Adverse Childhood Experiences, Sleep, and Social Emotional Development Among Infants and Toddlers from Families Involved with Child Protective Services

Jonika B. Hash

A dissertation

submitted in partial fulfillment of the

requirements for the degree of

Doctor of Philosophy

University of Washington

2018

Reading Committee:

Monica L. Oxford, Chair

Teresa M. Ward

Susan J. Spieker

Program Authorized to Offer Degree:

School of Nursing

University of Washington

University of Washington

Abstract

Adverse Childhood Experiences, Sleep, and Social Emotional Development Among Infants and Toddlers from Families Involved with Child Protective Services

Jonika B. Hash

Chair of the Supervisory Committee:

Monica L. Oxford

Department of Family and Child Nursing

Background: Maltreated infants and toddlers, and their families, live in highly stressful and challenging contexts. The stressors experienced by maltreated infants and toddlers can be harmful to their development. Sleep health is an integral component to the developing child's physical and psychological wellbeing. Yet very little sleep research has been conducted among populations of maltreated infants and toddlers. There is a lack of understanding about the sleep problems experienced by these children, how sleep may underlie their social emotional development, and how already evidenced-based, home-visiting interventions can be leveraged to have the added benefit of addressing sleep problems among maltreated infants and toddlers.

Purpose: The purpose of this dissertation is to address this paucity of knowledge about sleep among maltreated infants and toddlers. There are three papers in this dissertation, all of which include a sample of dyads (parents and their 10- to 24-month-old child) from families with a CPS maltreatment report. *Paper 1* examines how behavioral sleep problems associate with parents' concerns about their child's sleep among this sample of parent-child dyads from families with a CPS maltreatment report. Paper 1 also examines sleep duration among children from these families, compared to a reference sample of children uninvolved with CPS. *Paper 2* examines longitudinal, transactional relations between sleep and social emotional development among this sample of infants and toddlers from families involved with CPS. *Paper 3* examines if adverse childhood experiences increase the risk of having a sleep problem among this sample of infants and toddlers. Paper 3 also examines if a home-visiting, relationship-based intervention can reduce children's risk of having a sleep problem, both directly and indirectly by way of increased parenting sensitivity.

Methods: All papers in this dissertation are based on a secondary analysis of a longitudinal, randomized controlled trial comparing a home-visiting, relationship-based parenting intervention to a resource and referral control condition. Participants included 247 parents and their biological 10- to 24-month-old child (n = 124 treatment condition, n = 123 control condition) from families with a CPS maltreatment report. Data were collected at approximately 3-month intervals including baseline (T1), immediately post-intervention (T2), 3 months post-intervention (T3), and 6 months post-intervention (T4). *For paper 1:* Only data from dyads randomized to the control condition were used. Measures included parent reports about their child's sleep (collected at T2 and T4). Reference sample means (about the children uninvolved with CPS) were extracted from a previous report. *For paper 2:* Only data from dyads randomized to the control condition

were used. Measures included parent reports about their child's sleep problems and daily napping behavior (collected at T2), as well parent reports about their child's internalizing behaviors, externalizing behaviors, and competence (collected at all time points). *For paper 3:* Data from the full sample were used. Measures included parent reports about their child's sleep problems (collected at T4), an observed parenting sensitivity tool (collected at all time points), and a combination of tools used to count children's adverse childhood experiences (collected across all time points).

Results: *Paper 1:* At T2, children's night wakings and difficulty falling asleep on their own, but not difficulty sleeping alone, significantly associated with whether or not their parent was concerned they had a sleep problem. Six months later, at T4, children's night wakings and difficulty sleeping alone, but not difficulty falling asleep on their own, significantly associated with whether or not their parent was concerned they had a sleep problem. Mean nocturnal sleep duration was significantly longer and mean nap duration was significantly shorter among children ages 24 to 36 months, compared to children of the same age in the reference sample. *Paper 2:* Higher baseline externalizing behavior associated with a greater propensity for parents to indicate that they were concerned their child had a sleep problem 3 months later. Higher baseline internalizing behavior also associated with a greater propensity for parents to indicate concern that their child had a sleep problem 3 months later, but only at the trend level. A greater propensity for parents to indicate concern that their child had a sleep problem associated with higher levels of internalizing and externalizing behavior 6 months later. A greater tendency for children to take a daily nap associated with lower internalizing behavior, lower externalizing behavior, and higher competence 6 months later. *Paper 3:* Children's adverse childhood experiences significantly associated with whether or not their parent was concerned they had a

sleep problem; as the number of adverse childhood experiences increased, the odds of having a sleep problem also increased. Post hoc analyses indicated an interaction between children's adverse childhood experiences and treatment assignment such that children's odds of having a sleep problem increased as their number of adverse childhood experiences increased, but only among children in the control condition.

