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Co-Occurrence and Non-Overlap Among Behavioral and Health-Related Problems in Preschool Children

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ABSTRACT

Integrating mental health and healthcare services increases the reach of healthcare while reducing costs and stigma associated with seeking mental health services. To provide such services for preschool aged children we must first understand how behaviors related to healthy lifestyle and mental/behavioral health overlap. This study examined the relationship between behavior problems, sleep duration, screen time, and eating patterns and assessed the frequency of co-occurring problems in these areas. Because of the importance of parenting across these domains, the association between parent disciplinary strategies and the co-occurrence of behaviors in the different problem areas was assessed. MANOVAs revealed that there was a relationship between several problem areas. Elevated screen time was associated with a higher intensity of behavior problems, lower sleep duration, and less healthy eating patterns. A high intensity of behavior problems was associated with higher screen time use. Lower sleep was associated with higher screen time use and less healthy diet. High intensity behavior problems and elevated screen time use were also related to less effective parenting styles. And lax parenting styles predicted more co-occurring problems. Findings suggest support for addressing these problem areas using an integrative health care approach.

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CHAPTER 1

INTRODUCTION

In the area of health promotion there is a call for adopting an integrative approach to health-related behaviors (Wiefferink et al., 2006). Using a single intervention to target multiple health behaviors has the potential to increase access to services and health benefits while possibly reducing cost (Prochaska, Spring, & Nigg, 2008; Wiefferink et al., 2006). Integrating mental health and physical/medical services might further increase the reach of healthcare, in part by reducing the stigma associated with seeking mental health services only (Foster et al., 2005).

The major causes of death in the United States (i.e., heart disease and cancer) are associated with multiple health behaviors including substance use, diet, stress, and physical activity (National Center for Health Statistics, 2017). Engaging in healthy lifestyle behaviors such as nonsmoking, maintaining a healthy weight, eating recommended servings of fruits and vegetables, and exercising regularly reduces the risk of disease (Eyre et al., 2004). However, the majority of adults in the US do not engage in all of these healthy lifestyle behaviors and unhealthy behaviors often co-occur (Pronk et al., 2004; Reeves & Rafferty, 2005). In adolescents, similar results have been found, with approximately 30% of adolescents engaging in all four of the healthy lifestyle behaviors mentioned above (Pronk et al., 2004). In a study of children and adolescents, it was found that engaging in multiple risky health behaviors increases over time (Driskell, Dyment, Mauriello, Castle, & Sherman, 2008). Fruit and vegetable consumption and physical

activity decreases as children age and screen time increases (Driskell et al., 2008). Problems in these healthy lifestyle behaviors are linked to an increased risk of chronic diseases in adulthood, are preventable by establishing healthy behaviors, and are influenced by parenting practices (Baker, Morawska, & Mitchell, 2019). Research suggests that these health-related behaviors need to be established early in childhood because they may be more likely to persist into adolescence and adulthood (Jones, Hinkley, Okely, & Salmon, 2013). Early childhood is an important time for implementing integrated health promotion services (Weisleder et al., 2016). To justify and plan for such integrated services, we need to know more about the target areas proposed for integration including how much overlap there is amongst common childhood problems. Identifying childhood problems that co-occur can facilitate investigating common determinants and origins, which may inform potential interventions that integrate across domains (Brotman et al., 2012; Peters, Kok, Ten Dam, Buijs, & Paulussen, 2009).

There are many factors that impact health status in children. The framework for children's health promotion suggests that overall health status is impacted by multiple biological mechanisms which are, in turn, impacted by a child's health promoting behaviors (e.g., physical activity, television viewing, food preferences), appropriate nutrition, and parenting style (Mistry et al., 2012). These foundations of health are impacted by family and community capacities including parent's psychological resources, financial resources, and institutional resources. These family and community capacities are impacted by policies and programs that promote child health outcomes. When considering health promotion programs, it is imperative that they are aligned with

these systems because lifestyle choices and health behaviors are conditioned by multiple factors (Bronfenbrenner, 1992; Mistry et al., 2012).

The current study looked at how healthy lifestyle behaviors (i.e., screen time, sleep duration, and healthy eating patterns) in young children are associated with each other and with childhood behavior problems (see Figure 1). Behavior problems in children ages 3- to 5-years-old include defiance and non-compliance with parent instructions, emotional regulation difficulties, and physical aggression toward others. These behavior problems are prevalent in preschool-aged children (Potegal & Davidson, 2003; Österman & Björkqvist, 2010). Prevalence research indicates that clinical levels of behavior problems in preschool-age children range from 8-17% (Egger & Angold, 2006; Hotlz, Fox, & Meurer, 2015; Lavigne, LeBailly, Hopkins, Gouze, & Binns, 2009).

1.1 Screen Time

Sedentary behavior is defined as any behavior performed in a sitting, reclining, or lying position with an energy expenditure that is comparable to resting levels (Tremblay et al., 2017). One commonly studied sedentary behavior is screen time which includes TV viewing, computer/video game use and interactive and mobile media. This is one of the most common sedentary activities in which preschoolers participate (De Decker et al., 2012).

The American Academy of Pediatrics (AAP) recommends that parents limit children's screen time to no more than two hours of quality programming per day for children ages 3-5 (AAP, 2001). Additionally, it is recommended that parents engage in media with their child to help the child process information viewed (AAP, 2001). Research suggests that children's screen time use exceeds the recommended amount and

children view screens for approximately 3hours per day (Anderson, Economos, & Must, 2008; Manganello & Taylor, 2009; Tandon, Zhou, Lozano, & Christakis, 2010; Taras, Sallis, Nader, & Nelson, 1990; Zimmerman & Christakis, 2005).

This is concerning because of the numerous health effects of screen time. Excessive screen time has been associated with children's physical health. De Jong et al., (2013) found that the odds of being overweight was 1.65 times higher in children who watched more than 1.5 hours of TV a day compared to children who watched less than 1 hour of TV per day. Increased television viewing has been associated with increased body fat (LeBlanc et al., 2012; Robinson, 1999). In an experimental study to reduce screen time, Robinson (1999) found a significant decrease in body mass index for children in a screen reduction intervention. Children in the intervention group had significant decreases in screen time and meals consumed in front of a television suggesting that dietary intake may play a role in the association between screen time and overweight/obesity status (Robinson, 1999). Cox et al. (2012) found that time spent viewing TV was negatively associated with daily vegetable intake and positively associated with frequency of eating takeaway foods. These studies suggest that the consumption of energy-dense nutrient-poor foods while engaging in screen time may contribute to overweight and obesity in childhood.

Screen time is also associated with sleep problems in children (Singh & Kenney, 2013). Hale and Guan (2015) found that screen time impacts sleep primarily through shortened duration and delayed bedtimes. It is hypothesized that this relationship may be attributed to several factors including a time displacement, that is, less time for sleep; psychological or physical arousal due to media content; or because of the effect that

screen light may have on circadian rhythms and melatonin production (AAP, 2016; Hale & Guan, 2015).

