THE ROLE OF MATERNAL MENTAL HEALH IN INFANT

TEMPERAMENT AND EARLY SCREEN EXPOSURE

ASSOCIATIONS

by

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A THESIS

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Primary Thesis Advisor

The use of tablets, television, and other screens as tools for learning or play in an infant's environment has become increasingly common, despite the American Academy of Pediatrics recommending the complete avoidance of screen time for children under 2 years of age. Temperament, defined as an infant's disposition shaped by biology, is associated with infant media exposure. Maternal mental health may play a role in mediating this association. By sampling data from the nation-wide Play and Learning Across a Year (PLAY) project, we look at infants' exposure to media at 12-, 18-, and 24-months of age (n=10), as well as maternal anxiety and depression symptoms and infant temperament measures, to explore the possibility of associations among media exposure, maternal mental health, and infant temperament. Data were collected from parents via questionnaires during an in-home visit.

Due to the low-powered nature of this pilot sample, and ongoing data collection, we conducted exploratory and descriptive analyses only. We did not formally test for mediation effects. The relationship patterns within our pilot sample among infant negative affectivity, hours per day infants are exposed to television, and maternal depression and anxiety appear to be consistent with prior findings. The data collection process for this project is ongoing, thus future directions include the progression of data collection, facilitated through the nationwide PLAY project, to investigate the potential mediation effect of maternal mental health on infant temperament and media exposure associations.

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I would first like to thank Dr. Caitlin Fausey for your excellent mentorship throughout the thesis process and my undergraduate experience. I would not be the student or consumer of research I am today without your guidance. As an extension, I would like to thank the University of Oregon Learning Lab for an irreplaceable research experience. I would not trade my time working as a lead experimenter on the PLAY project for the world, it was truly an unforgettable experience. Thank you to my PLAY team, for keeping our dynamic one that makes me look forward to spending long hours in the lab, the last year and a half wouldn't have been the same without you all. Thank you to my CHC advisor and my CHC thesis representative, Dr. Daphne Gallagher. Your support and guidance throughout the last four years has been invaluable. Lastly, thank you to my parents, John and Kathryn Henner, for your unwavering support and endless encouragement throughout my entire academic career. You two are my greatest role models and I am eternally grateful for the love you have poured into me, making me the woman I am today.

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Literature Review

Introduction

Parents who feel that they do not have a sufficient ability to calm their upset children give media devices as a calming tool at a higher rate than parents who feel they can easily calm their child down (Radesky et al., 2016). Why might some parents have better control over calming their infants than others? The answer may partially lie in the infant's temperament, or the biological disposition that an infant inherits which underlines their behavior, reactivity, and emotion regulation. Parents with highly reactive infants experience higher rates of parenting stress, leading them to expose their child to higher rates of screen time (Shin et al., 2021). In the following study, maternal anxiety and depression symptoms are explored as a potential mediating variable between infant temperament and screen time associations.

Infant Temperament Dimensions

Temperament is defined as inherited, biological dispositions that appear to be relatively consistent across development which underline and modulate the expression of an individual's activity, reactivity, affectivity, and self-regulation (Putnam & Rothbart, 2006; Shiner et al., 2012). Effortful control is the term used to describe the self-regulation dimension of temperament, which includes the ability to voluntarily modulate attention and behavior (Eisenberg, Smith, & Sprinrad, 2016). Reactivity refers to the two dimensions of temperament known as negative affectivity and surgency extraversion. Negative affectivity is characterized by high associations for sadness, fear, frustration, and discomfort, and by negative associations for soothability. Surgency extraversion is defined by positive associations for impulsivity, high

intensity pleasure, and high activity level, and by strong negative associations on the shyness scale (Putnam & Rothbart, 2006).

These major elements of temperament are present early in life and can be measured as early as four months of age (Kagan, 2017). As development proceeds, however, temperament becomes increasingly more influenced by experience and environment. Experiences in an infant's environment can interact with temperament to create personality and determine vulnerability to psychopathology later in development (Shiner et al., 2020). For example, children who experienced negative parenting and were classified as having low levels of effortful control, average levels of negative affect, and high levels of surgency were at the highest risk for developing externalizing behavioral issues at age four (Brown et al., 2022).

Media Exposure in Early Childhood

Media exposure is prevalent for children and infants of all ages in the United States. Despite the recommendation by the American Academy of Pediatrics that parents should avoid exposing their child to any form of screen media before the age of two (AAP, 2016), a nationally representative study conducted in 2013 found that nearly 40% of children under two years old use mobile devices such as smartphones or tablets (Rideout, 2013). Parents of young children in today's culture in the United States are forced to learn how, or if, to set boundaries around their child's media use. Empirical evidence suggests increased media exposure is associated with an abundance of negative effects such as disordered sleep, obesity, cognitive delays, and other health impairments at all ages (Clifford et al. 2020; Duch et al., 2013; Nathanson & Beyens, 2018; Zimmerman, 2005). Undoubtedly, screen time can be a useful tool for parents to facilitate learning, provide enjoyable experiences, and foster creativity. Parents report that they use screen time primarily to facilitate parent independent activities, even though they may hesitate due to

current research reporting the detrimental effects (Hiniker et al., 2016). A growing body of research is interested in the volume of media that young children and infants experience and the mechanisms by which this exposure occurs (Radesky et al., 2014, 2016; Shin et al., 2021; Thompson et al., 2013).

Infant Temperament & Media Use

Exposure to media continues to be pervasive in the early years of life and research suggests that a child's temperamental disposition may have an impact. Children with socio-emotional and self-regulation difficulties (i.e. children scoring high in negative affectivity and low in effortful control), are given mobile devices as a calming tool by parents at a higher rate than children who did not express these same difficulties and thus view more media at two years of age (Radesky et al. 2014, 2016).When mothers perceive their infants as having increased activity and fussiness levels, those infants had higher levels of TV exposure in the home (Thompson et al., 2013). Further, increased media use at age 3 was associated with a decrease in effortful control at age four (Fitzpatrick et al., 2022). These findings indicate that media exposure in early childhood is associated with different temperamental characteristics present in early infancy.

