beneficial in some instances, it is not often that media is used by children and families in a manner that mediates the negative and enhances the positive aspects. Overall, most researchers and policymakers agree that the associated developmental risks outweigh the developmental benefits of using media for extended periods (Council on Communications and Media, 2016; Hutton et al., 2020).

COVID-19

The COVID-19 pandemic began globally in late 2019 to early 2020. Research suggests that the first case of COVID-19 in the United States was reported on January 21, 2020, and cases continued to skyrocket thereafter (Schuchat, 2020). A surge in the number of cases and related deaths resulted in the implementation of nationwide social-distancing policies. The World Health Organization (WHO) declared COVID-19 as a pandemic on March 11, 2020. Subsequently on

March 13, 2020, COVID-19 was declared a National Emergency by the President's Proclamation 9994 (2020). Globally, COVID-19 caused significant disruptions to the lives of individuals both young and old. Families were confined to their home, which disrupted the daily routine for many children (Bruni et al., 2021).

COVID-19 in North Carolina Schools

As COVID-19 continued to spread across the United States and abroad, North Carolina Governor Roy Cooper signed Executive Order No. 117 into effect on March 14, 2020. Executive Order No. 117 closed all public schools across the state beginning March 16, 2020, until at least March 30, 2020. The order, however, was extended multiple times, ultimately closing schools for the remainder of the 2019-2020 schoolyear. Schools were allowed to reopen in August 2020 for the 2020-2021 schoolyear, with instruction occurring primarily via virtual learning for the first several months of the school year. It was not until October 2020 that elementary students were allowed to return to school for face-to-face instruction. Middle and high school students were not allowed to return to school until well-into the 2020-2021 schoolyear, in February 2021. While students were permitted to return to school at various points during the schoolyear, school districts provided options for families. Many districts offered a mix of in-person and virtual learning, along with some hybrid options.

Students across NC were impacted by the pandemic, although most agree that students from rural, low-income, and minority communities were and continue to be disproportionately impacted by the pandemic and pandemic-related closures. Students belonging to any one of these groups were and continue to be at a risk for decreased academic achievement, food insecurity, lack of physical activity, and decreased access to physical and mental health services, which are known to impact health outcomes in children (Boutzoukas et al., 2021).

COVID-19 in North Carolina Communities

Following the initial announcement of school closures, Executive Order Number 121 was put into effect by Governor Cooper on March 27, 2020, ordering residents of North Carolina to stay at home beginning on March 30, 2020 (Executive Order No. 121, 2020). The executive order, which also called for the practice of social distancing, aimed to reduce the burden of COVID-19 on healthcare facilities and to prevent the spread of the disease. After the stay-at-home order, many businesses closed, and employees were either left working from home or unemployed. By May 2020, estimates suggest that 650,000 North Carolinians had been laid off (Sills & Rich, 2021). This impacted many families' financial resources, leading to increased concern of eviction and homelessness. In response, Governor Cooper implemented an executive order preventing eviction proceedings and terminated utility services due to nonpayment (Executive Order N. 124, 2020).

Childcare was also impacted by this change, with many childcare facilities closing to prevent the spread of COVID-19 or opening only to families of frontline workers (Rivest, 2021). Governor Cooper's stay-at-home order was modified several times through various phases, eventually being lifted in late February 2021 as COVID-19 vaccines became more accessible to residents of NC (Executive Order No. 195, 2021). The statewide mask mandate was implemented on June 25, 2020, and was lifted on May 14, 2021, approximately one year after it began (Executive Order No. 215, 2021).

Existing Research

Across the globe, researchers began to collect data on the effects of COVID-19 as soon as restrictions began in many countries. Currently, research on children related to COVID-19 is limited, particularly research involving two or more timepoints. Many researchers attempted to

study child behavior before and during the pandemic, but often relied on retrospective data, via parent or caregiver estimation, to describe behavior before the pandemic (Tso et al., 2020; Aguilar-Farias et al., 2021; Bruni et al., 2021).

COVID-19 and Sleep

Children's sleep during COVID-19 has been a popular topic in recent pediatric research. Results related to the effect of the pandemic on sleep are mixed and vary by age group. A 2021 meta-analysis found that half (49%) of children included in the 16 reviewed studies were not meeting sleep recommendations during the pandemic (Sharma et al., 2021). Okely et al., (2021) found no changes in sleep duration in preschool-aged children, while others found an increase in sleep duration in older children (Moore et al., 2020). In a sample of Italian children, researchers found a delay in sleep and wake times which resulted in increased sleep durations, in addition to an increase in sleep disturbances such as nightmares, night terrors, and night awakenings (Cellini et al., 2021; Bruni et al., 2021). Findings were similar in a group of Chinese children, though sleep disturbances were less commonly reported in this sample (Liu et al., 2020). Israeli children were reported to have similar patterns of sleep before and during the pandemic, with approximately a third of the sample reporting decreased sleep durations and a few reporting increased sleep durations (Zreik et al., 2020). One study attempted to examine family characteristics contributing to changes in sleep patterns in Turkish children, finding that children of health workers had greater impairment of sleep habits in comparison to children of non-health workers (Bucak et al., 2021). Cellini et al., (2021) found that female children experienced poorer sleep than male counterparts.

COVID-19 and Media Use

Media use was most often studied considering sleep disturbances during the pandemic; few studies focused solely on media use or screen time variables. Despite this, many researchers were able to collect important data about media usage. Unsurprisingly, an overwhelming majority of research indicates that media use increased for children of all age groups and in all countries during the pandemic, even when virtual learning activities are excluded (Liu et al., 2020; Bruni et al., 2021). Some estimates indicate that media use increased by approximately one hour during the pandemic for preschool to school-aged children (Tso et al., 2020; Okely et al., 2021). Aguilar-Farias et al., (2021) found that in a sample of preschool-aged Chilean children, greater caregiver education was associated with a greater increase in screen time. They also found that those living with small families (<4 people) had a less marked increase in screen time in comparison to those living with larger families. Not surprising, children living in rural areas and those with more play area at home experienced a less marked increase in screen time in comparison to urban counterparts.

Theoretical Framework

Numerous factors influence a child's development, regardless of the presence of a global pandemic. The socio-ecological model (SEM) for behavior change is a framework that is often applied in situations of health promotion and is one that is applicable to studying changes in child behavior in the context of the COVID-19 pandemic. The socio-ecological model is based on the model first introduced by Bronfenbrenner, who proposed a series of systems that interacted with the individual in the center. Bronfenbrenner identified the systems as a microsystem, mesosystem, exosystem, and macrosystem. Systems theories, in simplest form, help to explain the idea that one system impacts another.

Bronfenbrenner's original system was developed to explain a parent's ability to meet a child's needs, related to a variety of external factors that were likely to vary across individuals and families. Thus, the factors impacting a parent also impacted a child and the child's development. Some factors that Bronfenbrenner considered as influential in determining the parent's ability to meet a child's needs included the availability and adequacy of childcare, the presence of significant social support, and safety (Bronfenbrenner, 1977; Bronfenbrenner, 1979; Jack, 2000). Bronfenbrenner's model focused on the varying levels of stress and support among a family, as well as the interactions among them. Over time, SEMs have been adapted to adequately describe health promotion practices which include interpersonal, organizational, community, and policy factors (Kilanowski, 2017).

Because Bronfenbrenner's SEM is well-supported in its ability to explain various factors in both child development and health promotion, it can also be applied to evaluate health-related behavioral changes in both sleep and media use that may have occurred in response to the COVID-19 pandemic. Within the individual, child-specific factors including age, race, and sex are considered. Sleep and media use are also present at this level of analysis, given the impact that other systems may have on these factors independent to each child. The microsystem is then considered, which encompasses factors within the child's immediate environment. Some of these factors may have remained constant for children prior to and during the pandemic, while others may have changed. Microsystems include parents, peers, and school or childcare. As a result of the COVID-19 pandemic, many factors within the microsystem level were disrupted by a switch to virtual learning and working or changes in childcare. Parent stress levels can also be considered within the microsystem, given the documented impacts of parent stress on the parenting relationship, which directly impacts the child. The microsystem is nested within the

mesosystem, which helps to assess relationships between different microsystems. In the context of the COVID-19 pandemic, this may consider how schooling changes impacted childcare changes, or how parental stress impacted parental responses and management of behavior. This system is likely to appear different when considering pre- and mid-pandemic timepoints.

Emerging from the mesosystem is the exosystem, where systems are external to the child and may indirectly impact the child's development. Ashiabi and O'Neal (2015) consider parental workplace an exosystemic factor, arguing that children are indirectly, rather than directly impacted by changes in this domain. During the pandemic, many parents experienced changes in the workplace including working remotely or working under staggered schedules to promote social distancing, potentially creating an indirect effect on children. Lastly, Bronfenbrenner considers the macrosystem, which involves societal and cultural values, economic conditions, available resources, and opportunities. In light of the pandemic, various local and state laws and ordinances surrounding social distancing, school closures, and mask mandates can be considered under the macrosystem.

In summary, Bronfenbrenner's SEM proposes that one system interacts with another, to produce a cascade of processes that then impact the individual child at the base of the systems. During the COVID-19 pandemic, state and local laws at the macrosystem level impacted parental work opportunities and/or school district policies at the exosystemic level. Those factors then influence the mesosystem, where an interaction of effects occur between the exosystem and the microsystem. For example, when parents were not permitted to go to their worksite and were left without jobs or were forced to work from home, parent stress levels likely changed. State and local laws may have also impacted childcare availability, with the closing of many schools and childcare centers. In one direction, these changes impacted children at the microsystemic level,

given changes in daily interactions between parent and child as well as changes in childcare or schooling. In the opposite direction, this may have changed the financial resources available to a family, representative of a macrosystemic change. As a result, this framework leads to clear questions related to changes in children's media use and sleep patterns in the context of the COVID-19 pandemic and many related changes that occurred within family systems.

Statement of the Problem and Significance of the Study

Given the important issues of sleep and media use, particularly during early childhood, combined with limited research in pediatric populations during COVID-19, this study will address a critical gap in research, providing insight into how families with young children behave during a global pandemic with regards to sleep and media use. Findings will also be useful in determining how families can maintain healthy sleep and media use habits, by identifying factors that disrupt these habits. The first aim is to describe the media use of children aged 4-7 in North Carolina at time 1 (pre-COVID-19) and at time 2 (during COVID-19) and identify the factors that influence changes between the two time points. Limited previous work suggests that family size may have impacted media use during COVID-19 (Bucak et al., 2021). The second aim of the study is to describe the sleep habits at time 1 and at time 2. The third aim of the study is to determine the impact of media use on sleep for children before and during the COVID-19 pandemic. Specifically, changes in media use will be used to predict sleep duration, while controlling for sex and household income.