A dose-response relationship has also been found between TV viewing specifically and behavior problems in children (Hinkley et al., 2014). Manganello & Taylor (2009) propose that TV viewing may impact child behavior problems through concepts of social learning theory (i.e., modeling and normalizing aggressive behavior). They found that increased TV time in children predicted childhood aggression. Associations between more general screen time and child behavior problems have also been found with this relationship being mediated by the impact of screen time on sleep (Barlett, Barlett, Eisenmann, & Walsh, 2012; Parent, Sanders, & Forehand, 2016).

1.2 Sleep Duration

Sleep deficits in children have increased over the last decade (Moreira & Pradella-Hallinan, 2017). The American Academy of Sleep Medicine recommends 10 to 13 hours of sleep per 24 hour period for 3- to 5-year-old children (Paruthi et al., 2016). However, past studies indicate that children get less than the recommended hours of sleep (Matricciani, Olds, Blunden, Rigney, & Williams, 2012; National Sleep Foundation [NSF], 2004; O'Brien, 2009). Matricciani et al. (2012) conducted a systematic review which found that the recommended hours of sleep for children exceed the actual amount of sleep by approximately 37 minutes. The NSF's poll (2004) found that for preschool children specifically, the average amount of sleep was 10.4 hours in a 24 hour period.

Sleep problems are common among children, with 20-40% of preschoolers affected (Alfano, Smith, Reynolds, Reddy, & Dougherty, 2013; Blunden, 2012; Johnson & McMahon, 2008; McGreavey, Donnan, Pagliari, & Sullivan, 2005). These sleep

problems include bedtime resistance, nighttime fear, and middle of the night awakenings which all result in children receiving an inadequate amount of sleep. Adequate sleep is important for several biological processes and has been associated with physical and psychosocial health (Beltramini & Hertzig 1983; Dahl, 1996).

Inadequate sleep has consistently been associated with other childhood problems including behavior problems, sedentary behavior, and physical health. Past research has provided strong evidence linking inadequate sleep in children with behavior problems, difficulty maintaining attention, academic concerns, and physical health (Appelhans et al., 2014; Beebe, 2011; El-Sheikh, Kelly, Buckhalt, & Hinnant, 2010; Ievers-Landis, Storfer-Isser, Rosen, Johnson, & Redline, 2008; Owens-Stively et al., 1997; Reid, Hong, & Wade, 2009; Sadeh, Gruber, & Raviv, 2002). Clifford et al. (2012) found that inadequate sleep was associated with risk for obesity with the likelihood for obesity 1.19-2.25 times greater among children who sleep less than 10 hours per night. Bates, Viken, Alexander, Beyers, and Stockton (2002) assessed the relationship between sleep problems and behavior problems in a community sample of preschool children and found that sleep problems predicted negative adjustment in preschool (Bates et al., 2002). Furthermore, inadequate sleep in preschool aged children has shown longer-term effects on behavior problems and substance use. Gregory, Eley, O'Connor, and Plomin (2004) conducted a longitudinal study in which they found that sleep issues at ages 3 and 4 predicted behavior problems at age 7. Wong, Brower, and Zucker (2009) found that sleep problems at ages 3-5 predicted substance use in adolescents and that this relationship was stronger for boys.

1.3 Eating Patterns

Healthy eating patterns established in early childhood are important because they can lead to healthy eating patterns in adulthood (Patrick & Nicklas, 2005; Stark et al., 2017). Unhealthy eating patterns typically lead to chronic health concerns in adulthood, including increased risk for cardiovascular disease, diabetes, specific cancers, and obesity (Brady, Lindquist, Herd, & Goran, 2000). Eating patterns are linked with growth and development in children, with unhealthy eating patterns leading to overweight and obesity amongst children (Fernandez-Alvira et al., 2014). The prevalence of childhood overweight and obesity across the world increased from 4.2% in 1990 to 6.7% in 2010 (de Onis, Blossner, & Borghi, 2010). This rate is expected to increase to 9.1% by 2020 (de Onis et al., 2010). Prevalence rates in the US are slightly higher. Data from the 2009-2010 National Health and Nutrition Examination Survey (NHANES) show that the prevalence rate of obesity among preschool aged children is 12.1% (Ogden, Carroll, Kit, & Flegal, 2012). The 2011-2012 NHANES data indicate that the prevalence rate of obesity has dropped to 8.4% for this age group (Ogden, Carroll, Kit, & Flegal, 2014). However, a more recent study of the trends in prevalence rates of obesity using NHANES data from 1999-2014 conclude that there have not been any significant decreases in obesity rates in any age group (Skinner, Perrin, Skelton, 2016).

The 2015-2020 Dietary Guidelines for Americans (U.S. Department of Health and Human Services and U.S. Department of Agriculture, 2015) states that a healthy eating pattern includes a variety of vegetables, fruits, grain (at least half of which are whole grains), fat-free or low-fat dairy, a variety or protein foods, and oils, while limiting consumption of saturated fats and trans fats, added sugars, and sodium. Research

indicates that children's eating patterns do not follow dietary guidelines. In general, children consume less than the recommended amount of fruits, vegetables, and grains and an excess of added sugars and refined carbohydrates (Brady et al., 2000; Butte et al., 2010; Hess & Slavin, 2014; Kranz, Hartman, Siega-Riz, & Herring, 2006; Nicklas et al., 2001).

1.4 Parent Disciplinary Practices

Theories of social development and strong research evidence indicate that there is a relationship between parenting practices and adaptive/healthy behaviors in children. Research suggests that self-regulatory processes are important for establishing healthy behaviors (Moffitt et al., 2011). Self-regulatory skills are developed in childhood and parenting processes influence this development. Social learning theory posits that children learn through modeling and observation of others (Bandura, 1977). Additionally, social learning theory states that learning is facilitated by the pairing of behaviors and consequences (Bandura, 1977); therefore, a parents' consistent use of rewards and punishments can increase or decrease specific behaviors in children.

One aspect of parenting practices, discipline, is consistently associated with the occurrence or non-occurrence of problems in many areas. Research findings indicate that coercive, harsh, and over-reactive parenting practices contribute to behavior problems in children (Conduct Problems Prevention Research Group, 2002; Forgatch & Martinez, 1999; Dishion & Patterson, 1999; Patterson & Reid, 1984; Patterson, De Baryshe, & Ramsey 1990; Patterson, Reid, & Dishion, 1992; Webster-Stratton, 1998). Parents who exhibit an over-reactive disciplinary style can increase the development and persistent course of childhood behavior problems (Mesman & Koot, 2001; Patterson, 1982).