Infant Temperament & Maternal Mental Health

Previous research indicated that children who have one or more depressed parents are significantly more likely to have a "difficult" temperament (i.e., high negative affectivity and low effortful control) than children without depressed parents (Bruder-Costello et al., 2007). These findings were further confirmed in a 2010 study that found maternal depression when a child was 6 months old predicted more difficult temperament at 24 months old (Hanington et al., 2010). These authors also noted that the measurement that was used to assess depression

symptoms may have also measured anxiety symptoms, a condition that is often comorbid with depression, meaning that some of these findings might have been due to a link between maternal anxiety and difficult child temperament.

Maternal Mental Health & Media Use

Various factors may be associated with early childhood media exposure. Many studies suggest maternal psychopathology may be one of these factors. For instance, strong positive associations have been found between maternal depression and 2-5 year old children's overuse of television (Park et al., 2018). In 2017, a systematic review was conducted of 29 studies which examined the associations between early child media exposure and other biological, demographic, and sociocultural variables (Duch et al., 2013). Notably, eight studies looked at the associations between screen time and maternal depression, concluding that across studies there was a significant positive association. According to these results, we can expect mothers who report more depression symptoms may also have children exposed to more media at an early age. This paper, however, did not address any mediating factors, so the mechanisms which drive these associations remain unknown.

Few, if any, studies currently examine the relationship between maternal anxiety and increased infant and early childhood screen exposure, however research has indicated that maternal stress serves as a mediator between infant temperament and increased screen use (Shin et al., 2021). This mediation is due to the direct relationship that child temperament, such as decreased Effortful Control and increased Negative Affectivity, has on parenting stress, and the direct relationship between increased parenting stress and an increased early media use. From this finding, we can predict that because maternal anxiety is uniquely related to parenting stress

(Huizink et al., 2017), reported parental anxiety symptoms may mediate the relationship between child temperament and early media exposure.

Maternal Mental Health Symptoms as a Mediator Between Infant Temperament & Media Associations

Previous literature has confirmed that there is a significant relationship between infant temperament and media exposure (Fitzpatrick et al., 2022; Radesky et al. 2014, 2016; Thompson et al., 2013). Parental mental health symptoms have been found to be related to increased difficult temperament (Bruder-Costello et al., 2007; Hanington et al., 2010) and increased media exposure (Duch at al., 2017; Park et al., 2018). Thus, we hypothesize that maternal anxiety and depression symptoms may mediate the association between infant temperament and early media exposure.

Overview of The Current Study

The current study uses the very short form of Rothbart's Early Children's Behavior Questionnaire (ECBQ-VSF; Putnam et al., 2010; Appendix A). This instrument was developed after the standard form of the CBQ (Putnam et al., 2006), which consisted of 195 items. The CBQ provides each infant with a score for three temperament dimensions: negative affectivity, surgency extraversion, and effortful control. In our study, we opted to exclusively examine the negative affectivity dimension of temperament because previous studies have predominantly focused on this dimension when investigating relationships between infant temperament, maternal mental health, and early media exposure (Bruder-Costello et al., 2007; Hanington et al., 2010; Radesky et al. 2014, 2016 ; Shin et al., 2021; Thompson et al., 2013).

To measure maternal depression and anxiety symptoms, the four item Patient Health Questionnaire (PHQ-4) was used (Kroenke et al., 2009; Appendix B). This measure is an ultra-brief screening scale for anxiety and depression.

To measure media exposure, collaborators working on the PLAY project, from which data for this project were obtained, developed a short yet comprehensive measure to achieve feasibility for participants (Appendix C).

Previous research has examined the associations between infant temperament and media exposure (Fitzpatrick et al., 2022; Radesky et al., 2014, 2016; Thompson et al., 2013), infant temperament and maternal mental health (Hanington et al., 2010), and maternal mental health and media exposure (Duch at al., 2017; Park et al., 2018). In 2021, Shin et al., investigated the mediation effect of parenting stress on infant temperament and media use. However, no study to our knowledge has examined the effects of maternal anxiety and depression symptoms on the relationship between infant temperament and early media exposure. Media exposure in the early years of life has been clearly associated with disadvantageous outcomes, meaning that it is imperative to understand the mechanisms by which children are exposed to media in these critical stages of development. Based on the current literature, we expect to find that children with high negative affectivity will have mothers who report greater depression and anxiety symptoms and will thus be exposed to more media.

Methods

Participants

Data from this project were drawn from a larger study of naturalistic play observation through the Play and Learning Across a Year (PLAY) project, for which the data collection process is still ongoing. Infants at 12- (n = 1), 18- (n = 5), and 24- (n = 4) months were included in this study (total n = 10). Data in this study were collected from families located in Eugene and Springfield, OR. Families were included in the study if the predominant languages spoken to the child were English and/or Spanish, if the child was not premature (born four weeks before the due date), and if the child had not been diagnosed with any cognitive, auditory, vision, or motor disability.

Procedure

Participants were recruited in the Eugene and Springfield area in Oregon through various methods. Most participants were recruited through Team Duckling events, a community outreach program, where families can sign up to be contacted to participate in research conducted at the University of Oregon. Other participants were recruited via flyer handouts placed at various family-oriented community organizations throughout the greater Eugene area. Participants were contacted via phone by research assistants to check if children met all inclusion criteria and to schedule the home visit. On the day of the home visit, researchers entered the home of the family and collected various data including administration of questionnaires at the end of the home visit. Questionnaire data are analyzed for the current study.

Measures

Infant Temperament

The Rothbart Early Childhood Behavior Questionnaire (Very Short Form) was used to assess child temperament characteristics (CBQ-VSF; Appendix A; Putnam, et al., 2010). This measure is administered to caregivers to obtain a detailed profile of a child's temperament. Parents were asked to respond to a 36-item measure using a seven-point Likert scale which had a range from one ("never) to seven ("always"). Parents were asked to respond "NA" if the event the item measure described did not occur in the last two weeks. Three broad domains of temperament are measured by the CBQ-VSF: surgency extraversion, negative affectivity, and effortful control. Each consisted of 12 items on the CBQ-VSF, with scores for each being averaged. Higher scores represent higher levels of the temperament characteristic.

Parent Mental Health Symptoms

To assess parent mental health symptoms, the PLAY project uses the PHQ-4 (Kroenke et al., 2009; Appendix B) which focuses on reports of anxiety and depression symptoms. This measure consists of four items. Mothers were asked to rate how often they experienced the stated problems on a 4-point, Likert-like scale (0 = Not at all, 1 = Several days, 2 = More than half the days, and 3 = Nearly every day). Each question addressed a different mental health symptom; the first two questions addressed symptoms of anxiety (nervousness/ anxiousness and worry), and the second two addressed symptoms of depression (anhedonia and hopelessness).