Hypothesis 1: There will be significant differences in media use durations between time 1 and time 2, such that media use duration increased at time 2.

Hypothesis 2: There will be significant differences in sleep durations between time 1 and time 2, such that sleep duration increased at time 2.

Hypothesis 3: Greater media use duration will predict a decrease in sleep duration after accounting for sociodemographic variables. Participants who are males and of lower household income will report greater decreases in sleep.

CHAPTER 2: METHODS

Study Design

The present analysis utilized data collected as part of an existing project that was approved by the East Carolina University (ECU) Institutional Review Board (IRB) (see Appendices A & B). All study data were collected and managed using REDCap electronic data capture tools hosted at ECU (Harris et al., 2009; Harris et al., 2019). REDCap (Research Electronic Data Capture) is a secure, web-based software platform designed to support data capture for research studies, providing 1) an intuitive interface for validated data capture; 2) audit trails for tracking data manipulation and export procedures; 3) automated export procedures for seamless data downloads to common statistical packages; and 4) procedures for data integration and interoperability with external sources.

Original data were collected between March 2019 and March 2020 (phase one) with additional data being collected in between May and July 2020 (phase two). Data were collected in a region of North Carolina that was originally affected by COVID-19 in late March/early April 2020. Data from phase one included both parent/caregiver-report and child-specific data. Parents/caregivers provided consent for participation and provided their email address (see Appendix C). Assent was obtained prior to collection of child-specific data (see Appendix D). Data from phase two was collected specifically for the purposes of the present project and includes only parent/caregiver report. For the purposes of the present study, only parent/caregiver-reported data was utilized in present analyses.

Participants

Participants of the current study were recruited from private daycare and preschool centers (n = 7), public school systems (n = 3), private schools (n = 1), churches (n = 1), the ECU

Infant and Child Cognition Lab, community events, and personal contacts across central and eastern North Carolina.

During the first phase, families with a typically developing child between the ages of three and six were recruited for participation. A total of 253 children and their families were recruited for participation in phase one; of those, 194 had completed parent surveys. During phase two, families who completed surveys during phase one were asked to complete a second survey regarding COVID-19 related changes. A total of 97 participants completed both the phase 1 and the phase 2 survey. After exclusionary criteria were applied, 88 participants remained in the final sample.

Participants in the final sample were 88 children (61.4% female), aged 4.33 to 7.71 years ($M = 5.79$ years, $SD = 0.76$). English was identified as the primary language for all participants. Additional demographic data for participants and caregivers are presented in Tables 2-3 below.

Table 2

Participant Ethnicity

Ethnicity	<i>N</i>	Percentage
White/Caucasian	75	85.2
Black/African American	5	5.7
Biracial/Multiracial	4	4.5
Hispanic/Latino	3	3.4
Asian/Pacific Islander	1	1.1

Table 3*Yearly Household Income*

Income	<i>N</i>	Percentage
\$0 to \$24,999	4	4.5
\$25,000 to \$49,999	8	9.1
\$50,000 to \$74,999	11	12.5
\$75,000 to \$99,999	17	19.3
\$100,000 to 124,999	7	8.0
\$125,000 to \$149,000	14	15.9
Greater than \$150,000	19	21.6
Preferred not to answer	8	9.1

Table 4*Caregiver Demographics*

	Caregiver 1	Caregiver 2
Relationship of Caregiver to Child	n (%)	n (%)
<i>Birth Mother</i>	72 (81.8)	11 (12.5)
<i>Birth Father</i>	11 (12.5)	65 (73.9)
<i>Stepmother</i>	0 (0.0)	0 (0.0)
<i>Stepfather</i>	0 (0.0)	2 (2.3)
<i>Adoptive mother</i>	0 (0.0)	2 (2.3)
<i>Adoptive father</i>	1 (1.1)	0 (0.0)
<i>Foster mother</i>	0 (0.0)	0 (0.0)
<i>Foster father</i>	2 (2.3)	0 (0.0)
<i>Grandmother</i>	0 (0.0)	2 (2.3)
<i>Grandfather</i>	2 (2.3)	0 (0.0)
<i>Other</i>	0 (0.0)	2 (2.3)
<i>Not Applicable</i>	--	4 (4.5)
Highest Level of Education	n (%)	n (%)
<i>Kindergarten to 8th grade</i>	0 (0)	0 (0.0)
<i>Some high school, no diploma</i>	0 (0)	2 (2.3)
<i>High school diploma/GED</i>	3 (53.4)	8 (9.1)
<i>Some college, no degree</i>	6 (6.8)	6 (6.8)
<i>Trade/Technical/Vocational</i>	0 (0)	5 (5.7)
<i>Associate Degree</i>	10 (11.4)	4 (4.5)
<i>Bachelor's Degree</i>	24 (27.3)	25 (28.4)
<i>Master's Degree</i>	27 (30.7)	19 (21.6)
<i>Professional Degree</i>	11 (12.5)	5 (5.7)
<i>Doctorate Degree</i>	7 (8.0)	6 (6.8)
<i>Not Applicable</i>	--	8 (9.1)
Occupation	n (%)	n (%)
<i>Student</i>	1 (1.1)	1 (1.1)
<i>Stay-at-home</i>	10 (11.4)	5 (5.7)
<i>Teacher/Educator</i>	20 (22.7)	7 (8.0)
<i>Nursing/Medical/Health Service</i>	28 (31.8)	8 (9.1)
<i>Food Service</i>	1 (1.1)	1 (1.1)
<i>Retail</i>	0 (0.0)	1 (1.1)
<i>Skilled Trade</i>	1 (1.1)	12 (13.6)
<i>Professional/Management</i>	17 (19.3)	26 (29.5)
<i>Other</i>	10 (11.4)	19 (21.6)
<i>Not Applicable</i>	--	8 (9.1)

Exclusionary Criteria. After accounting for participants who completed the phase one survey and the phase two survey, a total of 9 participants were excluded from the study. Participants were excluded from analyses if the caregiver reported a behavioral health disorder (i.e., developmental delay) (n = 1). A parent-reported sleep disorder was also an exclusionary criterion, although no children in the present sample were identified as having such a disorder. Other survey responses were excluded if the caregiver responded to the surveys about two different children (i.e., provided a different birth date on the phase 2 survey than the phase 1 survey) (n = 3), if duplicate responses were observed (i.e., responding to surveys twice) (n = 2), and due to incomplete survey responses (n = 3).

Timeline

Recruitment began in February 2019, and the first phase of surveys were distributed via REDCap on March 1, 2019. Figure 1 provides a timeline of survey completion during phase one and indicates that the bulk of data collection occurred before March 2020, at which point COVID-19 was becoming prevalent in North Carolina. Phase two surveys were distributed to families via REDCap on May 27, 2020. Families received weekly reminder emails for one month, with a final reminder email being sent on June 25, 2020. The last survey from phase two was completed on July 20, 2020, and a final report was submitted to the ECU IRB on July 30, 2020. Figure 2 provides a timeline of survey completion during phase two.

Figure 1

Phase 1 Survey Completion Timeline

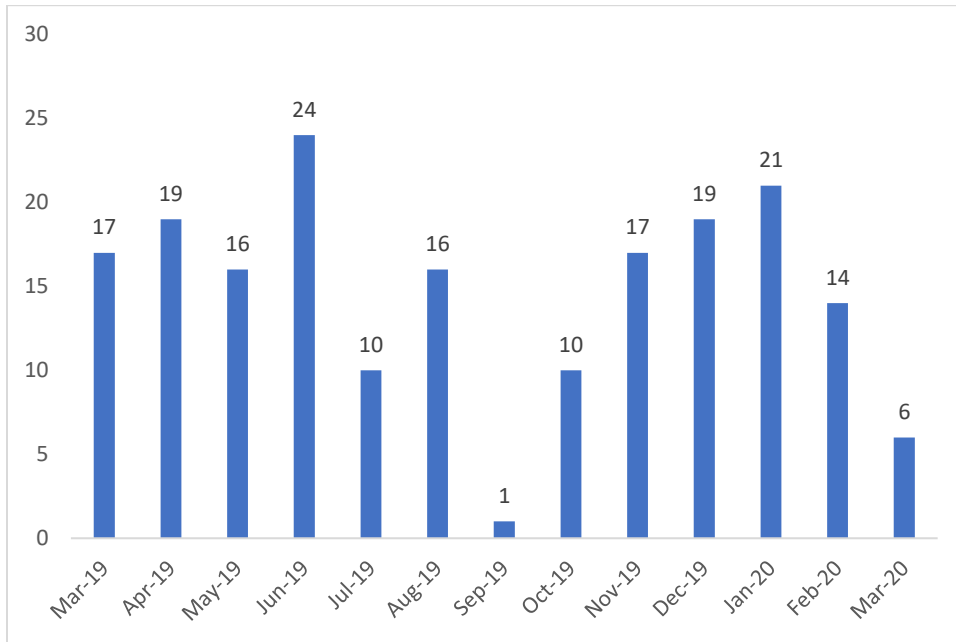
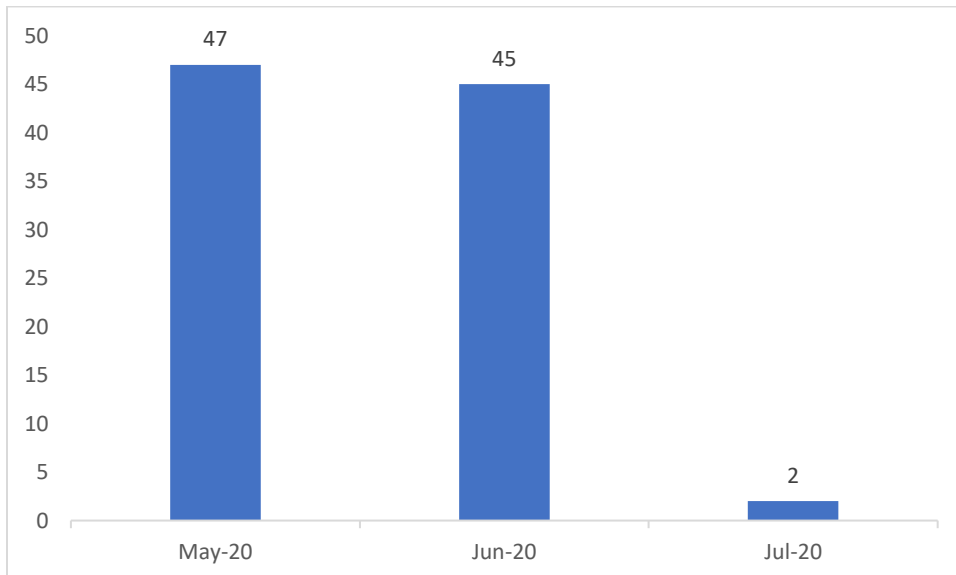


Figure 2

Phase 2 Survey Completion Timeline



Measures

Caregiver-report measures used in the present study collected information on child and family demographic characteristics, child media use habits, and child sleep habits. An additional fourth measure was also distributed to assess child temperament; however, child temperament data were not included in the present study. Each survey measure was created to be an independent stand-alone measure, although the four original measures (i.e., demographics, media use habits, sleep, and temperament) were linked, such that all measures were distributed via one individual REDCap survey link and data from one survey was linked to all others. Families were sent periodic reminder emails via REDCap alerting them to incomplete surveys.