Furthermore, coercive and over-reactive parenting has been associated with unhealthy eating patterns in children (Patrick, Nicklas, Hughes, & Morales, 2005). Patrick et al. (2005) also found that authoritative parenting styles in which parents encourage healthy choices and provide choices in eating options are positively associated with healthy eating patterns. In contrast to coercive, harsh, and over-reactive discipline is permissive and inconsistent discipline. This type of discipline is associated with behavior problems in children (Querido et al., 2002; Rinaldi & Howe, 2012; Thompson, Hollis, & Richards, 2003). Research also indicates that there is an association between permissive parenting style and reduced sleep quality and sleep duration in children, as well as excessive screen time use in children (Adam, Snell, & Pendry, 2007; Gau, Soong, & Merikangas, 2004; Jago et al., 2011; Owens-Stively et al., 1997; Spilsbury et al., 2005).

It is clear that disciplinary practices are implicated in childhood behavior problems and healthy lifestyle related behaviors (Anderson & Keim, 2016; Kochanska, Coy, & Murray, 2001). This makes it important to consider the relationship between parent disciplinary practices and these multiple problem areas, specifically, the co-occurrence of behaviors across domains. This has implications for tailoring interventions to target behaviors across domains. For example, Brotman et al. (2012) found that parenting interventions targeting behavior problems in preschool aged children also reduced risk for obesity. Because parents are the primary agents of change in intervening with preschool aged children, these findings may inform integrated services for managing multiple types of childhood problems.

1.5 Current Study

As reviewed above, previous research has focused on the co-occurrence of health problems only or has studied the relationship between one health problem and behavior problems in children. The current study aims to fill this gap in research by assessing the relationships between several different problem areas (i.e., high intensity of behavior problems, lower sleep duration, elevated screen time, and less healthy eating patterns) in preschool children. The study examined the relationship between each of the problem areas and assessed the frequency of co-occurring problems. The role of parenting in co-occurring health and behavior problems has not been studied before. Because of the importance of parenting across these domains, the association between parenting factors and the co-occurrence of behaviors in the different problem areas was also assessed. Exploring these research aims will inform the literature on which behaviors in preschool aged children co-occur and will inform discussions related to the provision of integrated services for children.

The specific research questions to be answered are: (1) which problem areas are related?; (2) what is the relationship between parenting and each problem area?; and (3) does parenting predict the number of co-occurring problems experienced by children? It is hypothesized that there will be significant relationships between each of the problem areas; that parenting approaches that are high on laxness, over-reactivity, and hostility will be associated with each problem area; and that higher scores on each of these parenting factors will predict a higher number of co-occurring problems.

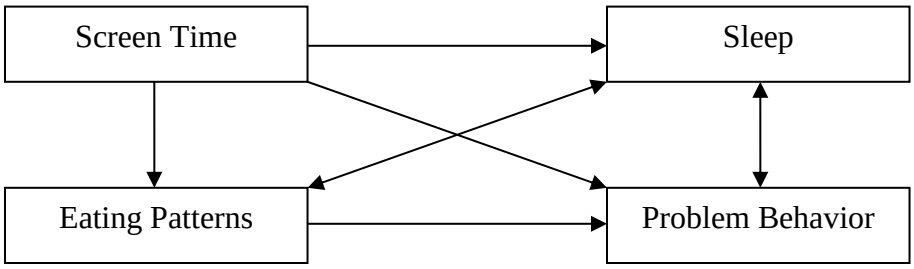

Figure 1.1 Relationship between health behaviors and behavior problems

CHAPTER 2

METHOD

2.1 Participants

Families for this study were recruited from multiple local agencies including pediatrician offices, preschools, daycare centers, faith institutions, and local family friendly events. Inclusion criteria were: (a) caregivers who had a child aged 3-5 years old; (b) caregivers who reside in the greater Columbia, South Carolina area; and (c) caregivers who speak/read/understand English. In households where there were two caregivers, the caregiver who spends the most time with the child during the day completed the questionnaires as they may be more familiar with the child's daily behaviors. Exclusion criteria were children having a current diagnosis of the following: autism spectrum disorder, cerebral palsy, developmental delay, epilepsy, fetal alcohol syndrome, Fragile X syndrome, intellectual disability, neural tube defects, any physical disability that impairs mobility, and traumatic brain injury. 290 families were included in this study. One family was excluded from data analysis because they did not complete any measures related to child behavior problems making the final sample for data analysis 289 families. A power analysis indicated that this sample size was adequate to detect small effects. The mean ages of children in the sample was 3.9 years (SD = .79) with 51% of the children being females. Over half the children in the sample were White (59.7%), 15.2% of children were Black, 2.1% were Hispanic, 1.0% were Asian or Pacific Islander, and 9.3% of children were described as multi-racial (race was unknown/unreported for 12.8% of

children). The mean age of parents in the sample was 33.6 years (SD = 9.2). Parents completing the survey were primarily biological mothers (89.7%), 6.6% were biological fathers, .6% step-parents, 2.8% adoptive parents, and .3% identified as other caregiver. The majority of parents identified as White (65.9%), 15.2% of parents identified as Black, 2.8% identified as Hispanic, 1.4% identified as Asian or Pacific Islander, and 4.8% identified as multiracial (race was unknown/unreported for 9.9% of parents). The majority of parents completing the survey were married (83.1%). Parents in the sample were mostly educated with 71% completing 4 years of college or more; 19% of parents completed 1-3 years of college, 9.3% completed high school or obtained a GED, and 0.7% completed some high school. Similarly, in terms of income, most families had an annual income of $50,000 or more (72.1%).

2.2 Measures

2.2.1 Family background questionnaire. Parents provided demographic information by answering questions regarding: parent gender, age of parent, race of parent, education level of parent, household income; and child's gender, child's age, and child's race.

2.2.2 Intensity of childhood problem behavior. The Eyberg Child Behavior Inventory ([ECBI], Eyberg & Pincus, 1999) is a 36-item measure of child disruptive behavior problems, specifically externalizing behavior problems, in children ages 2-16 as reported by parents/caregivers. The ECBI has two scales: the intensity scale, which reflects the frequency and severity of problem behaviors and the problem scale which assesses whether each behavioral item is perceived by the parent as problematic or not. Because of the focus on intensity of behavior problems in the current study, only the

intensity scale was utilized. The ECBI has strong psychometric properties. The intensity scale had high internal consistency ($\alpha = .93$). Clinical cutoff scores are utilized to differentiate between clinically elevated scores and scores within normal limits. Scores can range from 36 – 252 on the intensity scale and a score of 131 or above indicates clinically significant behavior problems.

2.2.3 Screen time. Parents provided information on how much time their child views/interacts with a screen on a variety of devices including television, videogame, mobile device, or tablet. Parents reported average time in minutes spent on these devices for a day during the week and a day during the weekend. Screen time on the week day was multiplied by five. Screen time on the weekend was multiplied by two. The weekday and weekend screen time minutes were totaled and divided by seven to gain an approximation of the child's screen time per day. Based on screen time guidelines from the American Academy of Pediatrics and screen time cutoffs used in previous studies (Anderson et al., 2008; Duch et al., 2013; Hancox, Milne, & Poulton, 2004; Mendoza, Zimmerman, & Christakis, 2007; Pearson, Biddle, Griffiths, Johnston, & Haycraft, 2018; Tandon et al., 2010), children who view screens for less than 2 hours (per 24 hour period) were categorized as having healthy amounts of screen time. Children who view screens for 2 hours or more were categorized as having elevated screen time.