Media Exposure

To assess media exposure, the PLAY project uses a custom brief "Media Use" measure from within a larger "Home Questionnaire" (Appendix C). This assessment consists of three

parts. The first part assesses which types of media the family has access to, which types of media the infant has used in their life, and how the infant interacts with those media. Media options include TV, DVD player, Computer, Smart phone, iPad or Tablet, Educational game, and Video Game console. The second part asked parents to give an estimation of how many hours the TV is on in the home per day when someone is at home, regardless of if someone is watching. The third part asked parents to rate how likely parents use their phone or other device while spending time with their child during meals, playtime, bedtime routine, and while driving their infant to or from activities/ when riding on public transportation. Parents were asked to answer part three using a 5-point Likert scale from 1 ("I never do this") to 5 ("Very likely").

Statistical Analytic Approach

Our primary research question is the extent to which maternal depression and anxiety symptoms mediate the association between child temperament (i.e., negative affectivity) and early child media exposure (i.e., hours/ day the TV is on in the home). Specifically, we hypothesized that infants scoring high in negative affectivity would have mothers who report greater symptoms of anxiety and depression, which would also be associated with more media exposure. As stated below, data analysis is ongoing, and the current sample is under-powered to test these hypotheses. Thus, we report descriptive analysis and visualizations, conducted using R and R studio. Once data collected by the University of Oregon PLAY team was received, we conducted data wrangling in Excel so that we could import just this study's measures as a .csv file that would be readable by the R programing software.

Results

This pilot analysis is restricted to a sample of n = 10 due to ongoing data collection. The sample is underpowered for mediation analysis. Therefore, we will not present any inferential statistics. Instead, we will start by reporting descriptive statistics for each of the three main variables of interest. Next, we will visually examine relationships between each pairwise set of variables and assess whether they are consistent or inconsistent with what is reported in prior literature. By doing so, we will explore the possibility that current data are consistent with maternal mental health being a mediator of the relationship between infant temperament and early media exposure.

Descriptive Statistics

Infant Temperament Scores

Infant temperament was scored in three different dimensions: negative effectivity, surgency extraversion, and effortful control. Scores were calculated using Early Childhood Behavior Questionnaire Very Short Form (CBQ-VSF) Scoring Procedure (Putnam et al., 2010). Infant temperament scores were measured on a scale of 1-7 for each dimension. The median score for the negative affectivity dimension of infant temperament was 2.79 ($IQR = 1.21$), with a minimum of 1.75 and a maximum of 3.25. For the effortful control dimension of temperament, the median score was 4.35 ($IQR = 1.34$), with a minimum of 3.67, and a maximum of 5.75. For the surgency extraversion dimension of temperament, the median score was 5.28 ($IQR = 0.53$), with a minimum of 4.0 and a maximum of 5.83. The distribution of infant temperament scores for each dimension is visually represented in Figure 1.
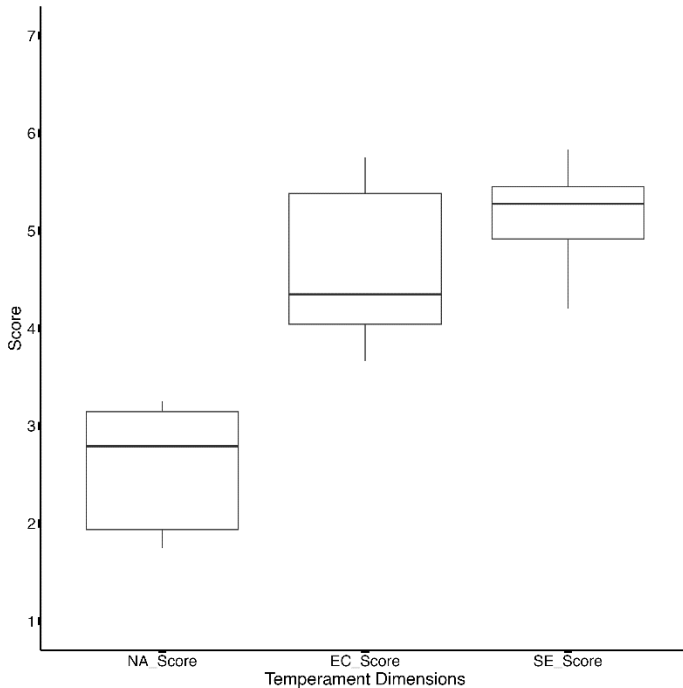
Figure 1: Infant Temperament Dimension Scores: Negative Affectivity, Effortful Control, and Surgency Extraversion

The thick black line inside the box indicates the median score for each temperament dimension (see text). The asymmetrical placement of the line within the interquartile range indicates a skewness in the distribution of the data. The edges of the boxes indicate the upper and lower quartiles. The edges of the whiskers indicate the minimum and maximum.

Maternal Mental Health Scores

Two measures of depression and anxiety were taken each on a 0-3 scale (See Appendix B). Total anxiety was calculated by summing the scores of questions F1 and F2. Total depression was calculated by summing the scores of F3 and F4. Thus, total anxiety and total depression scores are reported on a 0-6 scale. Mothers reported an average anxiety score of 2 (I*QR* = 1.75), with a minimum of 0 and a maximum of 6. For reported depression, we found a median of 1 (*IQR* = 1.75), with a minimum of 0 and a maximum of 3. The distribution of reported maternal mental health is visually represented in Figure 2.