In the second phase of the study, a link to the COVID-19 follow up survey was distributed via REDCap to caregivers who had already provided written consent and completed the original media use survey in phase one. A separate written consent to participate was not required by the IRB, although families were presented with an electronic consent prior to viewing survey items. The COVID-19 follow-up survey was designed to assess for demographic changes and changes in media use and sleep habits. As such, data from the follow-up measure were linked to data from the original measures.

Demographics. The original demographic survey, comprised of 21 questions, was developed specifically for the purposes of this study (see Appendix E). The demographic survey was emailed via REDCap to each child's caregiver using the email address provided on the consent form by the consenting adult. The demographic survey included both child- and caregiver-specific items. Some items specific to the child included the child's race, age, sex, primary language, and any medical diagnoses or diagnoses related to a developmental delay or attention problems. Items specific to the caregiver included the caregiver's relationship to the

child (e.g., birth mother, birth father, stepmother, stepfather, etc.), their occupation, highest level of education completed, household income, and household structure (e.g., age, gender, and relationship to child of all individuals living in the home). The demographic survey employed branching logic, such that some respondents may not have been required to answer all 21 questions depending on answers to previous questions. For example, if the respondent indicated that the child had only one caretaker, questions about a second caretaker's occupation and education were not displayed.

Media Use Survey. The original media use survey, comprised of 46 questions, was developed specifically for the purposes of this study because there is not a widely used or standardized measure to assess children's media use (see Appendix F). Like other measures used, the media use survey also included branching logic such that some respondents may not have been required to answer all 46 questions depending on answers to previous questions. The media use survey collected data on caregiver perception of media's effect on family time (i.e., media causes more, less, or no difference in time spent with family), the availability of media devices in the home, the frequency of background television, the frequency of the child using multiple media devices, the amount of time the child spent engaging with media independently and with an adult, the presence or absence of a television in the child's bedroom, and the child's three favorite shows and apps. Caregivers were also asked if their child's pediatrician or primary care provider discussed media use with the family.

The Children's Sleep Habits Questionnaire (CSHQ). The *Children's Sleep Habits Questionnaire* is a standardized caregiver-report measure designed to assess sleep behavior in children (Owens et al., 2000). The measure includes 45 items to assess bedtime behavior and sleep onset, sleep duration, night wakings, daytime sleepiness, and other sleep-related concerns

(see Appendix G). However, total sleep duration was the only relevant question to the present study. Sleep duration was calculated based on caregiver response to the following survey item: “Number of minutes the child sleeps each day (including naps).”

Follow-Up Survey. The follow-up survey, comprised of 39 questions, was developed specifically for the purposes of this study (see Appendix H). The follow-up survey was distributed via REDCap to respondents of previous survey measures. Although this survey was initially distributed on May 27, 2020, caregivers provided responses between May and July 2020. It is important to note that the follow-up survey specifically inquired about the child’s behavior and activities during the initial shelter-in-place order in effect from March 30 to May 8, 2020.

The follow-up survey collected data about changes to the family because of the COVID-19 pandemic, including changes in employment (e.g., job loss, working from home, no change), childcare status (e.g., staying at home, staying in someone else’s home, childcare facility), and educational status (e.g., virtual learning, printed packets, at-home learning). Other items targeted changes in sleep and media use from prior to and during the COVID-19 pandemic. Specific items asked whether the child was sleeping more or less (or no different) during COVID-19 than before the pandemic, using more or less media (or no different) during COVID-19 than before the pandemic, using new types of media, and/or using new apps. In addition to the qualitative items, caregivers were asked to report the child’s sleep duration (quantitatively), using the same question that was previously used in the *Children’s Sleep Habits Questionnaire*. Caregivers were also asked to answer quantitative questions about the child’s media use during the COVID-19 pandemic that were similar to questions on the initial media use survey, including the number of

days per week that the child engaged in a variety of media use activities and the duration of the engagement per day.

Data Analysis

All data were collected using REDCap and were analyzed using SPSS (v 28.0). Descriptive statistics were analyzed for all study variables. To address Hypotheses 1 and 2, paired-sample t-tests were utilized to describe differences in media use and sleep totals between phase 1 and phase 2. To address Hypothesis 3, a hierarchical regression analysis was conducted to determine if media use predicted the change in sleep. Household income and child sex were included as control variables in the model. To evaluate the extent to which changes in media use during the pandemic are related to sleep, a hierarchical multiple linear regression was conducted. Daily average media use was coded based on time point to predict sleep duration as the continuous dependent variable. Given the literature on sex and household income differences among patterns of sleep and media use in children, these were included as control variables in the present analysis and entered in step 1. Average daily media use during COVID-19 was entered into the model at step 2.

Power Analysis

When examining sleep patterns in Australian adolescents, Bei et al., (2014) found medium effects of school day versus vacation on total sleep time. Because many children's schedules during the pandemic resembled schedules for summer vacation, it is plausible that similar patterns will be found in the present sample. A post-hoc power analysis using the statistical software G*Power 3.1 (Faul et al., 2009) was conducted to determine the available power for the present sample size. A sample size of 88 was used for statistical power analyses and a 3-predictor variable equation was used as a baseline. The recommended effect sizes used

for this analysis were small ($f^2 = .02$) and medium ($f^2 = .15$), based on previously cited literature (Cohen, 1977). The alpha level was set at $p < .05$ and the statistical power was found to be .37 for small effects and .97 for medium effects. As such, the present analyses are suitable to detect medium effects.

CHAPTER 3: RESULTS

Descriptive Statistics

Prior to the COVID-19 pandemic, most children in the present sample were attending a daycare, preschool, or school facility outside of the home. Likely due to the shelter-in-place order and subsequent closing of most schools and childcare facilities across the state, the trend in childcare was reversed during the second phase of data collection and most children were staying at home with a caregiver. Given school closures, the nature of education also changed between phase 1 and 2 of data collection. Information about childcare and education settings are presented in Table 5 below. Overall, most caregivers perceived that their child's media use increased with the pandemic (75%) and sleep remained the same (68.2%). Descriptive statistics surrounding sleep and media are presented below.

Table 5*Childcare Settings*

Childcare Setting	Phase 1 n	Phase 2 n
Staying at home	15	82
<i>Virtual learning daily</i>		22
<i>Virtual learning 2-4x/week</i>		15
<i>Virtual learning 1x/week</i>		8
<i>Printed packets</i>		18
<i>Independent learning at home</i>		16
<i>Other</i>		3
Home-based care	1	0
Daycare/school	91	4
<i>Center-based daycare</i>	36	
<i>Montessori school</i>	21	
<i>Charter school</i>	4	
<i>Public school</i>	19	
<i>Private school</i>	11	
Other	0	2

Note: Some caregivers indicated their child utilized a combination of childcare prior to the pandemic. As a result, the total N in phase 1 is greater than the total sample size.

Sleep

During phase 1 of data collection, children in the present study (aged 4.01—6.69 years; *Mdn* = 4.86 years) were reportedly sleeping an average of 661.31 minutes per day (*SD* = 52.39). When caregiver perceptions on sleep changes were assessed during phase 2 of data collection, 68.2% of caregivers perceived no changes in sleep, 19.3% perceived an increase in sleep, and 12.5% perceived a decrease in sleep. During phase 2, the children (then aged 4.33—7.71 years; *Mdn* = 5.64 years) experienced, on average, a decrease in their average minutes of sleep per day. Children averaged approximately half an hour less of sleep per day (*M* = 625.23, *SD* = 53.94) during the COVID-19 pandemic, indicating a significant decrease in sleep durations from phase 1 to phase 2, $t(87) = 4.82, p < .001$. Descriptive statistics for sleep are presented below in Table 6.

Media Use

During phase 1, over half of the children in the present study were reportedly using approximately one hour of media per day, on average ($M = 66.05$, $Mdn = 52.60$, $SD = 51.93$).

When caregiver perceptions on media use changes were assessed during phase 2 of data collection, 75.0% of caregivers perceived an increase in media use, 18.2% perceived no change in media use, and 6.8% perceived a decrease in media use. Consistent with most caregiver perceptions, media use during phase 2 nearly doubled on average ($M = 119.51$, $Mdn = 108.75$, $SD = 67.71$). In support of hypothesis 1, media use during phase 1 was significantly less than the media use during phase 2, $t(87) = 9.00$, $p < .001$. Descriptive statistics for media use are presented below in Table 6.

Table 6.

Descriptive Statistics for Phase 1 and Phase 2

Variables	<i>N</i>	<i>M</i>	<i>SD</i>	<i>Mdn</i>	Min	Max	Skewness	Kurtosis
Phase 1 Age (years)	88	4.99	0.76	4.86	4.01	6.69	0.38	-0.52
Phase 2 Age (years)	88	5.79	0.64	5.64	4.33	7.71	0.43	-0.34
Phase 1 Sleep Duration (min.)	88	661.31	52.39	660.00	540.00	810.00	0.39	0.14
Phase 2 Sleep Duration (min.)	88	625.23	53.94	630.00	480.00	780.00	-0.52	1.08
Phase 1 Media Use (min.)	88	66.05	51.93	52.60	3.00	316.70	1.90	5.89
Phase 2 Media Use (min.)	88	119.51	67.71	108.75	10.07	394.00	1.47	3.69

Regression

The sample size ($N = 88$) was deemed adequate using GPower for three independent variables to be included in a linear regression, with small effect sizes (Faul et. al., 2009). Residual diagnostics were implemented following analyses, to determine that all analysis assumptions were met. An analysis of leverage, standardized residuals, and influence was carried out on the data to identify any points with substantial influence. Per Ley et al., (2018), the following were cut points were compared to: residual scores (> 3.0), Cook's distance (> 1), Mahalanobis distance (> 20), and leverage (> 0.14). Normality of residuals was examined using Normal q-q plots of the standardized residuals for each model. No outliers were identified, and all assumptions of the analysis were met. **Change in**

sleep was calculated by taking the difference in sleep between the COVID measure and the pre-COVID measure. Hierarchical regression was used to examine hypothesis 3, which stated that greater media use duration would predict a decrease in sleep duration after accounting for sociodemographic variables. It was specifically hypothesized that male participants and participants of lower household income would report greater decreases in sleep. Using hierarchical regression, change in sleep was predicted by household income, sex, phase 1 media use, and phase 1 sleep in step one. Media use at phase 2 was then added to characterize if the difference in sleep was related to the difference in media use. The demographic variables were entered in this order given the documented effects of sex and income on media use in the existing literature. The regression statistics are presented in Table 7. The hierarchical regression revealed that the regression model was statistically significant at step one, $F(4, 75) = 13.48, p < .001$, and explained 41.8% of the variance in the change in sleep. Considering income, child sex, and pre-COVID levels of media use and sleep, media use at time 2 did not predict change in sleep over the course of the study. The only significant predictor of change in sleep over the course of the study was pre-COVID sleep duration. Results of the regression indicate that a one unit increase in pre-COVID sleep duration predicted a .82 unit decrease in the change in sleep. The introduction of media use during COVID at step 2, did not explain any additional variance in the model ($\Delta R^2 = 0$).