2.2.4 Sleep duration. Parents provided information on approximate time their child goes to bed and approximate time their child wakes up on a weekday and on a day over the weekend. Parents also reported duration of any regular naps. Hours slept during the week were multiplied by five. Hours slept on the weekend were multiplied by two. The weekday and weekend sleep duration hours (which included night time sleep and

naps) were totaled and divided by seven to gain an approximation of the child's sleep duration per 24 hour period. Based on guidelines from the American Academy of Sleep Medicine, children who slept for 10 hours or more were categorized as having healthy amounts of sleep. Children who slept for less than 10 hours were categorized as having lower sleep duration.

2.2.5 Eating patterns. A type of food frequency questionnaire, the 26-item Dietary Screener Questionnaire ([DSQ], National Cancer Institute, 2015) was used to assess healthy and less healthy eating patterns in children as reported by parents. The DSQ was developed for use in the 2009-2010 NHANES. Items assess the frequency of consuming a variety of foods and drinks in the past month. In line with other research (e.g., Taylor, Emley, Pratt, & Musher-Eizenman, 2017), the DSQ was slightly modified for the current study such that items asked parents to respond with regards to their child's dietary intake. Although the preferred method of assessing food intake is based on dietary recall methods (i.e., 24 hour dietary recall, daily food diary), this method is labor-intensive for parents, especially in assessing young children (Livingstone & Robson, 2010). Food frequency questionnaires have shown acceptable psychometric properties (α = .69 for this sample) for gross eating patterns when compared to the more intensive dietary recall instruments (Flood et al., 2013; Koleilat & Whaley, 2016; Rodrigo, Aranceta, Salvador, & Varela-Moreiras, 2015; Randall Simpson, Keller, Rysdale, & Beyers, 2008). The current study is interested in the general construct of healthy or less healthy eating. Scores from the DSQ were used to create a healthy eating score based on the methods used by Perry et al. (2015). Healthy foods (based on NHANES categories) are scored 0 if not eaten at all, 1 if eaten monthly, 2 if eaten weekly, and 3 if eaten daily.

Unhealthy foods are negatively scored and assigned values of -3 if eaten daily, -2 if eaten weekly, -1 if eaten monthly, and 0 if not eaten at all. This resulted in scores between -30 to 48, with scores of six and above indicating healthy eating patterns and scores below six indicating less healthy eating patterns.

2.2.6 Parenting practices. The Parenting Scale is a 30-item self-report measure of discipline practices generally, for parents of preschool children (Arnold, O'leary, Wolff, & Acker, 1993). Parents rate the likelihood of using specific discipline strategies for a number of child behavior problems on a 7-point likert scale. Discipline practices are assessed along three factors: laxness (permissive discipline), over-reactivity (arguing with child and allowing things to build up), and hostility (use of physical discipline and insulting child). The total score had high internal consistency ($\alpha = .82$).

2.3 Procedures

Parents who were interested in taking the survey completed a consent process and were screened for eligibility. Eligible parents then completed an online survey and received a $10 electronic gift card for their participation. Parents provided demographic information and completed a set of questionnaires to assess the intensity of their child's behavior problem, child's average screen time use, child's average sleep duration, child's eating patterns, and parenting behaviors.

2.4 Analytic Plan

Bivariate Pearson correlations were calculated between all problem areas (i.e., behavior problems and health-related behaviors) using continuous scales for each area. For each of the problem areas, scores were then dichotomized, where a score of 1 indicates that the child has a problem in that area and a score of 0 indicates that the child

does not have a problem in that area. The criteria in Table 1 were used to create the dichotomized scores.

A multivariate analysis of variance (MANOVA) was used to assess which problem areas were related. For this research question, four separate MANOVAs were used. The independent variable was one of the four dichotomized problem areas; the continuous dependent variables were the remaining three problem areas. This analysis was repeated with each dichotomized problem area serving as the independent variable.

To examine how parenting factors vary for each problem area, a MANOVA was conducted to assess if mean differences exist. For this research question, the continuous dependent variables were laxness, over-reactivity, and hostility; the independent variable was divided into two groups (presence of problem area versus absence of problem area) based on the dichotomized problem areas.

To explore how well each parenting factor predicts the number of problem areas a child experiences, a problem area index was created. Scores on the index ranged from 0-4 using the dichotomous scores from each problem area. Using the criteria from Table 1, children's scores were totaled across all problem areas. Children who scored 0 on this index did not experience problems in any of the areas; children who scored 1 had a problem in one area; children who scored 2 had a problem in two areas; children who scored 3 had a problem in three areas; and children who scored 4 had a problem in four areas. The three predictor variables were entered simultaneously (laxness, over-reactivity, and hostility) and regressed onto the dependent variable (problem areas index).

Table 2.1 Dichotomy of Each Problem Area

Area	Criterion for "Yes"
Behavior problems	ECBI score > 130
Lower sleep duration	Less than 10hours/night average
Elevated screen time	2 hours or more/day average
Less healthy eating	DSQ score < 6.00

CHAPTER 3

RESULTS

Means, standard deviations, frequencies, and bivariate Pearson correlations are presented in Tables 2-4. The mean intensity of child behavior problems was reported to be 103.64 (SD = 27.98). On average, parents reported that children slept for 10.62 hours (SD = .76) in a 24-hour period. It was reported that children's average screen time use was 2.18 hours (SD = 1.01) and their average diet score was 9.97 (SD = 5.35). Parents completed the parenting scales, the mean laxness score was 2.32 (SD = .87), the mean over-reactivity score was 2.94 (SD = .96), and the mean hostility score was 1.72 (SD = .95), all of which were below the clinical cutoff scores.

To answer the research question of which problem areas were related, a multivariate analysis of variance (MANOVA) was conducted using each problem area as the independent variable, with the remaining three problem areas serving as dependent variables. Independent variables were dichotomized such that a score of 1 indicates that the child had a problem in that area and a score of 0 indicates that the child did not have a problem in that area. Multivariate test results are summarized in Table 5 and significant relationships are shown in Figure 2. The Pillai's Trace test statistic was used due to uneven cell sizes.

For intensity of child behavior problems, children were divided into two groups: those with clinically significant levels of behavior problems based on the ECBI score and those without elevated behavior problems. The other childhood problems included sleep

duration, screen time, and diet. Children without elevated behavior problems and children who had clinically significant levels of behavior problems had similar sleep duration in a 24-hour period (M = 10.62, SD = .73 and M = 10.60, SD = .94, respectively). Children without elevated behavior problems had less screen time compared to children with more intense behavior problems (M = 2.09, SD = .93 and M = 2.70, SD = 1.23, respectively). Children without elevated behavior problems had a healthier diet compared to children with more intense behavior problems (M = 10.18, SD = 5.34 and M = 9.24, SD = 5.05, respectively). The differences between intensity of child behavior problem groups on the combined dependent variables was statistically significant, $F(3, 283) = 4.74$, $p < .01$; Pillai's Trace = .048; partial $\eta^2 = .048$. Follow-up univariate ANOVAs (see Table 6) showed that screen time was statistically significantly different between intensity of child behavior problem groups: $F(1, 285) = 13.41$, $p < .001$; partial $\eta^2 = .047$.