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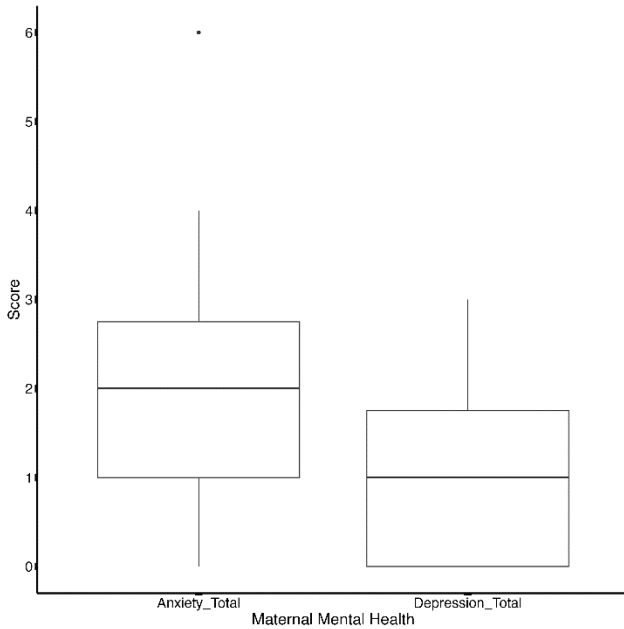
Figure 2: Maternal Mental Health (Anxiety and Depression) Scores

The thick black line located inside the box indicates the median reported depression and anxiety scores (see text). The asymmetrical placement of the line within the interquartile range indicates a skewness in the distribution of the data. The edges of the box indicate the upper and lower quartiles. The edges of the whiskers indicate the minimum and maximum. Points indicate outliers.

Early Media Exposure

Mothers reported the average amount of hours a day the TV is on when someone is in the home, even when no one is watching (see Appendix C). The median hours of TV on in the home per day was 2.0 (*IQR* = 4.70), with a minimum of 0 and a maximum of 12. The distribution of TV hours in the home is visually represented in Figure 3.
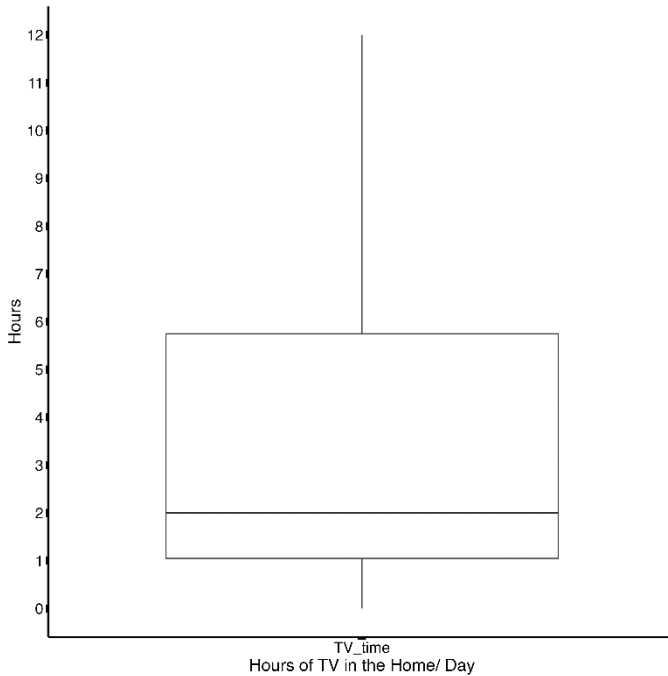
Figure 3: TV Hours in the Home per Day

The thick black line located inside the box indicates the median reported hours of TV in the home/ day (see text). The asymmetrical placement of the line within the interquartile range indicates a skewness in the distribution of the data. The edges of the box indicate the upper and lower quartiles. The edges of the whiskers indicate the minimum and maximum.

Relationships Among Maternal Anxiety and Depression, Infant Temperament & Early Media Exposure

The primary question of this thesis concerned the potential mediation effect of maternal mental health on infant temperament and early media exposure associations. To investigate this question, it was first necessary that data collected were imported into R and R Studio to create scatterplots and visualize pairwise variable relationships.

Infant Temperament and Early Media Exposure

Before investigating the primary research question, an exploration of the relationship between infant media exposure and infant temperament was necessary to investigate if the same relationship found in the literature was present in our pilot sample. Using R, the negative

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affectivity dimension of temperament was plotted against the media exposure measure of hours of TV in the home per day. We examined the negative affectivity dimension of temperament because previous studies have predominantly focused on this dimension when investigating relationships among the variables of interest of this thesis (Bruder-Costello et al., 2007; Hanington et al., 2010; Radesky et al. 2014, 2016 ; Shin et al., 2021; Thompson et al., 2013). When plotting infant negative affectivity scores against hours of TV in the home per day, it became evident that in this sample, infants who were exposed to more hours of TV in the home per day scored higher in the negative affectivity dimension of temperament, consistent with existing relationship found in the literature; see Figure 4.

Figure 4 shows wide variation in hours of TV per day, particularly for infants with a reported negative affectivity score of 3. More TV hours appear to be associated with higher negative affectivity, which is consistent with prior literature. However, the restriction of range in negative affectivity scores (i.e., overall low scores) cautions against strong interpretations. It is also possible that the apparent curvilinear association will hold up once more data have been collected, that a linear positive association will emerge, or that no association will be supported by the full sample.
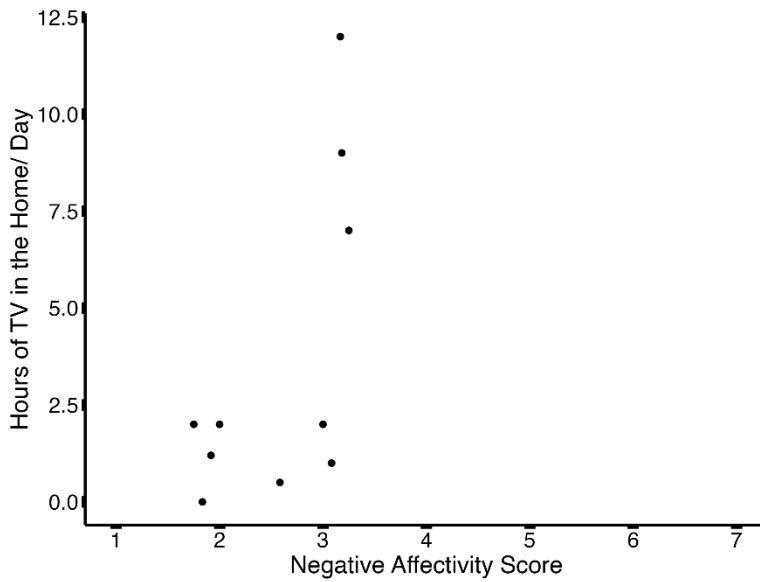
Figure 4: Pilot Data (n = 10) Consistent with Nonlinear Association Between Negative affectivity and Hours of TV in the Home/ Day