Table 7

Regression Statistics

Variable	B	<i>t</i>	<i>p</i>	sr ²	R	R ²	Adj. R ²	ΔR ²
Step 1					.647	.418	.387	
Average Media Use (Pre-COVID)	-0.05	-0.41	0.681	.001				
Average Sleep Duration (Pre-COVID)	-0.82	-6.86	<.001	.365				
Household Income	3.53	0.99	0.327	.006				
Child Sex	10.33	0.80	0.428	.005				
Step 2					.647	.418	.379	0
Average Media Use (COVID)	-0.01	-0.04	0.968	.000				

Note. The dependent variable is Change in Sleep

*Unstandardized beta coefficients

CHAPTER 4: DISCUSSION

While other studies have addressed patterns of sleep and media use during the COVID-19 pandemic, the present study is unique in its utilization of a repeated measures design and investigation of sociodemographic factors related to these patterns. Many studies reviewed in a 2021 meta-analysis analyzing changes during the COVID-19 pandemic utilized a similar sociodemographic sample from a previous time period as the basis for comparison (Sharma, et al., 2021), making the present study unique in its ability to compare the same sample at two time points. Results from existing studies examining patterns of media use and sleep during the COVID-19 pandemic appear to be mixed.

In the current study, more than half of the children in the sample were following the media use recommendations set forth by the AAP prior to the COVID-19 pandemic. More children and families were adherent to the AAP recommendations before the pandemic than expected, based on the sample described by Rideout and Robb (2020) where average media use for preschool-aged children exceeded two hours. Consistent with the hypothesized findings and with existing literature (Tandon et al., 2021; Werling et al., 2021), however, media use significantly increased during the early stages of the pandemic for the present sample. Children's media use more than doubled during the pandemic, with many children exceeding the media use recommendations from the AAP. The average media use during the COVID-19 pandemic was surprisingly more consistent with Rideout and Robb's (2020) pre-COVID estimates of media use, which suggested children aged two to four were using round two hours of media per day and children aged five to eight were using more than three hours of media per day. This finding is consistent with findings from Olds et al. (2019) and provides some support for similarities between early COVID-19 lockdowns and summer vacation schedules in terms of children's

behavior. Results from the present surveys indicated that caregivers noticed this change, too, with 75% of caregivers noticing that their child's media use had increased. This increase in media use is consistent with changes in media use observed between school days and holiday breaks, suggesting that during the early weeks of the pandemic, children and families may have been operating on a "summer vacation" schedule rather than establishing a completely new routine in the face of a global pandemic (Olds et al., 2019; Weaver et al., 2020).

While literature consistently finds an increase in media use over summer breaks, the current literature is mixed in terms of how a "summer vacation" schedule impacts children's sleep. Nixon and colleagues (2008) found that sleep decreases during summer months, while Hunt and colleagues (2021) and Brazendale and colleagues (2018) found that sleep duration increases during summer months. The average total sleep duration in the present sample decreased during the pandemic, which was contrary to both the hypothesized results and to the more recent research on summer vacation (Brazendale et al., 2018; Hunt et al., 2021). Children in the present sample were sleeping approximately half an hour less, on average, during the early weeks of the pandemic than prior to the COVID-19 pandemic and yet continued to meet recommended sleep totals at both time points.

Although there was a significant decrease, on average, during the COVID-19 pandemic, the average sleep durations of children in the present sample still exceed the minimum hours of sleep recommended by the AASM and NSF guidelines (see Table 1) for preschool-aged children. The average sleep durations found in the present sample at both time points were comparable to the average sleep duration (628.20 minutes) found by Scharf and colleagues (2013) in a sample of 4-year-old children. Additionally, the sleep durations for the present sample are consistent with those reported in a meta-analysis by Galland and colleagues (2018). The meta-analysis

reports sleep durations that range from 9.18 to 10.20 hours (550.8–612 minutes) in preschool aged populations and from 8.10 to 9.86 hours (486–591.6 minutes) in school aged populations. Children in the present sample averaged 10.41 hours prior to the pandemic, and 11 hours in the early weeks of the pandemic (see Table 6). Unlike media use, caregivers in the present sample were less attuned to their child’s sleep changes. Over half of caregivers in the present sample perceived no changes to their child’s sleep durations prior to and during the pandemic. Notably, the change in sleep was much smaller in magnitude than the change in media use, although both changes were statistically significant.

In addition to describing patterns of media use and sleep during the pandemic, the present study also aimed to determine if pre-pandemic media use predicted how children’s sleep duration changed during the COVID-19 pandemic. Current literature indicates that having a television in the bedroom, evening media use, and viewing media with violent content are related to sleep problems in pediatric populations (Brockmann et al., 2016; Cain & Gradisar, 2007; Cespedes et al., 2014; Garrison, Liekweg, & Christakis, 2011). Given the hypothesized increase in media use during the pandemic and the lack of structure resulting from school closures and other disruptions to daily routines, it was hypothesized that an increase in media use during the pandemic would yield shorter sleep durations. Results indicate that children’s media use before the pandemic was predictive of the child’s sleep change during the pandemic. However, *change* in media use during the COVID-19 pandemic did not account for any additional variance in changes to children’s sleep. This leads to the question, what other factors may be contributing to sleep changes in the present sample?

From the perspective of the socio-ecological model, a child exists as the center of a layered system, where there are multiple levels and interactions that exert an influence on the

child at the center of the system (Bronfenbrenner, 1977; Bronfenbrenner, 1979; Jack, 2000; Kilanowski, 2017). The SEM maintains that one factor (e.g., policy changes as a result of the global COVID-19 pandemic) can exert influence across multiple levels to create behavior changes for the individual at the center of the system. The COVID-19 pandemic yielded policy changes like shelter-in-place orders and lockdowns across the world. These policy changes then impacted communities, organizations, relationships, and individuals. For some children and families, these changes created a barrier to typical, day-to-day behaviors and therefore impacted children's patterns of sleep and media use.

The current study considered how intra-individual factors like sex, household income, and individual media use habits may have influenced the observed change in the child's sleep, all within the context of policy changes resulting from the global pandemic. By focusing only on intra-individual factors, the model does not capture changes at more distal levels that may have influenced the child's sleep behaviors. Communities, organizations, and relationships were all impacted by the policy changes during the pandemic. For many families, policies resulting from COVID-19 caused changes to patterns of socialization and physical activity, to childcare settings due to the closure of daycare centers and schools, and to the child's home environment due to tele-working caregivers and virtual interactions with teachers. These factors, and many others that are likely to influence an individual's behaviors, were not considered in the present model for sleep changes.

For instance, caregiver stress was not assessed in the present study. Caregiver stress was likely influenced by the downstream effects of policy changes related to the pandemic and has been associated with poorer self-regulation, emotional distress, and sleep difficulties in preschool-aged children (El-Sheikh & Kelly, 2017; Thibodeau-Nielsen et al., 2021). Similarly,

childcare was influenced by the downstream effects of pandemic policy changes, although this was not assessed in the present study. During the COVID-19 pandemic, the accessibility of childcare settings sometimes depended on a parent's occupation. In some areas, healthcare workers were able to use childcare facilities whereas non-healthcare workers were forced to utilize other options for childcare (Rivest, 2021). Many children in the United States spend a great deal of time being cared for outside of their home. This inevitably influences the child's behavior and development. The SEM illustrates how a policy change influenced the accessibility of childcare, which likely influenced the child at the center of the system in some capacity. This interrelatedness of socio-ecological factors is not well accounted for in the present model.

Although the SEM proposes an almost limitless number of factors that may influence a child's behavior, when considering changes to these factors brought on by COVID-19 related policy changes, some factors stand out as possibly being more influential than others. Previously mentioned factors such as caregiver stress and childcare setting, both of which may be related to caregiver occupation, could contribute to sleep changes. Other factors related to media use may also contribute. For example, the timing of media use (e.g., used throughout the day or concentrated to evening hours) was not included but may influence a child's sleep.

While the present findings leave some additional questions unanswered, these results provide reason for optimism regarding the impact of the pandemic on children. Despite a significant increase in media use between pre-pandemic and during the pandemic, whether for leisure or for virtual learning, children in the present sample on average continued to exceed the minimum ten hours of sleep recommended by both the AASM and NSF. This finding provides some evidence to suggest that media can be used as a functional tool for families, possibly

without increasing health risks (specifically sleep deficits) traditionally associated with increased media use.

The increase in media use that occurred during the pandemic did not result in clinically relevant short sleep (i.e., sleep totals below the minimum amount recommended by the AASM) for most children, despite a significant decrease in total sleep duration from pre-pandemic times to during the pandemic. Although the present study did not collect information on other health related behaviors like nutrition and physical activity, research suggests that short sleep durations lead to less energy and thus decreased physical activity and increased food intake (Bell & Zimmerman, 2010). Other research supports the idea of early childhood as a sensitive window for developing healthy sleep habits, given longstanding effects of short sleep on fat mass disposition (Diethelm et al., 2011). Given that data from the current sample does not provide support for short sleep durations, caregivers may be cautiously optimistic that their child's increase in media use during the pandemic has not had long-lasting impacts on overall health and development. These findings also illustrate the need for organizations and policymakers to re-evaluate recommendations on screen time and media use. More media use may be an inescapable reality for caregivers who are working from home or quarantining during the pandemic. Practitioners should be prepared to assist families by discussing the potential risks and benefits of media use, and ways to mitigate potential risks.