To determine the effect of sleep duration on the other childhood problems, children were divided into two groups: those with sleep duration of 10 hours or more in a 24-hour period and those with less than 10 hours of sleep duration in a 24-hour period. The other childhood problems included intensity of child behavior problem, screen time, and diet. There was a difference in intensity of behavior problems, screen time, and diet in children who had longer sleep duration (M = 103.79, SD = 27.11; M = 2.11, SD = 1.0; and M = 10.40, SD = 5.43, respectively) compared to children who had shorter sleep duration (M = 101.63, SD = 30.86; M = 2.46, SD = .97; and M = 8.50, SD = 4.44, respectively). The differences between sleep duration groups on the combined dependent variables was statistically significant, $F(3, 283) = 3.40$, $p < .05$; Pillai's Trace = .036; partial $\eta^2 = .035$. Follow-up univariate ANOVAs (see Table 7) showed that screen time

was statistically significantly different between sleep duration groups ($F(1, 285) = 5.31$, $p < .05$; partial $\eta^2 = .019$) as was diet ($F(1, 285) = 5.72$, $p < .05$; partial $\eta^2 = .02$).

The effect of screen time on the other childhood problems was determined by dividing children into two groups: those who had less than 2 hours of screen time in a 24-hour period and those who had 2 or more hours of screen time in a 24-hour period. The other childhood problems included intensity of child behavior problem, sleep duration, and diet. There was a difference in intensity of behavior problems, sleep duration, and diet in children who had less screen time ($M = 99.66$, $SD = 24.94$; $M = 10.71$, $SD = .71$; and $M = 11.11$, $SD = 5.53$, respectively) compared to those who had more screen time ($M = 106.14$, $SD = 29.53$; $M = 10.55$, $SD = .80$; and $M = 9.25$, $SD = 5.00$, respectively). The differences between screen time groups on the combined dependent variables was statistically significant, $F(3, 283) = 4.96$, $p < .01$; Pillai's Trace = .05; partial $\eta^2 = .05$. Follow-up univariate ANOVAs (see Table 8) showed that screen time was statistically significantly different between healthy and unhealthy diet groups ($F(1, 285) = 8.79$, $p < .01$; partial $\eta^2 = .03$). Screen time differences trended towards significance for intensity of behavior problems ($F(1, 285) = 3.85$, $p = .051$; partial $\eta^2 = .013$) and sleep duration groups ($F(1, 285) = 3.03$, $p = .083$; partial $\eta^2 = .011$).

A final MANOVA assessing the overlap of problem areas was conducted to determine the effect of diet (i.e., healthy and unhealthy diet) on intensity of behavior problem, sleep duration, and screen time. The intensity of behavior problems was similar between children who had healthier diets and children who had less healthy diets ($M = 103.11$, $SD = 26.98$ and $M = 104.43$, $SD = 30.91$, respectively) as was amount of sleep ($M = 10.61$, $SD = .77$ and $M = 10.64$, $SD = .76$, respectively). There was a small

difference in screen time between children who had healthier diets and children who had less healthy diets (M = 2.12, SD = 1.0 and M = 2.39, SD = .99, respectively). The differences between diet groups on the combined dependent variables was not statistically significant, $F(3, 283) = 1.23$, $p = .298$; Pillai's Trace = .013; partial $\eta^2 = .013$.

To examine how parenting factors vary for each problem area, separate MANOVAs were conducted for each problem area to assess if mean differences exist (see Table 9). For this research question, the continuous dependent variables were laxness, over-reactivity, and hostility; the independent variables were the dichotomized problem areas.

In determining the effect of intensity of child behavior problems on parenting style, parents scored lower on laxness, over-reactivity, and hostility for children without elevated behavior problems (M = 2.25, SD = .84; M = 2.88, SD = .91; and M = 1.67, SD = .88, respectively) and higher when children had clinically significant levels of behavior problems (M = 2.65, SD = .95; M = 3.31, SD = 1.12; and M = 2.00, SD = 1.31, respectively). The differences between intensity of child behavior problem groups on the combined dependent variables was statistically significant, $F(3, 273) = 4.07$, $p < .01$; Pillai's Trace = .043; partial $\eta^2 = .043$. Follow-up univariate ANOVAs (see Table 10) showed that all three parenting styles were statistically significantly different between intensity of child behavior problem groups. When children had higher intensities of behavior problems, parents were more lax, $F(1, 275) = 7.73$, $p < .01$; partial $\eta^2 = .027$; more over-reactive, $F(1, 275) = 7.37$, $p < .01$; partial $\eta^2 = .026$; and more hostile, $F(1, 275) = 4.29$, $p < .05$; partial $\eta^2 = .015$.

A similar pattern of differences was found for the effect of screen time on parenting style. Parents scored lower on laxness, over-reactivity, and hostility when children had less than 2 hours of screen time (M = 2.10, SD = .80; M = 2.84, SD = 1.00; and M = 1.56, SD = .88, respectively) compared to when children had 2 hours or more of screen time (M = 2.48, SD = .90; M = 3.03, SD = .93; and M = 1.84, SD = .99, respectively). The overall model was significant $F(3, 274) = 5.24$, $p < .01$; Pillai's Trace = .054; partial $\eta^2 = .054$ with follow-up univariate ANOVAs showing differences in laxness and hostility between screen time groups as statistically significant (see Table 11). When children had lower amounts of screen time use, parents were less lax, $F(1, 276) = 13.08$, $p < .001$; partial $\eta^2 = .045$; and less hostile, $F(1, 276) = 5.95$, $p < .05$; partial $\eta^2 = .021$. The differences in screen time use trended towards significance for over-reactivity, such that when children were reported to have less screen time, parents were also less over-reactive, $F(1, 276) = 2.92$, $p = .09$; partial $\eta^2 = .010$.

For the remaining two problem areas (i.e., sleep duration and diet) there were no statistically significant differences between each group of the independent variable on the combined dependent variables. For sleep duration, the differences on the combined dependent variables was not statistically significant, $F(3, 272) = 1.17$, $p = .321$; Pillai's Trace = .013; partial $\eta^2 = .013$. The differences between diet groups on the combined dependent variables was not statistically significant, $F(3, 274) = 2.10$, $p = .1$; Pillai's Trace = .022; partial $\eta^2 = .022$.

The relationship between parenting and problem areas was further assessed with a multiple regression analysis. The three predictor variables were entered simultaneously (laxness, over-reactivity, and hostility) and regressed onto the dependent variable

(problem areas index). Overall, the model was significant ($F = 8.89$, $p < .001$) and the predictors accounted for 8.9% of the variance. The parenting style laxness predicted this outcome, ($\beta = .248$, $p < .001$) such that as laxness increased, the number of childhood health and behavior problems increased. Hostile parenting style trended toward significance, ($\beta = .118$, $p = .07$), such that as hostility increased the number of childhood health and behavior problems increased. An over-reactive parenting style did not significantly predict the number of childhood health and behavior problems. The regression results for the problem area index are summarized in Table 12.