Maternal Mental Health

Anxiety and Depression were mapped against each other in a scatterplot to reveal a positive correlation, consistent with the existing literature. Figure 5 shows that mothers who report low anxiety will also report low depression, and mothers who report high anxiety will also report high depression.
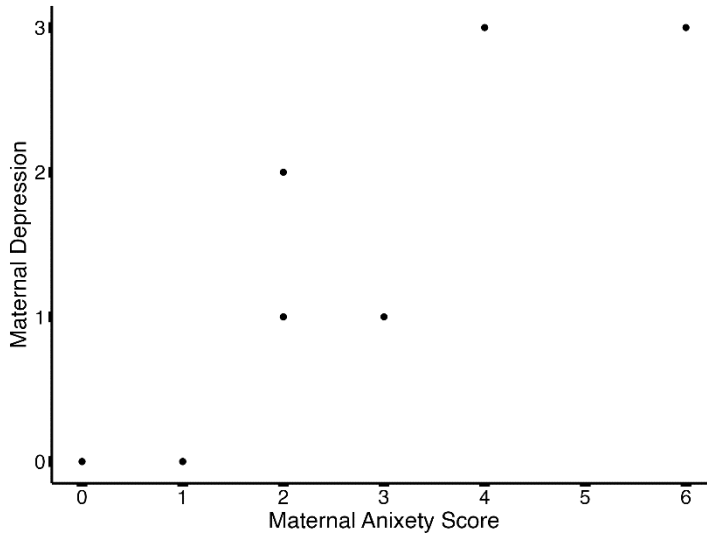
Figure 5: Pilot Data (n = 10) Consistent with Positive Association Between Maternal Anxiety and Depression

The sample from which this scatterplot was created had an n = 10. Only 7 points appear on this scatterplot due to three families reporting the same scores for depression and anxiety. Overlapping duplicate points occur at Anxiety Score 0 and Depression score 0, Anxiety score 1 and Depression score 0, and Anxiety score 2 and Depression score 1.

Infant Temperament and Maternal Mental Health

Maternal mental health measures of anxiety and depression were plotted against the infant temperament dimension of negative affectivity. In our pilot sample (n = 10) mothers whose infants scored higher in negative affectivity also reported more depression and anxiety symptoms, consistent with existing relationships found within the literature (see Figures 6 and 7).
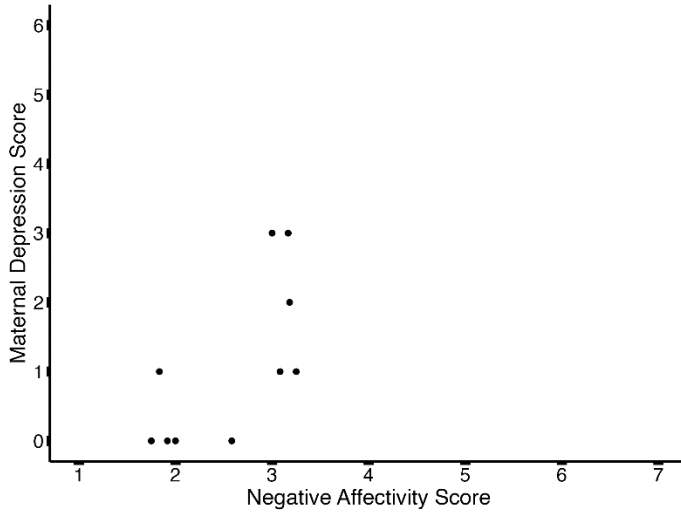
Figure 6: Pilot Data (n=10) Consistent with Positive Association Negative affectivity and Maternal Depression

Figure 7: Pilot Data (n=10) Consistent with Positive Association Negative affectivity and Maternal Anxiety

Maternal Mental Health and Early Media Exposure

Maternal mental health measures of depression and anxiety were plotted against the media exposure measure of hours of TV in the home per day. In our sample of n=10, we found a positive association between maternal mental health dimensions and infant media exposure, consistent with existing literature (see Figures 8 and 9).

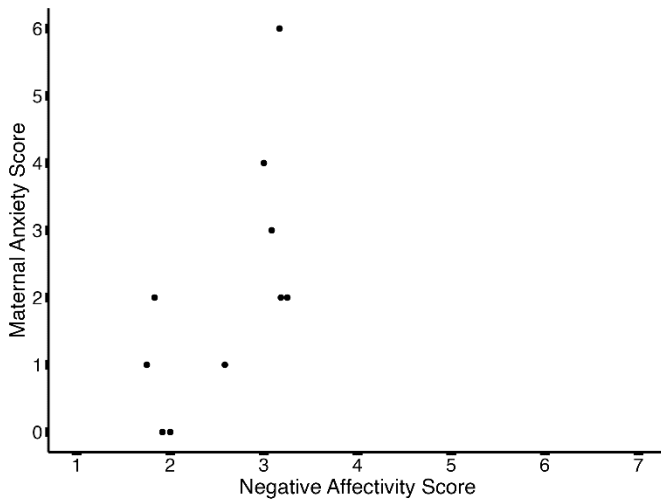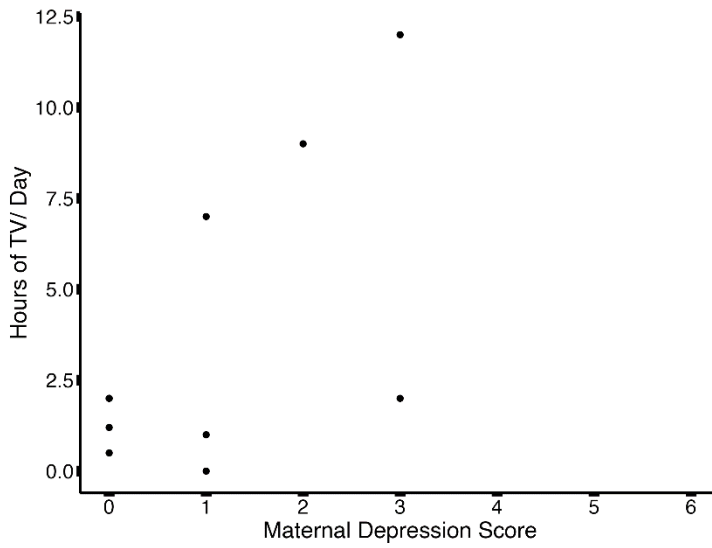Figure 8: Pilot Data (n=10) Consistent with Positive Association Between Maternal Depression and Hours of TV in the Home/ Day
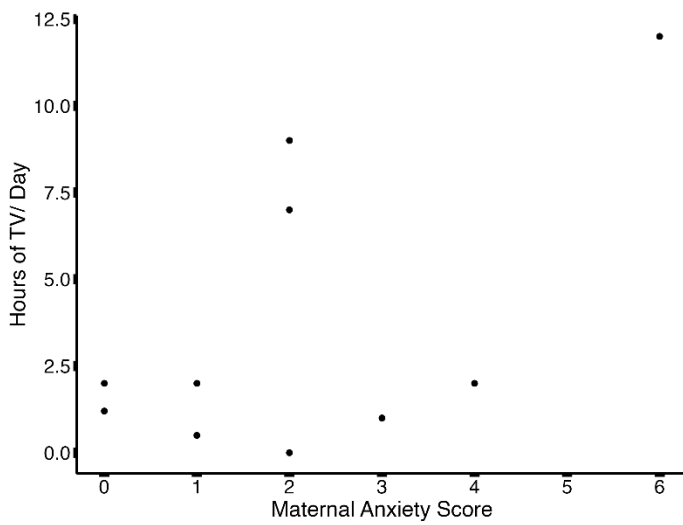
Figure 9: Pilot Data (n=10) Consistent with Positive Association Between Maternal Anxiety and Hours of TV in the Home/ Day