Future Directions and Limitations

As discussed above, the present study neglects to consider broader factors that influence child development. Future research should consider factors more distal to the child to better capture variance that contributes to child development and child-specific changes during the COVID-19 pandemic. Expanding the model to include parent occupation may explain some

variance and may serve as a proxy for caregiver stress, given some evidence to suggest that children of healthcare workers experienced greater impairment in sleep during the pandemic than children of non-healthcare workers (Bucak et al., 2021). Other factors such as family size and caregiver education may also be important to consider in future iterations of this research. Because the present study utilizes a two-timepoint model, it is unclear if the increase in media use and decrease in sleep found during phase 2 was sustained throughout the pandemic. Future iterations should also aim to expand the timeline of data collection, allowing for a multi-timepoint model rather than the two-timepoint model utilized here.

Although the topic is continuing to be studied, early research has found that patterns of media use during early phases of the pandemic (i.e., around the time of the present study's phase 2 data collection) were not sustained later in the pandemic as children and families established and adjusted to new routines (Werling et al., 2021). Additionally, in a population of Swedish children and adolescents established with psychiatry, media use generally returned to pre-pandemic levels later in the pandemic. Media use in males remained slightly higher than females (Werling et al., 2021). Overall, these findings suggest that negative effects of media use increases were generally reversible and may reframe media as a positive coping strategy for many families.

Demographic variables used in the present analysis were collected during pre-pandemic data collection. The demographic questions utilized in the follow-up survey did not consider the possibility of changes to family structure between the two data collection time points, which presents a limitation to the present analysis. Family size may have increased or decreased, caregiver occupations may have changed, and household income may have changed between these time points, yet this change was not captured in the present data collection efforts.

Demographic data collected prior to the COVID-19 does not clearly indicate whether a child's primary caregivers were involved in frontline work during the pandemic, which may be a significant factor to consider in future research based on existing literature about unique parenting stress experienced by frontline workers (Davis, 2021; Souadka et al., 2020). Other work indicates that there was a lull in marriage and divorce during early months of the pandemic (Manning & Payne, 2021) and there was a statistically significant decrease in median household income in 2020 (Shrider et al., 2021).

To maintain consistency between the pre-pandemic and mid-pandemic questionnaires, many questions remained the same across the two measures. While this was helpful in some capacity, this also presents significant limitations. The follow up measure created for this project considers various types of leisurely media use and how long each type of media is used but it does not provide an accurate depiction of the media devices or platforms that may have been utilized for virtual learning. Questions on the COVID-19 follow up measure related to media use are primarily focused on leisurely media use and do not specifically account for a platform for completing virtual learning activities. Although the survey captures media use during the first several weeks of pandemic-related shutdowns, it is neglecting media use related to educational activities and does not consider whether virtual learning was occurring synchronously (i.e., via Zoom) or asynchronously. Given that approximately half of the sample was reported to engage in virtual learning at least one day of the week, the average daily media use derived from survey responses is likely an underestimation of children's media use consumption during the shelter-in-place order.

Most of the current sample identified as White/Caucasian and most caregivers were highly educated. Rideout and Robb (2020) identified significant differences in media use across

different ethnic/racial groups, where the White/Caucasian children utilized significantly less media than either Black or Hispanic/Latinx children. Given that the present sample was not diverse enough to assess for differences in media use across ethnic/racial groups, a more heterogeneous group may lead to different or more significant findings. There are documented differences in media use among different racial/ethnic groups, such that minority children use one hour of media more per day, than their White counterparts (Rideout & Robb, 2020). A more heterogeneous group may have led to more variability in media use changes. Additionally, most participants indicated their household income exceeded \$75,000. Although household income and SES are not synonymous, an income over \$75,000 has been labeled as higher income in previous research of child media use (Rideout & Robb, 2020) and income under \$30,000 is generally classified as lower income. Notably, federal poverty guidelines recognize a household income of \$26,200 as the poverty threshold in 2020 (U.S. Census Bureau, 2021). Applying this trichotomy, most participants were from high income homes. There is significant support for a gap in screen use between low- and high-income households based on access to media devices and parent perception about media use (Rideout & Robb, 2020). Although household income was accounted for in the present regression analysis, it is possible that a more complex, resource-based measure of SES may produce more nuanced findings.

Conclusion

The present study utilized a sample of 88 children and their caregivers to assess media use and sleep habits, and whether child sex, household income, and media use were related to changes in sleep observed in the early weeks of the COVID-19 pandemic. Results of the present study support the notion that many families operated on a “summer vacation” schedule during the early weeks of the pandemic, with increased screen time and decreased sleep. Contrary to

hypothesized results, considering income, child sex, and pre-COVID levels of media use and sleep, media use at time 2 did not predict change in sleep over the course of the study. Sleep at time 1 (prior to the pandemic) was in fact the only significant predictor of the change in sleep over the course of the study. Applying Bronfenbrenner's socio-ecological model to the present study, there are a number of factors beyond the child-specific factors included here, that future research could examine to determine the influence on child development and child behavior. Future research should expand upon the current model, both in terms of timepoints of data collection and in factors considered in the model that may explain additional variance in the change in sleep.

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Appendix A: IRB Approval



EAST CAROLINA UNIVERSITY
University & Medical Center Institutional Review Board
4N-64 Brody Medical Sciences Building · Mail Stop 682
600 Moye Boulevard · Greenville, NC 27834
Office 252-744-2914 · Fax 252-744-2284 ·
www.ecu.edu/ORIC/irb

Notification of Initial Approval: Expedited

From: Social/Behavioral IRB
To: [Brittany Goss](#)
CC: [Lori Curtindale](#)
Date: 2/6/2019
Re: [UMCIRB 18-002084](#)
The moderating effects of temperament on sleep and inhibition in preschoolers

I am pleased to inform you that your Expedited Application was approved. Approval of the study and any consent form(s) occurred on 2/5/2019. The research study is eligible for review under expedited category # 4, 7. The Chairperson (or designee) deemed this study no more than minimal risk.

Changes to this approved research may not be initiated without UMCIRB review except when necessary to eliminate an apparent immediate hazard to the participant. All unanticipated problems involving risks to participants and others must be promptly reported to the UMCIRB. The investigator must submit a Final Report application to the UMCIRB prior to the Expected End Date provided in the IRB application. If the study is not completed by this date, an Amendment will need to be submitted to extend the Expected End Date. The Investigator must adhere to all reporting requirements for this study.

Approved consent documents with the IRB approval date stamped on the document should be used to consent participants (consent documents with the IRB approval date stamp are found under the Documents tab in the study workspace).

The approval includes the following items:

Name	Description
Assent	Consent Forms
CBQ	Surveys and Questionnaires
Consent	Consent Forms
CSHQ	Surveys and Questionnaires
Demographics	Surveys and Questionnaires
Demographics	Data Collection Sheet
Demographics	Surveys and Questionnaires
Dissertation Proposal	Study Protocol or Grant Application
Flyer	Recruitment Documents/Scripts
Media Use	Surveys and Questionnaires
Recruitment Script	Recruitment Documents/Scripts

The Chairperson (or designee) does not have a potential for conflict of interest on this study.

Appendix B: IRB Amendment



EAST CAROLINA UNIVERSITY
University & Medical Center Institutional Review Board
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Notification of Amendment Approval

From: Social/Behavioral IRB
To: Kelli Long
CC: [Lori Curtindale](#)
Date: 5/27/2020
Re: [Ame13_UMCIRB 18-002084](#)
[UMCIRB 18-002084](#)
The moderating effects of temperament on sleep and inhibition in preschoolers

Your Amendment has been reviewed and approved using expedited review on 5/26/2020. It was the determination of the UMCIRB Chairperson (or designee) that this revision does not impact the overall risk/benefit ratio of the study and is appropriate for the population and procedures proposed.

Please note that any further changes to this approved research may not be initiated without UMCIRB review except when necessary to eliminate an apparent immediate hazard to the participant. All unanticipated problems involving risks to participants and others must be promptly reported to the UMCIRB. The investigator must submit a Final Report application to the UMCIRB prior to the Expected End Date provided in the IRB application. If the study is not completed by this date, an Amendment will need to be submitted to extend the Expected End Date. The investigator must adhere to all reporting requirements for this study.

Approved consent documents with the IRB approval date stamped on the document should be used to consent participants (consent documents with the IRB approval date stamp are found under the Documents tab in the study workspace).

The approval includes the following items:

Document	Description
COVID Follow Up Survey (0.01)	Surveys and Questionnaires
COVID Follow Up Survey Recruitment Script(0.03)	Recruitment Documents/Scripts
Expedited Survey Research Consent(0.01)	Consent Forms
PI Change	B. Goss to K. Long

For research studies where a waiver of HIPAA Authorization has been approved, each of the waiver criteria in 45 CFR 164.512(i)(2)(ii) has been met. Additionally, the elements of PHI to be collected as described in items 1 and 2 of the Application for Waiver of Authorization have been determined to be the minimal necessary for the specified research.

The Chairperson (or designee) does not have a potential for conflict of interest on this study.

Appendix C: Consent Form

East Carolina University



Informed Consent to Participate in Research

Information to consider before taking part in research that has no more than minimal risk.

Title of Research Study: Moderating Effects of Temperament on Sleep and Inhibition in Preschoolers
Principal Investigator: Brittany Goss, MS, MA
Institution/Department or Division: Infant and Child Cognitive Lab/Department of Psychology
Address: 1038 WH Smith Blvd., Suite 102, Greenville, NC 27858
Telephone #: 252-737-4957

Researchers at East Carolina University's (ECU) Infant and Child Cognitive Lab, a division of the Department of Psychology, study problems in society, health problems, environmental problems, behavior problems and the human condition. Our goal is to try to find ways to improve the lives of you and others. To do this, we need the help of volunteers who are willing to take part in research. The following information is provided for you to decide whether you and your child wish to participate in the present study. If you decide not to participate in this study, or later withdraw from participation, your or your child's relationship with this lab, the services it may provide, or with East Carolina University will not be affected.

Why is this research being done?

The purpose of this research is to gather information on the potential relationship between sleep, temperament, media use and inhibition in preschoolers. The decision to take part in this research is yours to make. By doing this research, we hope to learn more about how sleep, temperament and media use relates to inhibition in preschoolers.

Why am I being invited to take part in this research?

You are being invited to take part in this research because you have a child or children of the appropriate age range (4 to 5 years of age). If you volunteer to take part in this research, you will be included with other volunteers from the community as participants.

Are there reasons I should not take part in this research?

You should not take part in this research if your child is younger or older than the population being researched, or if you know in advance that you will not be able to participate in all aspects of the research. There are no health, gender, or race requirements needed to be a participant.

What other choices do I have if I do not take part in this research?

You can choose not to participate.

Where is the research going to take place and how long will it last?

The research procedures will be conducted at your child's school or at the ECU Infant and Child Cognition research lab, located at 1038 WH Smith Blvd, Suite 102. The total amount of time your child will be asked to volunteer for this study is 20 minutes.