Table 3.1 Descriptive Statistics of Variables

Variable	N	Mean	Std. Dev.	Possible Range
Intensity of child behavior problem	289	103.64	27.98	36 to 252
Sleep duration (hours)	288	10.62	.76	n/a
Screen time (hours)	289	2.18	1.01	n/a
Diet	289	9.97	5.35	-30 to 48
Parenting subscales				
Laxness	287	2.32	.87	1 to 7
Over-reactivity	285	2.94	.96	1 to 7
Hostility	284	1.72	.95	1 to 7

Table 3.2 Frequency Distribution of Dichotomous Variables

Variable	Categories	Frequency
Intensity of child behavior problem	0 = 130 or less	85.1%
	1 = Above 130	14.9%
Sleep duration	0 = 10 hours or more	81.3%
	1 = Less than 10 hours	18.8%
Screen time	0 = Less than 2 hours	42.4%
	1 = 2 hours or more	57.6%
Diet	0 = More healthy	79%
	1 = Less healthy	21%
Problem area index	0 = No problem areas	27.5%
	1 = One problem area	41.1%
	2 = Two problem areas	24.4%
	3 = Three problem areas	5.9%
	4 = Four problem areas	1.0%

Table 3.3 Bivariate Pearson Correlation Matrix

	1	2	3	4	5	6	7
1. Intensity of child behavior problem	1.00						
2. Sleep duration	.021	1.00					
3. Screen time	.201**	-.162**	1.00				
4. Healthy diet	-.038	.091	-.240**	1.00			
5. Laxness (parenting)	.263**	-.191**	.178**	-.151*	1.00		
6. Over-reactivity (parenting)	.299**	-.015	.124*	-.103	.335**	1.00	
7. Hostility (parenting)	.235**	-.045	.157**	-.158**	.246**	.400**	1.00

*p < .05

**p < .01

Table 3.4 Multivariate Test of Differences between each Problem Area

Effect	N	Pillai's Trace Value	F	Sig.	Partial Eta Squared
Intensity of child behavior problem	287	.048	4.74	.003	.048
Sleep duration	287	.035	3.40	.018	.035
Screen time	287	.050	4.96	.002	.050
Diet	287	.013	1.23	.298	.013

Table 3.5 Between Subjects Effects: Intensity of Child Behavior Problem

Source	Dependent Variable	Type III Sum of Squares	Df	Mean Square	F	Sig.	Partial Eta Squared
Intensity of child behavior problem	Sleep duration	.015	1	.015	.03	.872	.000
	Screen time	13.41	1	13.41	14.02	.000	.047
	Diet	31.78	1	31.78	1.13	.288	.004

Table 3.6 Between Subjects Effects: Sleep Duration

Source	Dependent Variable	Type III Sum of Squares	Df	Mean Square	F	Sig.	Partial Eta Squared
Sleep duration	Intensity of child beh. problem	204.55	1	204.55	.26	.608	.001
	Screen time	5.31	1	5.31	5.39	.021	.019
	Diet	158.12	1	158.12	5.72	.017	.020

Table 3.7 Between Subjects Effects: Screen Time

Source	Dependent Variable	Type III Sum of Squares	Df	Mean Square	F	Sig.	Partial Eta Squared
Screen time	Intensity of child beh. problem	2948.51	1	2948.51	3.85	.051	.013
	Sleep duration	1.75	1	1.75	3.03	.083	.011
	Diet	240.57	1	240.57	8.79	.003	.030

Table 3.8 Multivariate Test for Differences between Problem Areas on Parenting

Effect	N	Pillai's Trace Value	F	Sig.	Partial Eta Squared
Intensity of child behavior problem	277	.043	4.07	.008	.043
Sleep duration	276	.013	1.17	.321	.013
Screen time	278	.054	5.24	.002	.054
Diet	278	.022	2.10	.100	.022

Table 3.9 Between Subjects Effects: Intensity of Child Behavior Problem and Parenting

Source	Dependent Variable	Type III Sum of Squares	Df	Mean Square	F	Sig.	Partial Eta Squared
Intensity of child behavior problem	Laxness	5.70	1	5.70	7.73	.006	.027
	Over-reactivity	6.64	1	6.65	7.37	.007	.026
	Hostility	3.90	1	3.90	4.29	.039	.015

Table 3.10 Between Subjects Effects: Screen Time and Parenting

Source	Dependent Variable	Type III Sum of Squares	Df	Mean Square	F	Sig.	Partial Eta Squared
Screen Time	Laxness	9.59	1	9.59	13.08	.000	.045
	Over-reactivity	2.68	1	2.68	2.92	.089	.010
	Hostility	5.37	1	5.37	5.95	.015	.021

Table 3.11 Multiple Regression Analysis for Problem Area Index

Variable	B	SE	β	*t*
Laxness	.261	.065	.248**	4.017
Over-reactivity	-.004	.062	-.005	-.070
Hostility	.112	.061	.118*	1.845
R^2		0.089		
F		8.86**		

*p < .10

**p < .001

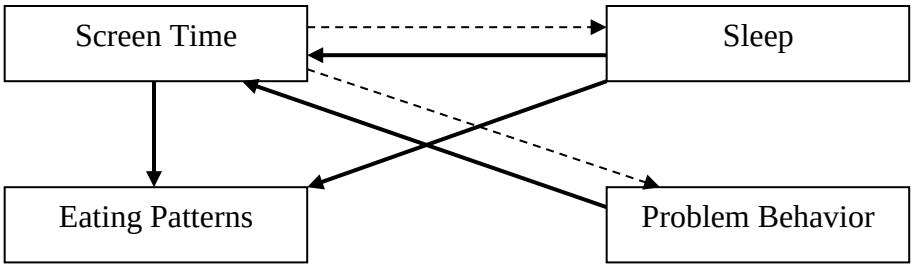

Figure 3.1 Significant relationships between health behaviors and behavior problems.

Note: bold lines represent significant relationships and dash lines represent relationships that trended towards significance.

CHAPTER 4

DISCUSSION

The current study was an exploratory cross-sectional examination of the co-occurrence of child health and behavior-related problems in preschool-aged children. The first research question assessed the relationship between each of the problem areas (i.e., high intensity of child behavior problems, lower sleep duration, elevated screen time, and less healthy eating patterns) to identify which problem areas co-occur. Several associations were found between co-occurring problems with parents reporting that 30% of children in this sample had problems in two or more areas.