Exploring the Mediation Effect of Maternal Mental Health on Infant Temperament and Early Media Exposure

As previously mentioned, this sample (n=10) is underpowered for mediation analysis, therefore it is not possible to formally test the mediation effect of maternal mental health on infant temperament and early infant screen exposure associations. However, we may speculate that with additional data, a partial mediation effect would be present within this sample. A partial mediation would suggest that the relationship between infant temperament (negative affectivity) and early infant media exposure (hours of TV present in the home per day) is both direct, and indirect through the effect of infant temperament on maternal mental health (see Figure 10). We speculate both a direct and indirect relationship, resulting in a partial mediation effect, due to the consistent nature of infant temperament and media exposure associations (a), as well as infant temperament and maternal mental health associations (b) and maternal mental health and media exposure associations (c).
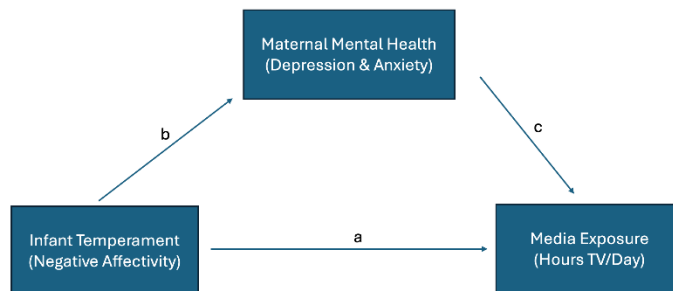
Figure 10: Hypothesized Mediation: Maternal Mental Health partially mediates the association between Infant Temperament and Media Exposure

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Discussion

Discussion of Measures

For statistical analysis of the temperament variables, we opted to focus on the temperament dimension of negative affectivity because when examining the relationship between early media exposure and infant temperament, or maternal mental health and infant temperament, the previous literature has largely focused on this dimension (Bruder-Costello et al., 2007; Hanington et al., 2010; Radesky et al. 2014, 2016 ; Shin et al., 2021; Thompson et al., 2013).

Early media exposure may be captured via a variety of measures, as exhibited by the number of scales used and questions administered in the "Media Use" portion of the larger "Home Questionnaire" (Appendix C). We used the "Hours of TV in the home per day" measure because past studies have predominantly focused on this measure of media exposure when investigating the effects of media exposure in infancy (Park et al., 2018; Radesky et al., 2014; Thompson et al., 2013; Zimmerman & Christakis, 2005; Vismara et al., 2021). We opted to use the "Hours of TV in the home per day" measure compared to other available measures, such as "Likelihood of mother to use media" during different infant-centered activities, due to the variability in interpretation of this measure. For example, one mother may have opted to report that during bedtime routine she is "5: Very Likely" to use her media device because she routinely uses her smartphone to play music for her and her infant. However, another mother may interpret this same situation as "1: I Never Do This", because although she routinely plays music using her media device, she never physically interacts with her media device after turning on the music during the bedtime routine. Due to the potential inconsistency in interpretation of this media use measure, we opted to not use this measure for analysis. Other available media measures,

including what media devices are available in the home and whether the child uses available media devices, were not used because these measures did not capture the duration or extent of media exposure.

In this study, maternal mental health was measured using the PHQ-4 (Appendix B) which is an ultra-brief measure which captures two depression symptoms and two anxiety symptoms. Other studies in the literature that look at the relationship between maternal mental health and media exposure and/or infant temperament have either focused on the dimension of maternal depression (Hanington et al., 2010; Thompson et al., 2013; Part et al., 2018), or parenting stress (Shin et al., 2021; Vismara et al., 2021), as opposed to maternal anxiety. Parenting stress is uniquely related to maternal anxiety (Huizink et al., 2017), thus we use the associations between parent stress and infant temperament and/or infant media exposure in the previous literature as reference for the interpreting the nature of the preliminary associations found in this pilot study.

Discussion of Results

This thesis's objective was to investigate the potential mediation effect of maternal anxiety and depression on infant temperament and early media exposure associations. Due to ongoing data collection by the University of Oregon PLAY team of undergraduate researchers, and the low powered nature of the current sample, it was not possible to formally test for the mediation effect. However, the pilot sample allows us to speculate that with additional data, a mediation or partial mediation effect would be present, based on the predominantly consistent nature of the relationships found within the sample, as compared to previous literature.

Our preliminary analysis found that consistent with previous research (Radesky et al., 2014; Shin et al., 2021; Thompson et al., 2013), infant negative affectivity was associated with increased media exposure, though the association in our pilot sample appears to be nonlinear.