What will I be asked to do?

To conduct our research, you will be asked to complete several questionnaires and your child will be asked to play a game on an iPad.

Page 1 of 3

Consent Version # or Date: _____

Title of Study: Moderating Effects of Temperament on Sleep and Inhibition in Preschoolers

What possible harms or discomforts might I experience if I take part in the research?

It has been determined that the risks associated with this research are no more than what you would experience in everyday life.

What are the possible benefits I may experience from taking part in this research?

It is unlikely that this study will provide any direct benefit to you or your child, but your participation will make an important contribution toward our understanding of the potential relationship between sleep, temperament and inhibition in preschoolers. Upon your request, we will send you a general report of our results.

Will I be paid for taking part in this research?

Participants will be entered into a drawing to win one of five Walmart gift cards valued at \$20.

Who will know that I took part in this research and learn personal information about me?

To do this research, ECU and the people and organizations listed below may know that you took part in this research and may see information about you that is normally kept private. With your permission, these people may use your private information to do this research:

- Any agency of the federal, state, or local government that regulates human research. This includes the Department of Health and Human Services (DHHS), the North Carolina Department of Health, and the Office for Human Research Protections
- The University & Medical Center Institutional Review Board (UMCIRB) and its staff, who have responsibility for overseeing your welfare during this research, and other ECU staff who oversee this research.
- Additionally, the following people and/or organizations may be given access to your personal health information and they are: Dr. Lori Curtindale, and other research members of the Infant and Child Cognition Lab.

How will you keep the information you collect about me secure? How long will you keep it?

Research records will be held in the strictest confidence and will be used solely for research purposes. Electronic data collected will be automatically assigned alphanumeric identifiers to help ensure confidentiality. Physical data, including consent and assent forms, will be stored in filing cabinets in the locked office of the Infant and Child Cognition Lab, which is located in a secure building. All electronic and physical data will be kept for seven years after the publication of the data.

What if I decide I do not want to continue in this research?

If you decide you no longer want to be in this research after it has already started, you may stop at any time. You will not be penalized or criticized for stopping. You will not lose any benefits that you should normally receive.

Who should I contact if I have questions?

The people conducting this study will be available to answer any questions concerning this research, now or in the future. You may contact the Principal Investigator at 252-737-4957 (Monday through Friday, between 9:00am and 5:00pm).

If you have questions about your rights as someone taking part in research, you may call the Office for Human Research Integrity (OHRI) at phone number 252-744-2914 (days, 8:00 am-5:00 pm). If you would like to report a complaint or concern about this research study, you may call the Director of the OHRI, at 252-744-1971.

Is there anything else I should know?

You may withdraw your consent to participate in this study at any time. You also have the right to cancel your permission to use and disclose information collected about you and your child, in writing, at any time, but sending

Page 2 of 3

Consent Version # or Date: _____

Title of Study: Moderating Effects of Temperament on Sleep and Inhibition in Preschoolers

written requests to: Brittany Goss at 1038 WH Smith Blvd., Greenville, NC 27858. If you cancel permission to use you and your child's information, the researchers will stop collecting additional information about you and your child. However, the research team may use information that was gathered before they received your cancelation as described above.

I have decided I want to take part in this research. What should I do now?

The person obtaining informed consent will ask you to read the following and if you agree, you should sign this form:

- I have read (or had read to me) all of the above information.
- I have had an opportunity to ask questions about things in this research I did not understand and have received satisfactory answers.
- I know that I can stop taking part in this study at any time.
- By signing this informed consent form, I am not giving up any of my rights.
- I have been given a copy of this consent document, and it is mine to keep.

Parent's Name (PRINT)

Signature

Date

Parent's Email Address (PRINT)

Date of Birth

Child's Name (PRINT)

Person Obtaining Informed Consent: I have conducted the initial informed consent process. I have orally reviewed the contents of the consent document with the person who has signed above, and answered all of the person's questions about the research.

Person Obtaining Consent (PRINT)

Signature

Date

Page 3 of 3

Consent Version # or Date: _____

Appendix D: Assent Form

East Carolina University



Verbal Assent Script *Things You Should Know Before You Agree To Take Part in this Research*

IRB Study # _____

Title of Study: The Moderating effects of Temperament on Sleep and Inhibition

Hi. My name is [researcher's/research assistant's name]. Right now, I'm trying to learn how kids your age behave. I would like to ask you to help me by being in a study, but before I do, I want to explain what will happen if you decide to help me.

I will ask you to play a game on an iPad, which will require you to tap the screen when you see a special animal. If you decide to be in the study, I will not use your name and no one will find out how you did.

Your [mom/dad] says it's okay for you to be in the study. But if you don't want to be in the study, you don't have to be. I won't be upset, and no one else will be upset, if you don't want to be in the study. If you want to be in the study now but change your mind later, that's okay. You can stop at any time. If there is anything you don't understand you should tell me so I can explain it to you.

You can ask me questions about the study. If you have a question later that you don't think of now, you can call me or ask [your parents] to call me or send me an email.

Do you have any questions for me now?

To be completed by person obtaining verbal assent from the child:

Would you like to be part of the study by playing the game?

Child's response: ☐ Yes ☐ No

Child's Name (printed)

Person Obtaining Assent (PRINT)

Signature

Date

Appendix E: Demographic Survey

Confidential

Page 1

Parent Survey

Please complete the survey below. Each item requires a response.

Thank you!

The following questions are concerning your preschool-aged child.

Child's First Name

(Please enter your preschool aged child's first name.)

What is [child_first_name]'s sex?

- ☐ Male
☐ Female

What is [child_first_name]'s date of birth?

Which of the following best describes [child_first_name]'s daytime childcare/educational setting(s)?

- ☐ In-home care (i.e. parent, nanny, or au pair)
☐ Home-based daycare
☐ Center-based daycare/preschool
☐ Montessori school
☐ Charter school preschool
☐ Charter school kindergarten
☐ Public school preschool
☐ Public school kindergarten
☐ Private school preschool
☐ Private school kindergarten
☐ Homeschool
☐ Other
(Please select all settings applicable to your child. If your child attends preschool part-time and stays at home with a parent/nanny part-time, please check both boxes.)

Which race/ethnicity best describes [child_first_name]?

- ☐ American Indian / Alaskan Native
☐ Asian / Pacific Islander
☐ Black / African American
☐ Hispanic / Latino
☐ White / Caucasian
☐ Biracial / Multiracial
☐ I prefer not to answer.

Is English [child_first_name]'s primary language?

- ☐ Yes
☐ No

What is [child_first_name]'s primary language?

- ☐ Spanish
☐ French
☐ Chinese
☐ German
☐ Italian
☐ Portuguese
☐ Other

03/08/2020 2:36pm

projectredcap.org



Does [child_first_name] have any medical diagnoses, developmental delays, or diagnoses related to attention?

- ☐ Yes
☐ No

If [child_first_name] has any medical diagnoses, developmental delays, or diagnoses related to attention problems, please describe.

(Please describe diagnosis if you answered yes to the previous question.)

Please enter your zipcode:

Please provide a list of all individuals living in the home with [child_first_name].

List their relationship to [child_first_name], their gender, and their age.

(Ex. 1. mother, female, 35; 2. father, male, 35; 3. brother, male, 10)

Is the person completing this form a primary caregiver of [child_first_name]?

- ☐ Yes
☐ No

The following questions are asking about the parent(s) and/or caretaker(s) living in the home with [child_first_name].

What is the relationship of Parent 1 / Caretaker 1 to [child_first_name]?

- ☐ Birth Mother
☐ Birth Father
☐ Step-mother
☐ Step-father
☐ Adoptive Mother
☐ Adoptive Father
☐ Foster Mother
☐ Foster Father
☐ Grandmother
☐ Grandfather
☐ Other

What is the highest level of education completed by Parent / Caretaker 1?

- ☐ Kindergarten to 8th grade
☐ Some High School / No Diploma
☐ High School Diploma / GED
☐ Some College / No Degree
☐ Trade / Technical / Vocational Training
☐ Associate's Degree (AA, AS)
☐ Bachelor's Degree (BA, BS)
☐ Master's Degree (MA, MS, MSW)
☐ Professional Degree (MD, DDS, DMD, DVM, JD)
☐ Doctorate Degree (PhD, EdD)

What is Parent / Caretaker 1's occupation?

- ☐ Student
☐ Stay-At-Home
☐ Teacher / Educator
☐ Nursing / Medical / Health Service
☐ Food Service
☐ Retail
☐ Agriculture / Farming
☐ Skilled Trade
☐ Professional / Management
☐ Other

What is the relationship of Parent 2 / Caretaker 2 to
[child_first_name]?

- ☐ Birth Mother
- ☐ Birth Father
- ☐ Step-mother
- ☐ Step-father
- ☐ Adoptive Mother
- ☐ Adoptive Father
- ☐ Foster Mother
- ☐ Foster Father
- ☐ Grandmother
- ☐ Grandfather
- ☐ Other
- ☐ N/A

What is the highest level of education completed by
Parent / Caretaker 2?

- ☐ Kindergarten to 8th grade
- ☐ Some High School / No Diploma
- ☐ High School Diploma / GED
- ☐ Some College / No Degree
- ☐ Trade / Technical / Vocational Training
- ☐ Associate's Degree (AA, AS)
- ☐ Bachelor's Degree (BA, BS)
- ☐ Master's Degree (MA, MS, MSW)
- ☐ Professional Degree (MD, DDS, DMD, DVM, JD)
- ☐ Doctorate Degree (PhD, EdD)

What is Parent / Caretaker 2's occupation?

- ☐ Student
- ☐ Stay-At-Home
- ☐ Teacher / Educator
- ☐ Nursing / Medical / Health Service
- ☐ Food Service
- ☐ Retail
- ☐ Agriculture / Farming
- ☐ Skilled Trade
- ☐ Professional / Management
- ☐ Other

What is the approximate household income for
[child_first_name]'s home?

- ☐ \$0 - \$24,999
- ☐ \$25,000 - \$49,999
- ☐ \$50,000 - \$74,999
- ☐ \$75,000 - \$99,999
- ☐ \$100,000 - \$124,999
- ☐ \$125,000 - \$149,000
- ☐ \$150,000+
- ☐ I prefer not to answer.

Would you like to be entered into a drawing to win a
\$20 Walmart gift card?

- ☐ Yes
- ☐ No

Please enter your email address so that we can
contact you if your name is drawn. (We will not
share your email address for any reason!)

(Please double-check that you have typed your
email address correctly.)

Appendix F: Media Use Survey (Phase 1)

Confidential

Page 1 of 4

Media-Use Survey

Please complete the survey below. Each question requires a response.

Thank you!