Screen time appears to be consistently associated with each of the other problem areas. Children in this study were reported to have more than 2 hours of screen time on average per day, which is comparable to screen time averages in previous research. For children who have problematic screen time use there appears to be a higher intensity of behavior problems, lower sleep duration, and a less healthy diet. These associations have also been found in previous research studies. In a large sample of 3-6 year olds, Wu et al. (2017) found a significant association between elevated screen time (i.e., 2 hours or more) and an increase in behavior problems. The relationship between screen time and sleep has also been well-established (Bathory & Tomopoulus, 2017; Hale & Guan, 2015; Singh & Kenney, 2013) with research suggesting a bidirectional relationship (Magee, Lee, & Vella, 2014); in a recent study of 3-4 year old children, screen time was negatively correlated with sleep duration such that as screen time increased, sleep

duration decreased (Zhao et al., 2018). Screen time has also consistently been indicated in the risk for obesity (Mendoza et al., 2007; Watanabe, Lee, Mori, & Kawakubo, 2016). There is strong support for energy intake being the mechanism by which screen time leads to this increased risk (Pearson et al., 2018; Robinson et al., 2017). Previous research has found significant associations between increased screen time and an unhealthy diet, including low fruit and vegetable consumption, increased energy-dense food and drink consumption, and increased total energy intake (de Jong et al., 2013; Magee, Caputi, & Iverson, 2013; Pearson et al., 2018; Robinson et al., 2017).

Given the relationship between screen time and health and behavior-related problems, the findings of the current study highlight the importance of monitoring the amount of screen time use in preschool-aged children, as well as the importance of educating parents on healthy screen time use (i.e., limiting screen time and co-viewing high quality programming). Education on parents' screen time use may also be important as previous research has suggested that parents' elevated screen time use models unhealthy screen habits for children (Pearson et al., 2018). Health-related behaviors are established in early childhood (Birch and Fisher, 1998) and sedentary behaviors appear to be more consistently maintained through adolescence (Biddle et al., 2010) making it crucial to help families create and implement structure and limits around healthy screen time use.

Additionally, parents may use screen time to keep children occupied or as a behavior management strategy to prevent behavior issues from occurring or from escalating (Hiniker, Suh, Cao, & Kientz, 2016; Nikken, 2019). Findings from this study indicate that children with a high intensity of behavior problems (i.e., above the clinical

cutoff) also have higher amounts of screen time. As mobile devices become increasingly available, it may be beneficial to help parents consider alternative methods for managing childhood behavior problems using parenting and behavioral interventions. Again, use of these interventions in early childhood may help establish patterns of healthy screen time behavior in addition to managing behavior problems.

There is strong evidence to support the relationship between sleep and behavior problems (Alfano et al., 2013; Beebe, 2011; Cremone et al., 2018; Reid et al., 2009; Wu et al., 2017). However, that relationship was not found in this study. This may be related to how sleep was measured. Cremone et al. (2018) assessed sleep timing (i.e., sleep onset and sleep midpoint, a marker of circadian phase) using both subjective sleep diaries and objective sleep data collected through actigraphy. They found that later sleep onset and later sleep midpoint was associated with behavior problems in 4-6 year old children (Cremone et al., 2018). Other studies have measured a wider range of sleep problems. Alfano et al. (2013) assessed a range of bedtime behaviors as well as interactions among parents and children that maintain problematic sleep patterns which were all positively correlated with behavior problems. Reid et al. (2009) created a composite sleep measure made of four sleep problems including trouble falling asleep, bedtime routine, waking up during the night, and restless sleep. These sleep problems were significantly associated with child behavior problems (Reid et al., 2009). In the current study, sleep was only measured with regards to duration and not quality; it is possible that children may be in bed for a healthy duration but their quality of sleep may not be adequate. Healthy sleep requires adequate duration, appropriate timing, good quality, regularity, and the absence of disturbances and disorders (Paruthi, et al, 2016). Future studies should consider both

duration of sleep and quality of sleep when determining the co-occurrence of problematic sleep and behavior problems. Additionally, using more objective measures of sleep such as actigraphy or polysomnography may reduce bias that is inherent in self-reported sleep data (Martinez et al., 2017).

Lower sleep was associated with elevated screen time and a less healthy diet. As discussed above, there is evidence that the relationship between sleep duration and screen time is bidirectional (Magee, et al., 2014). Research suggests that lower sleep in children may decrease engagement in active play and increase sedentary behaviors such as screen time (Must & Parisi, 2009).

Both sleep groups (i.e., 10 hours or more and less than 10hours) had an overall healthy diet score, but those with adequate sleep duration had a significantly healthier diet compared to those with lower sleep duration. Previous studies have also found this relationship. In a study of preschool-aged children, Mullins et al. (2017) found that decreased sleep duration was associated with an increase in overall caloric intake as well as an increase in consumption of sugar and carbohydrates. Hart et al. (2013) conducted an experimental sleep study and found that increased sleep duration resulted in a lower daily caloric consumption. Past research also indicates that there is a relationship between inadequate sleep and risk for obesity (Clifford et al, 2012; Chuang et al., 2015; Ford et al., 2016). Given the associations between sleep, diet, and obesity, screening for and addressing sleep and diet problems in early childhood may help establish healthy lifestyle habits which may then prevent more chronic health conditions associated with obesity.

While elevated screen time and lower sleep duration were both associated with unhealthy eating patterns, in this study, an unhealthy eating pattern was not associated

with more intense behavior problems, more screen time, or less sleep duration. This may be attributed to the cutoff score used to define healthy and unhealthy eating patterns. This may also be related to how diet was assessed. Other studies have used more specific measures of healthy diet such as fruit and vegetable consumption (Coon et al., 2001; Magee et al., 2013; Spurrier et al., 2008), sugar-sweetened beverage or juice intake (Ford et al., 2016; King, 2016), specific nutrient intake (Martinez et al., 2017; Mullins et al., 2017), and overall caloric intake (Hart et al., 2013).

The next research question examined the relationship between parenting and each of the problem areas. There was a relationship between intensity of child behavior problem and each of the parenting disciplinary styles such that higher intensities of child behavior problems were associated with higher laxness, over-reactivity, and hostility. These relationships are well-established in previous research (Conduct Problems Prevention Research Group, 2002; Forgatch & Martinez, 1999; Dishion & Patterson, 1999; Patterson & Reid, 1984; Patterson, De Baryshe, & Ramsey 1990; Patterson, Reid, & Dishion, 1992; Webster-Stratton, 1998).

There was also a relationship between screen time use and parent disciplinary style, where higher screen time use was associated with higher laxness scores and higher hostility scores. This finding is also supported by previous research that has looked at parenting and screen time in older children. In a sample of 5-10 year-old children, Langer et al. (2014) assessed the relationship between parenting style and screen time use. Results suggest that lax and hostile parenting predicts more than 2 hours of daily screen time (Langer et al., 2014). Similarly, in children between the ages of 10 to 11, lax parenting was associated with children watching more than 4 hours of television per day

(Jago et al., 2011). Sanders, Parent, Forehand, Sullivan, & Jones (2016) suggest that using parenting strategies to limit adolescents' screen time use may be difficult, which indicates that it is important to establish healthy screen time behaviors in younger children using parenting strategies.