Note that the cohort of infants included in our sample did not score high on the negative

affectivity scale. Relative to the full range of the temperament dimension scale (0-7), infants

included in this sample had a median negative affectivity score of 2.58 and a maximum score of

3.25. However, we did find in our analysis that a cluster of infants who were reported to be

exposed to more hours of TV per day, also scored higher in negative affectivity. Although this

finding may result from chance, we speculate that with more data the trend will continue to be

consistent with previous literature findings. Children who score high in negative affectivity are

more difficult to soothe, therefore parents may use media as a calming tool for their infant

(Radesky et al., 2016). However, we conjecture that maternal mental health might mediate this

association.

Consistent with previous research (Hanington et al., 2010; Shin et al., 2021; Vismara et

al., 2021) our preliminary analysis revealed that infant negative affectivity scores were positively

associated with both dimensions of maternal mental health (anxiety and depression). Mothers

were more likely to report higher levels of anxiety and depression when their infants scored

higher in negative affectivity. Although we saw the full range of possible anxiety scores reported

within our sample (*min* = 0, *max* = 6), we only saw a maximum reported depression score of 3

within our pilot sample. With the data collection process ongoing, we can expect to see the full

range of depression scores reported, and thus a stronger association between infant negative

affectivity and maternal depression may emerge, consistent with the previous literature.

Within our pilot sample, we found a positive association between the maternal mental

health measures of anxiety and depression with infant media exposure, consistent with the

literature (Part et al., 2018; Shin et al., 2021; Thompson et al., 2013). Though this preliminary

result is consistent with the existing literature which found that maternal depression and

parenting stress were significantly related to television exposure in infants, it is important to note the impact of outliers on our findings. Without outliers pulling the positive association within our sample, we might not have concluded a positive association. However, with data collection ongoing, we can speculate that the positive association would continue to reflect the existing literature with more participant data, regardless of outliers. As previously mentioned, we only saw a maximum reported depression score of 3 within our pilot sample and we also expect that with more data we would have a full range of responses on the depression scale.

Limitations and Future Directions

As with any research, important limitations are present in this thesis and must be noted. As previously stated, one major limitation of this study was that the data used were pilot data (n = 10) which constrained the statistical power and did not allow for inferential statistics to be reported, or for a formal test of the mediation effect of maternal mental health on infant temperament and media exposure associations. Thus, only descriptive statistics and visualization via scatterplots were reported. With the continuation of data collection for the PLAY project, an exciting path for future directions includes increasing the sample size to allow the possibility for a formal mediation analysis.

The self-report nature of the measures used introduces another limitation. The reliance on self-report measures introduces the risk of response bias, where participants may provide answers that they perceive as socially desirable or acceptable, rather than accurately reflecting their true experiences or behaviors. Another risk with self-report is inaccurate recall, specifically when administering the Rothbart CBQ-VSF (Appendix A) and question 2 of the "Media Use" portion of the larger "Home Questionnaire" (Appendix C). Further, different mothers may interpret questions administered during the "Home Questionnaire" differently, based on their

individual perspectives, experiences, and backgrounds, leading to inconsistencies across participants.

To avoid the risk of inaccurate recall that comes along with using self-report measures for the media exposure measure, future research might consider using advanced technology to monitor the number of hours the TV is on in the home per day. By using technology to monitor media exposure, mothers would not have to report an estimated answer for this measure and researchers could be confident that media exposure is valid across participants.

The PHQ-4 (Appendix B) measure for maternal mental health is an extremely brief measure and does not encompass all aspects of depression and anxiety. Although this ultra-brief measure was validated (Löwe et al., 2010), the interaction between the vulnerable nature of the brief measure and having undergraduate researchers in mother's home to administer questionnaire may have resulted in some self-report biases as well. Thus, it is possible that some mothers did not report depression and anxiety scores as they would have if the questionnaire had been administered in private, which might have led to more accurate responses, revealing another limitation for this study. For future research, it would be beneficial to use a more in-depth measure for depression and anxiety as well as explore the possibility of having mothers respond to maternal mental health measures in private, where they might feel the most comfortable being fully authentic in their responses.

Lastly, data collected for this study were collected from a restricted demographic of families living in Eugene and Springfield, Oregon. This restricted demographic may introduce sampling biases that affect the validity of the study's results. Because the sample predominantly comprises ethnically white families, which is prevalent in the Eugene-Springfield area, the findings may not accurately represent the diversity of families nationwide. Expanding the sample

from which data is drawn to a wider, more variable socioeconomic and ethnic demographic will provide more generalizability for results in future research.

Conclusions

This study examined the relationships among infant temperament, early media use, and maternal mental health, while speculating the potential mediation effect of maternal anxiety and depression on infant temperament and early media use associations. By understanding the relationships among these variables, parents may have a clearer understanding about their children's relationship with media, and how their own mental health plays a role in this, which may allow them to create more educated decisions on what boundaries to set when it comes to early media exposure. Further, infant caretakers and family-service workers may be able to have a clearer picture of how these variables interact with one another in the context of a mother-infant dyad. Overall, an understanding of how these variables relate to one another can provide a framework for developing healthy habits that benefit both infants and mothers.

Appendix A

(12 month – English only)

Rothbart Early Child Behavior Questionnaire (Very Short Form)

Experimenter: "Now, I will read you sentences about your child's behavior. Please let me know *how often* [CHILD] did this during the *LAST TWO WEEKS*. If [CHILD] was not in that particular situation in the last two weeks, then it "does not apply" (NA). But, if [HE/SHE] was in the situation and never behaved like that, then please say "never" (1). You can follow along here and we will be using the <u>purple</u> scale."

(Note: Experimenter should give a copy of both the scale and the Rothbart prompts <u>without experimenter instructions</u> to mom to follow along.)

never	very rarely	less than half the time	about half the time	more than half the time	almost always	always	does not apply
1	2	3	4	5	6	7	NA

Experimenter: "In the last two weeks..."

1. "When approached by an unfamiliar person in a public space (for example., the grocery store), how often did your child cling to a parent?"

1	2	3	4	5	6	7	N/A

2. "While having trouble completing a task (e.g. building, drawing, dressing), how often did your child get easily irritated?"

1	2	3	4	5	6	7	N/A

3. "When a familiar child came to your home, how often did your child seek out the company of the child?"

1	2	3	4	5	6	7	N/A

4. "When offered a choice of activities, how often did your child decide what to do very quickly and go for it?"