The following questions are about media-use and devices that are in your home.

In general, I feel that the media/devices in my home (like TVs, computers, video games, and mobile devices) cause my family members to spend....

- ☐ more time with other family members
☐ less time with other family members
☐ media/devices don't make much difference in how much time we spend with other family members

How does your family access television and movies in your home?

- ☐ Cable
☐ DVD/Bluray player
☐ Satellite
☐ Streaming Service(s) (e.g., Netflix, Hulu, Amazon Video, Youtube TV)
☐ Youtube (free)
☐ Other
☐ There is no access to television/movies in my home.
(Please mark all that apply.)

When someone is at home in your household, how often is the TV on (even if no one is actually watching it)?

- ☐ Always
☐ Most of the time
☐ Some of the time
☐ Hardly ever
☐ Never

The following questions are about [child_first_name]'s access to media and devices.

Which of the following does [child_first_name] have access to in your home?

- ☐ Smartphone
☐ Tablet (iPad, Android, other)
☐ Laptop
☐ Desktop
☐ Television
☐ Gaming Device (Xbox, Wii, PlayStation, etc.)
(Please mark all that apply.)

How often is [child_first_name] in the same room with a TV that is on, but is not watching the TV? For example, how often is your child playing in the living room while the TV in that room is on?

- ☐ Always
☐ Most of the time
☐ Some of the time
☐ Hardly ever
☐ Never

How often, if ever, does [child_first_name] like to use more than one type of device at a time? For example, play a handheld game while watching TV.

- ☐ Always
☐ Most of the time
☐ Some of the time
☐ Hardly ever
☐ Never

How many days per week does [child_first_name] engage in these activities:

	0 days	1 day	2 days	3 days	4 days	5 days	6 days	7 days
Watching shows/movies on TV	☐	☐	☐	☐	☐	☐	☐	☐
Watching shows/movies on a tablet or smartphone	☐	☐	☐	☐	☐	☐	☐	☐
Watching shows/movies on a desktop or laptop computer	☐	☐	☐	☐	☐	☐	☐	☐
Playing videogames on a gaming console (i.e., Wii, Xbox, Playstation)	☐	☐	☐	☐	☐	☐	☐	☐
Playing videogames on a tablet or smartphone	☐	☐	☐	☐	☐	☐	☐	☐
Playing videogames on a desktop or laptop computer	☐	☐	☐	☐	☐	☐	☐	☐
Using a tablet or smartphone to use apps or watch videos	☐	☐	☐	☐	☐	☐	☐	☐
Reading / Being read to	☐	☐	☐	☐	☐	☐	☐	☐

Does [child_first_name] have a television in his/her bedroom?

- ☐ Yes
☐ No

What is the main reason that [child_first_name] has a television in his/her bedroom?

- ☐ Frees up other TVs so other family members can watch their own shows
☐ Keeps the child occupied so parent can do other things
☐ It helps the child fall asleep
☐ Family bought a new TV and gave child old one
☐ To get the child to sleep in his/her own room
☐ It was provided as a reward for good behavior
☐ Child shares a room with an adult
☐ Child sleeps in a family room with a TV in it
(Please select the main reason.)

What are other reasons that [child_first_name] has a television in his/her bedroom?

- ☐ Frees up other TVs so other family members can watch their own shows
☐ Keeps the child occupied so parent can do other things
☐ It helps the child fall asleep
☐ Family bought a new TV and gave child old one
☐ To get the child to sleep in his/her own room
☐ It was provided as a reward for good behavior
☐ Child shares a room with an adult
☐ Child sleeps in a family room with a TV in it
☐ No additional reasons
(Please select additional reasons (i.e. reasons secondary to the reason selected in the above question).)

The next question is asking about [child_first_name]'s media use on a typical WEEKDAY.

Thinking about a typical WEEKDAY, about how much time, if any, did [child_first_name] spend:

	0 mins	1-15 mins	16-30 mins	31-45 mins	46-60 mins	61-75 mins	76-90 mins	91+ mins
Watching shows/movies on TV	☐	☐	☐	☐	☐	☐	☐	☐
Watching shows/movies on a tablet or smartphone	☐	☐	☐	☐	☐	☐	☐	☐
Watching shows/movies on a desktop or laptop computer	☐	☐	☐	☐	☐	☐	☐	☐
Playing videogames on a gaming console (Wii, Xbox, Playstation, etc.)	☐	☐	☐	☐	☐	☐	☐	☐
Playing videogames on a tablet or smartphone	☐	☐	☐	☐	☐	☐	☐	☐
Playing videogames on a desktop or laptop computer	☐	☐	☐	☐	☐	☐	☐	☐
Using a tablet or smartphone to use apps or watch videos	☐	☐	☐	☐	☐	☐	☐	☐
Reading/being read to	☐	☐	☐	☐	☐	☐	☐	☐

Is [child_first_name]'s media use different on a typical weekend than during a typical week?

☐ Yes

☐ No

((i.e., Does your child watch more television on the weekends?))

Thinking about a typical 24-hour period during the WEEKEND, about how much time, if any, did [child_first_name] spend:

	0 minutes	1-15 minutes	16-30 minutes	31-45 minutes	46-60 minutes	61-75 minutes	76-90 minutes	91+ minutes
Watching shows/movies on TV	☐	☐	☐	☐	☐	☐	☐	☐
Watching shows/movies on a tablet or smartphone	☐	☐	☐	☐	☐	☐	☐	☐
Watching shows/movies on a desktop or laptop computer	☐	☐	☐	☐	☐	☐	☐	☐
Playing videogames on a gaming console (Wii, Xbox, Playstation, etc.)	☐	☐	☐	☐	☐	☐	☐	☐
Playing videogames on a tablet or smartphone	☐	☐	☐	☐	☐	☐	☐	☐
Playing videogames on a desktop or laptop computer	☐	☐	☐	☐	☐	☐	☐	☐
Using a tablet or smartphone to use apps or watch videos	☐	☐	☐	☐	☐	☐	☐	☐

Reading/being read to ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐

The following question set is asking how often a parent or caretaker engages in activities with [child_first_name].

	Always	Most of the time	Some of the time	Almost never	Never
Watching shows/movies on TV	☐	☐	☐	☐	☐
Watching shows/movies on a tablet or smartphone	☐	☐	☐	☐	☐
Watching shows/movies on a desktop or laptop computer	☐	☐	☐	☐	☐
Playing videogames on a gaming console (Wii, Xbox, Playstation)	☐	☐	☐	☐	☐
Playing videogames on a tablet or smartphone	☐	☐	☐	☐	☐
Playing videogames on a desktop or laptop computer	☐	☐	☐	☐	☐
Using a tablet or smartphone to use apps or watch videos	☐	☐	☐	☐	☐
Reading/being read to	☐	☐	☐	☐	☐

The next section focuses on the content of the media that [child_first_name] uses.

Please indicate the channels, apps, or websites that your child uses

- ☐ Amazon Prime
- ☐ Boomerang
- ☐ Cartoon Network
- ☐ Disney Channel
- ☐ Disney XD
- ☐ Disney Junior
- ☐ Hulu
- ☐ Netflix
- ☐ Nickelodeon / Nicktoons / Teen Nick
- ☐ Nick Jr.
- ☐ PBS Kids
- ☐ Youtube
- ☐ Other

(Please mark all that apply.)

What other channels, apps, and/or websites does your child use that were not listed above?

What are the 3 shows that your child watches most often?

(Please list the 3 shows your child watches most often.)

What are the 3 apps that your child uses most often?

Has your child's pediatrician ever talked to you about media-use?

- ☐ Yes
☐ No

Appendix G: Sleep Survey (Phase 1)

Confidential

Page 1 of 3

Children's Sleep Habits Questionnaire (CSHQ)

Please complete the survey below. Each question requires a response.

Thank you!

Children's Sleep Habits Questionnaire (Preschool and School-Aged) BEDTIME

The following statements are about your child's sleep habits and possible difficulties with sleep. Think about the past week in your life when you answer the questions. If last week was unusual for a specific reason (such as your child had an ear infection and did not sleep well or the TV set was broken), choose the most recent typical week. Answer **USUALLY** if something occurs 5 or 6 times a week; answer **SOMETIMES** if it occurs 2 to 4 times a week; answer **RARELY** if something occurs never or 1 time during a week. Also, please indicate whether or not the sleep habit is a problem by choosing "Yes", "No", or "Not applicable (N/A)".

- 1) Date of CSHQ _____
- 2) Person completing CSHQ
☐ Birth Mother
☐ Birth Father
☐ Adoptive Mother
☐ Adoptive Father
☐ Foster Mother
☐ Foster Father
☐ Grandmother
☐ Grandfather
☐ Other
☐ Step father
☐ Step Mother
- 3) Time at which the child goes to sleep _____
(Child's bedtime in military time. (Ex: 8:30 pm = 20:30))
- 4) Time of day child usually wakes in the morning _____
((Ex: 8:00 am = 08:00))
- 5) Number of minutes the child sleeps per night _____
(Calculate minutes of nighttime sleep.)
- 6) Number of minutes child sleeps each day (including naps) _____
(Calculate minutes of naps and nighttime sleep.)
- 7) Child falls asleep within 20 minutes after going to bed
☐ Usually (5-7)
☐ Sometimes (2-4)
☐ Rarely (0-1)

- 8) Problem? ☐ yes
☐ no
☐ N/A
- 9) Child sleeps too little ☐ Usually (5-7)
☐ Sometimes (2-4)
☐ Rarely (0-1)
- 10) Problem? ☐ yes
☐ no
☐ N/A
- 11) Child sleeps the right amount ☐ Usually (5-7)
☐ Sometimes (2-4)
☐ Rarely (0-1)
- 12) Problem? ☐ yes
☐ no
☐ N/A
- 13) Child sleeps about the same amount each day ☐ Usually (5-7)
☐ Sometimes (2-4)
☐ Rarely (0-1)
- 14) Problem? ☐ yes
☐ no
☐ N/A
- 15) Child moves to someone else's bed during the night (parent, brother, sister, etc.) ☐ Usually (5-7)
☐ Sometimes (2-4)
☐ Rarely (0-1)
- 16) Problem? ☐ yes
☐ no
☐ N/A
- 17) Child awakes once during the night ☐ Usually (5-7)
☐ Sometimes (2-4)
☐ Rarely (0-1)
- 18) Problem? ☐ yes
☐ no
☐ N/A
- 19) Child awakes more than once during the night ☐ Usually (5-7)
☐ Sometimes (2-4)
☐ Rarely (0-1)
- 20) Problem? ☐ yes
☐ no
☐ N/A
- 21) Number of minutes a night waking usually lasts
(Enter 0 if night wakings do not occur.)