This relationship between ineffective parent disciplinary styles and problematic behaviors and elevated screen time supports the use of a single intervention, such as parent training interventions, to manage problems in each of these areas. Future studies should consider the use of such interventions to prevent problems in multiple areas by educating parents on more effective parenting styles. Brotman et al., (2012) assessed long-term health impacts of a parenting program that aimed to increase effective parenting and prevent behavior problems in 4-year-old children at risk for behavior problems. Findings from this study suggest that, compared to a control group, children who received the intervention had healthier behaviors related to screen time and diet (Brotman et al., 2012).

Contrary to previous studies, a relationship between the remaining problem areas (i.e., sleep and diet) and parent disciplinary style was not found. Again, differences in measurement may explain why the current study did not find these relationships. Owens-Stively et al. (1997) found a strong relationship between laxness and sleep but measured sleep quality and not duration. Spilsbury et al. (2005) also found a relationship between parenting style and sleep but they assessed encouragement of maturity as a parenting style and did not assess parent disciplinary style. When parenting and diet have been studied, more specific parenting styles were assessed. Patrick & Nicklas (2005) used a specific measure of caregiver feeding style to examine authoritarian and authoritative

feeding styles and children's food consumption patterns. A positive association was found between authoritative feeding and consumption of healthy foods, whereas a negative association was found between authoritarian feeding and consumption of healthy foods (Patrick & Nicklas, 2005). Similarly, Lloyd et al. (2014) assessed the use of parenting strategies specific to eating and activity and found that these strategies were positively associated with healthy diet.

The final research question assessed whether parent disciplinary practices predicted the number of co-occurring problems exhibited by children. The way parents handle problem behaviors did predict the number of problem behaviors endorsed, specifically, lax parenting styles predicted more co-occurring problems. The association between hostile parenting and number of co-occurring problems exhibited by children trended toward significance. Taken together, these findings have implications for helping parents learn more effective parenting styles, particularly related to discipline, to prevent the co-occurrence of childhood health and behavior problems.

While significant relationships were found between several problem areas as well as problem areas and parenting, it is important to note that the magnitude of these effects was small and comparable to those found in other studies in this area of research. However, the relationships found between child health and behavior problems still highlight the importance of preventing co-occurring childhood problems, potentially through changes in parenting strategies. Methodological limitations often contribute to small effects in social science research (McCartney & Rosenthal, 2000) and limitations for the current study are discussed below.

4.1. Limitations and Future Directions

Several limitations of the current study should be noted. Cut-off points were used to distinguish between problematic and non-problematic behaviors. Using cut-off points allows for comparison across studies (Cole, Flegal, Nicholls, & Jackson, 2007), however, cut-off points may not accurately distinguish between problem and non-problem groups in a specific sample (WHO Working Group, 1986). Future studies should consider alternatives to categorizing problematic and non-problematic behavior, perhaps using the sample data to identify these categories.

Participants in this study self-selected to participate which introduces a sampling bias. The majority of the final sample identified as white, educated, and was from a high socio-economic status which limits the generalizability of the study findings. Future studies should assess the co-occurrence of problem behaviors and parenting styles in a more diverse sample. Given that the findings of this study have some implications for the prevention of co-occurring child health and behavioral problems, it is important to assess the overlap of these problems in underserved populations for who access to health and mental health services may be more difficult (Azzi-Lessing, 2013). Additionally, future studies should assess the moderating effect of demographic variables such as child gender, child and parent race, parent education level, and socioeconomic status (SES). Previous studies indicate differences in child health and behavioral problems across demographic factors (El-Sheikh et al., 2013; Hale, Berger, LeBourgeois, & Brooks-Gunn, 2009; Marco, Wolfson, Sparling, & Azuaje, 2012; Tandon et al., 2012) and have found that relationships between health and behavioral problems are moderated by such factors. For example, El-Sheikh et al. (2010) found that the relationship between sleep problems

and behavior problems was moderated by race and SES. Assessing potential moderators of co-occurring health and behavior problems may better inform prevention and early intervention efforts.

There are also several measurement related limitations of this study, some of which were discussed previously. When measuring screen time use, only the amount of screen time use was measured. It is also important to assess the context of viewing screen time and the content of screen time. Previous research suggests that the effects of screen time may be less problematic when parents are actively engaged in screen time use with their child (Domoff et al., 2019). Future studies should account for this more engaged screen time use when assessing the amount of children's screen time use. As mobile devices become more available, it may also be necessary to assess characteristics of the screens including size, closeness to face, volume, and whether multiple screens are being utilized at the same time (Domoff et al., 2019; Hale & Guan, 2015). Additionally, this study did not take into consideration the content of screen time which is an understudied aspect of screen time (Hale & Guan, 2015). Previous studies have shown that viewing violent media content is related to an increase in aggressive behavior (Anderson et al., 2017) and that viewing prosocial media content is related to an increase in prosocial and helping behaviors (Coyne et al., 2018). Further research would inform the role of screen time content, especially any moderating effects, on the adverse impacts of elevated screen time use. Additionally, research needs to focus on the effects of handheld devices (i.e., smart phones and tablets) compared to traditional television viewing, not only to understand the increased amount of screen time exposure but also the impact of content and technological differences (Wolf, Wolf, Weiss, & Nino, 2018).

With regards to the assessment of sleep, as discussed previously, this study only considered sleep duration and not quality. Healthy sleep goes beyond sleep duration and should include the quality of sleep (Paruthi et al., 2016). Assessing the quality of sleep, specifically behaviors that impact the quality of sleep in early childhood, would help inform strategies and interventions to improve sleep quality. In addition to these measurement issues, the DSQ internal consistency for this sample was slightly lower than the recommended .70 or higher (Kline, 2005).

A final limitation, this study relied solely on self-report data from caregivers, which may be biased, and only assessed behaviors at home and not behaviors in child care settings. Future studies should consider using more structured assessments and/or multiple sources of data to accurately assess each of the problem areas. Specific to sleep measurement, future studies may consider using objective measures of sleep such as actigraphy or a combination of objective and subjective measures (see Mullins et al., 2017). In the current study parents reported the average time their child went to bed and the average time their child woke up which does not take into account the time it took for the child to actually fall asleep. This may have inflated the report of children's average sleep duration.

4.2. Conclusion

With the increasing use of integrated health care approaches, particularly regarding health promotion, this study assessed the co-occurrence of health and mental health related behaviors (i.e., behavior problems, lower sleep, elevated screen time, and unhealthy diet) in preschool aged children. Findings suggest that these behaviors co-occur and that problems in one type of behavior are associated with problems in another.

These findings support the use of integrated health care services for preschool aged children. It may be important for healthcare providers to include screening for each of the problem areas in routine care and consider methods for preventing problems from occurring. Given that parenting style was also related to the co-occurrence of problems, it may be important for future studies to consider the use of parenting interventions in an integrated healthcare setting to prevent the co-occurrence of problems in health and mental health related behaviors and to promote healthy lifestyle behaviors.

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