1	2	3	4	5	6	7	N/A

5. "During daily or evening quiet time with you and your child, how often did your child enjoy just being quietly sung to?"

1	2	3	4	5	6	7	N/A

6. "While playing outdoors, how often did your child choose to take chances for the fun and excitement of it?"

1	2	3	4	5	6	7	N/A

7. **"While engaged in play with his/her favorite toy, how often did your child play for more than 10 minutes?"**

1	2	3	4	5	6	7	N/A

8. **"While engaged in play with his/her favorite toy, how often did your child continue to play while at the same time responding to your remarks or questions?"**

1	2	3	4	5	6	7	N/A

9. **"When told that loved adults would visit, how often did your child get very excited?"**

1	2	3	4	5	6	7	N/A

10. **"During quiet activities, such as reading a story, how often did your child fiddle with his/her hair, clothing, etc.?"**

1	2	3	4	5	6	7	N/A

11. **"While playing indoors, how often did your child like rough and rowdy games?"**

1	2	3	4	5	6	7	N/A

12. **"When being gently rocked or hugged, how often did your child seem eager to get away?"**

1	2	3	4	5	6	7	N/A

13. **"When encountering a new activity, how often did your child get involved immediately?"**

1	2	3	4	5	6	7	N/A

14. **"When engaged in an activity requiring attention, such as building with blocks, how often did your child tire of the activity relatively quickly?"**

1	2	3	4	5	6	7	N/A

15. **"During everyday activities, how often did your child pay attention to you right away when you called to him/her?"**

(12 month – English only)

1	2	3	4	5	6	7	N/A

16. "During everyday activities, how often did your child seem to be irritated by tags in his/her clothes?"

1	2	3	4	5	6	7	N/A

17. "During everyday activities, how often did your child become bothered by sound while in a noisy environment?"

1	2	3	4	5	6	7	N/A

18. "During everyday activities, how often did your child seem full of energy, even in the evening?"

1	2	3	4	5	6	7	N/A

19. "While in a public place, how often did your child seem afraid of large, noisy vehicles?"

1	2	3	4	5	6	7	N/A

20. "When playing outdoors with other children, how often did your child seem to be one of the most active children?"

1	2	3	4	5	6	7	N/A

21. "When told "no", how often did your child stop the forbidden activity?"

1	2	3	4	5	6	7	N/A

22. "When told "no", how often did your child become sadly tearful?"

1	2	3	4	5	6	7	N/A

23. "Following an exciting activity or event, how often did your child seem to feel down or blue?"

1	2	3	4	5	6	7	N/A

24. "When playing indoors, how often did your child run through the house?"

1	2	3	4	5	6	7	N/A

25. **"Before an exciting event (such as receiving a new toy), how often did your child get very excited about getting it?"**

1	2	3	4	5	6	7	N/A

26. **"When he/she asked for something and you said "no", how often did your child have a temper tantrum?"**

1	2	3	4	5	6	7	N/A

27. **"When asked to wait for a desirable item (such as ice cream), how often did your child wait patiently?"**

1	2	3	4	5	6	7	N/A

28. **"When being gently rocked, how often did your child smile?"**

1	2	3	4	5	6	7	N/A

29. **"While being held on your lap, how often did your child mold to your body?"**

1	2	3	4	5	6	7	N/A

30. **"When a familiar adult, such as a relative or a friend, visited your home, how often did your child want to interact with the adult?"**

1	2	3	4	5	6	7	N/A

31. **"When asked to do so, how often was your child able to be careful with something breakable?"**

1	2	3	4	5	6	7	N/A

32. **"When visiting a new place, how often did your child *not* want to enter?"**

1	2	3	4	5	6	7	N/A

33. **"When he/she was upset, how often did your child cry for more than 3 minutes, even when being comforted?"**

1	2	3	4	5	6	7	N/A

34. **"When he/she was upset, how often did your child become easily soothed?"**

(12 month – English only)

1	2	3	4	5	6	7	N/A

35. **"When you were busy, how often did your child find another activity to do when asked?"**

1	2	3	4	5	6	7	N/A

36. **"When around large gatherings of familiar adults or children, how often did your child enjoy playing with a number of different people?"**

1	2	3	4	5	6	7	N/A

Rothbart Comments: _____

_____

_____

F. <u>**Patient Health Questionnaire (PHQ-4)**</u>

Experimenter: "**These next few questions are about you. Please follow along on the <u>pink</u> scale.**"

"**Over the last two weeks, how often have you been bothered by the following problems?**"

F1. "**Feeling nervous, anxious, or on edge**"

0 – Not at all
1 – Several days
2 – More than half the days
3 – Nearly every day

F2. "**Not being able to stop or control worrying**"

0 – Not at all
1 – Several days
2 – More than half the days
3 – Nearly every day

F3. "**Little interest or pleasure in doing things**"

0 – Not at all
1 – Several days
2 – More than half the days
3 – Nearly every day

F4. "**Feeling down, depressed, or hopeless**"

0 – Not at all
1 – Several days
2 – More than half the days
3 – Nearly every day

Appendix C

Media Use

Experimenter: **"Now, I'm going to be asking you some questions about media use and technology."**

	TV	DVD Player	Computer	Smart phone	iPad or other tablet	Educational game (Leapster)	Video game console (Xbox)
1a. Do you have any of the following?							
1b. Has your child ever used this device?							
1c. (If yes to 1b) How?							

2. **"How often is the TV on when someone is at home?"**

(Note: Please enter an INTEGER value for hours/day. Example, "2" or "3.5" If mother gives a range of numbers, prompt her to give an average or single number for hours/day.)

(Note: We are looking for the average time the TV is on. If needed, prompt mom: **"We know how long the TV is on may differ between weekdays and weekends, and whether your child is in the room or it's on in the background. We are looking for a rough average number of hours."**)

Number of hours/day: _____

3. *Experimenter*: **"For this next part, please follow along using the <u>orange</u> scale. There are often times when parents have to use their smartphone or tablet when spending time with their child. How likely are you to use your phone or other device (e.g. to make calls, text, check email, watch a video)…"**

	I never do this (1)	Not very likely (2)	Neutral (3)	Likely (4)	Very likely (5)
During meals					
During playtime					
During bedtime routine					

While driving them to or from activities, or when riding on public transportation					

Technology Comments: _____

_____

_____

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