-
- 22) Child returns to sleep without help after waking
- ☐ Usually (5-7)
☐ Sometimes (2-4)
☐ Rarely (0-1)
-

- 23) Problem?
- ☐ yes
☐ no
☐ N/A
-

Owens JA, Spirito A, McGuinn M. The Children's Sleep Habits Questionnaire (CSHQ): psychometric properties of a survey instrument for school-aged children. Sleep 2000, Dec 15; 23 (8):1043-51

Appendix H: COVID-19 Follow Up Survey (Phase 2)

Confidential

Page 1

COVID-19 Media Use Follow-Up

The attached survey is a follow-up survey from the original survey that you completed about your child's media use. We are now interested in learning more about how your child's media use changed with COVID-19. The text below is an explanation of the survey. The survey questions will follow.

Thank you for your time!

Dear Participant,

I am a doctoral student at East Carolina University in Psychology Department. I am asking you to take part in a follow-up survey of my research study entitled, "Moderating Effects of Temperament on Sleep and Inhibition in Preschoolers."

The purpose of this follow-up research is to learn more about how the shelter-in-place order due to the COVID-19 pandemic has changed your young child's media use. By doing this research, I hope to learn how young children engage in media use during a global pandemic. Your participation is completely voluntary. We will not be able to pay you for the time you volunteer while being in this study. However, at the end of the data collection period, we will draw the email addresses of five participants that indicate their desire to participate in the drawing to win one of five Walmart gift cards valued at \$10 each. If you are selected as one of the five participants, you will be notified by email and will have one week from the date of the email to claim your gift card.

You are being invited to take part in this research because your child participated in the initial phase of this research study at the ECU Infant and Child Cognition lab or at a daycare center, preschool, or school in NC between March 2019 and March 2020. The amount of time it will take you to complete this survey is approximately 15 minutes.

If you agree to take part in this survey, you will be asked questions that relate to media use during the shelter-in-place order that was in effect from March 30, 2020 until May 8, 2020.

This research is overseen by the University and Medical Center Institutional Review Board (UMCIRB) at ECU. Therefore, some of the UMCIRB members or the UMCIRB staff may need to review your research data. The follow-up survey that you are being asked to complete at this time is linked to the previous survey that you completed as part of the original research study. However, neither the current study nor the previous study asked for identifying information. Therefore, your responses cannot be traced back to you by anyone, including me.

Please call Kelli Long at 252-737-4957 for any research related questions. If you have questions about your rights when taking part in this research, call the University and Medical Center Institutional Review Board (UMCIRB) at 252-744-2914 (days, 8:00 am-5:00 pm). If you would like to report a complaint or concern about this research study, call the Director of Human Research Protections, at 252-744-2914. A copy of this consent form is available for download, should you wish to keep a copy.

You do not have to take part in this research, and you can stop at any time. If you decide you are willing to take part in this study, proceed to the next page and select the YES option to proceed with the survey.

Thank you for taking the time to participate in my research.

Sincerely,

Kelli Long
6/12/2020 1:37pm

projectredcap.org



Principal Investigator

[Attachment: "Expedited Research Letter.pdf"]

After reading the consent information above, please indicate if you would like to take part in the follow-up research study about media use during during the shelter-in-place order that was in effect until May 8th due to COVID-19. Please note that all questions are referring to the time period of the shelter-in-place order which was in effect from March 30 to May 8.

I agree to participate in the current research study.

- ☐ Yes
☐ No

Please enter your preschooler, kindergartner, or first grader's birthday (i.e., the child that previously participated in the first portion of this study either at his/her childcare facility, school, or at the ECU Infant and Child Cognition Lab).

(Please enter the birthday of your child that previously participated in this research study.)

The first section of questions asks about changes that occurred to you and your child's daily routine due to the shelter-in-place order that was in effect until May 8th due to COVID-19.

Some parents experienced a change in their job as a result of COVID-19. Please select the option that best describes your employment status during the shelter-in-place order.

- ☐ I was working outside of the home (e.g., reporting to work at your place of employment).
- ☐ I was working while staying at home (e.g., teleworking).
- ☐ I lost my job due to COVID-19.
- ☐ I was not employed prior to COVID-19 and am still not employed (e.g., stay-at-home parent).
- ☐ Other

Please describe your employment status during the shelter-in-place order.

Many childcare facilities and schools were closed as a result of the shelter-in-place order that was in effect until May 8th due to the COVID-19 pandemic.

Please select the option that best describes daytime childcare during the shelter-in-place order for your preschool, kindergarten, or first grade child.

- ☐ My child was staying at home with me or another member of my family during the day.
- ☐ My child was staying in someone else's home during the day.
- ☐ My child was going to a childcare facility during the day.
- ☐ Other

Please describe your preschool, kindergarten, or first grade child's daytime childcare during the shelter-in-place order.

Some schools and childcare facilities offered virtual learning opportunities (e.g., classes or activities on Zoom, videos on YouTube, etc.) while others provided packets of printed work or did not provide assignments. Please choose the option that best describes your child's education during the shelter-in-place order.

- ☐ My child participated in virtual learning daily.
- ☐ My child participated in virtual learning several times a week.
- ☐ My child participated in virtual learning once a week.
- ☐ My child participated in learning via printed packets.
- ☐ My child participated in learning activities at home that were not assigned by his/her childcare center or school.
- ☐ Other

Please describe your preschool, kindergarten, or first grade child's education during the shelter-in-place order.

Some children are experiencing a change to their sleeping routine as a result of the COVID-19 pandemic/shelter-in-place order. Please select the option that best describes your child's sleeping patterns during the shelter-in-place order.

- ☐ My child's sleep is no different than before the COVID-19 pandemic.
☐ My child is sleeping less during COVID-19.
☐ My child is sleeping more during COVID-19.

Please estimate the number of hours that your child got in 24 hours during the shelter-in-place order. For example, if your child usually takes a nap for 1 hour during the day and sleeps for 10 hours at night, enter 11 into the field below.

(Number of hours that your child sleeps per day (naps + night time sleep))

The next section of questions asks about you and your preschooler, kindergartner, or first grader's media use during the shelter-in-place order that was in effect until May 8th due to COVID-19.

During the shelter-in-place order, I felt that the media/devices in my home (like TVs, computers, video games, cell phones, and mobile devices) caused my family members to spend...

- ☐ more time with other family members
- ☐ less time with other family members
- ☐ media/devices don't make much difference in how much time we spend with other family members

Please choose the option that best describes your perception of your child's media use during the shelter-in-place order.

- ☐ My child was not using media any more or less than before the shelter-in-place order.
- ☐ My child was using more media than before the shelter-in-place order.
- ☐ My child was using less media than before the shelter-in-place order.

We are interested in learning more about your child's media use during the shelter-in-place order. Did your child begin watching new shows? Using new apps? Using a computer more than before? Using other devices more or less than before?

Please describe any changes that you noticed in your child's media use during the shelter-in-place order.

Please indicate about how many days of the week (Monday-Friday) during the shelter-in-place order your child engaged in the following activities:

	0	1	2	3	4	5
Watching television shows/movies	☐	☐	☐	☐	☐	☐
Watching videos (e.g., YouTube)	☐	☐	☐	☐	☐	☐
Playing videogames on a gaming console (e.g., Wii, Xbox, Playstation, Nintendo Switch, etc.)	☐	☐	☐	☐	☐	☐
Playing games or using apps on a tablet or smartphone	☐	☐	☐	☐	☐	☐

The next question is asking about your child's media use on a typical WEEKDAY during the shelter-in-place order. Thinking about a typical WEEKDAY during that time, about how much time, if any, did your child spend:

	0 mins	1-15 mins	16-30 mins	31-45 mins	46-60 mins	61-75 mins	76-90 mins	91+ mins
Watching television shows/movies	☐	☐	☐	☐	☐	☐	☐	☐
Watching videos (e.g., YouTube)	☐	☐	☐	☐	☐	☐	☐	☐
Playing videogames on a gaming console (e.g., Wii, Xbox, Playstation, Nintendo Switch, etc.)	☐	☐	☐	☐	☐	☐	☐	☐
Playing games or using apps on a tablet or smartphone	☐	☐	☐	☐	☐	☐	☐	☐

Please indicate about how many days of the weekend (Saturday-Sunday) during the shelter-in-place order your child engaged in the following activities:

	0 days	1 day	2 days
Watching television shows/movies	☐	☐	☐
Watching videos (e.g. YouTube)	☐	☐	☐
Playing videogames on a gaming console (e.g. Wii, Xbox, Playstation, Nintendo Switch, etc.)	☐	☐	☐
Playing games or using apps on a tablet or smartphone	☐	☐	☐

The next question is asking about your child's media use on a typical day of the WEEKEND during the shelter-in-place order. Thinking about a typical WEEKEND during that time, about how much time, if any, did your child spend doing the following activities in one day:

	0 mins	1-15 mins	16-30 mins	31-45 mins	46-60 mins	61-75 mins	76-90 mins	91+ mins
Watching television shows/movies	☐	☐	☐	☐	☐	☐	☐	☐
Watching videos (e.g., YouTube)	☐	☐	☐	☐	☐	☐	☐	☐
Playing videogames (e.g., Wii, Xbox, Playstation, Nintendo Switch, etc.)	☐	☐	☐	☐	☐	☐	☐	☐
Playing games or using apps on a tablet or smartphone	☐	☐	☐	☐	☐	☐	☐	☐

The following question set is asking how often a parent or caretaker engaged in activities with the child during the shelter-in-place order.

	Always	Most of the time	Some of the time	Almost never	Never	N/A because my child does not engage in this activity
Watching television shows/movies	☐	☐	☐	☐	☐	☐
Watching videos (e.g., YouTube)	☐	☐	☐	☐	☐	☐
Playing videogames (e.g., Wii, Xbox, Playstation, Nintendo Switch, etc.)	☐	☐	☐	☐	☐	☐
Playing games or using apps on a tablet or smartphone	☐	☐	☐	☐	☐	☐

What are your child's favorite shows right now?

What are your child's favorite apps right now? If your child does not use apps, you may leave this question blank.

Did you/your child download any new apps during the shelter-in-place order?

- ☐ Yes
☐ No

What new apps did you/your child download during the shelter-in-place order?

Different types of media emerged during the shelter-in-place order that were not typical prior to that time. Some examples included live videos from a variety of zoos across the country or story hour with a public library.

Did your child use different types of media during the shelter-in-place order than he or she previously used?

- ☐ Yes
☐ No

Please describe the new media that your child used during the shelter-in-place order.

Would you like to be entered into a drawing for one of five Walmart gift cards valued at \$10 to thank you for your participation in this research?

- ☐ Yes
☐ No

Please enter your email address so that we may contact you if you are selected as a gift card recipient.