Conclusion: This dissertation adds new knowledge to suggest that children's behavioral sleep problems were concerns that changed with development among these parents of infants and toddlers from families with a CPS maltreatment report. Findings also indicate the spread of sleep across the 24-hour period may have been different among the 24- to 36-month-old children in this sample, compared to the reference sample. In addition, children's daily napping behavior foreshadowed later social emotional functioning, while children's sleep problems both foreshadowed later and followed earlier behavior problems (especially externalizing behavior). Finally, accumulating early childhood adversity placed children at greater risk for sleep problems, but receiving a home-visiting, relationship-based intervention buffered children from this risk. Further research is needed to better understand sleep among populations of maltreated infants and toddlers.

TABLE OF CONTENTS

List of Figures 3

List of Tables 4

Chapter 1. Parent-Reported Sleep and Sleep Problems Among Infants and Toddlers Living in Families with a Child Protective Services Maltreatment Report 7

- Abstract 8
- Introduction 9
- Methods 12
- Results 18
- Discussion 22
- Conclusion 27
- References 28
- Appendix 46

Chapter 2. Longitudinal Relations Between Sleep Problems, Daily Napping Behavior, and Social Emotional Development Among Infants and Toddlers from Families Involved with Child Protective Services 47

- Abstract 48
- Introduction 49
- Methods 54
- Results 59
- Discussion 63

Conclusion 71

References 72

Appendix 88

Chapter 3. Adverse Childhood Experiences, Sleep Problems, and Parenting Sensitivity Among Parent-Child Dyads from Families Involved with Child Protective Services 89

Abstract 90

Introduction 91

Methods 95

Results 103

Discussion 107

Conclusion 112

References 113

Footnotes 119

Appendix 133

LIST OF FIGURES

Figure 2.1. Hypothesized model. 79
Figure 2.2. Results for the conditional latent growth curve path model with internalizing behavior. 83
Figure 2.3. Results for the conditional latent growth curve path model with externalizing behavior. 84
Figure 2.4. How context and development shape napping behavior. 86
Figure 2.5. Full statistical representation of the hypothesized model. 88
Figure 3.1. Hypothesized model. 120
Figure 3.2. Supporting Parents Program study flowchart. 124
Figure 3.3. Results for the hypothesized model tested in the Resource & Referral group alone. 130
Figure 3.4. Results for the hypothesized model tested in the full sample. 131
Figure 3.5. Predicted probabilities of having a sleep problem at 6 months post-intervention for children in the R&R and PFR groups, by ACE score 132
Figure 3.6. Full statistical model tested in the Resource & Referral group alone. 133
Figure 3.7. Full statistical model tested in the full sample. 134

LIST OF TABLES

Table 1.1. *Sleep Duration Measures for the CPS and Non-CPS Samples* 35
Table 1.2. *Baseline Demographics for the CPS Sample*.....36
Table 1.3. *T2 Sleep Descriptives for the CPS Sample*.....38
Table 1.4. *T4 Sleep Descriptives for the CPS Sample*.....41
Table 1.5. *Multiple Logistic Regression with Standard Predictor Entry Model Results for T2 and T4 Parent-Perceived Sleep Problems Among the CPS Sample*.....44
Table 1.6. *Single Sample t-Tests Comparing Sleep Duration Means Between the CPS and Non-CPS Samples*.....45
Table 1.7. *Zero-Order Correlations Among Variables for the Multiple Logistic Regression Models Predicting T2 and T4 Parent-Perceived Sleep Problems* 46
Table 2.1. *Descriptives and Zero-Order Correlations Among Study Variables*.....80
Table 2.2. *Unconditional Latent Growth Curve Model Results for T2 - T4 Internalizing and Externalizing Behavior*.....82
Table 2.3. *Multiple Linear Regression with Standard Predictor Entry for T4 Social Emotional Competence* 85
Table 3.1. *Baseline Characteristics by Intervention Condition*.....122
Table 3.2. *Measurement Tools and Assessment Time Points used to Construct the Child ACE Score*.....126
Table 3.3. *Descriptives for Analysis Variables*.....127
Table 3.4. *Zero-Order Correlations Among Study Variables in the Resource & Referral Group and in the Full Sample* 128
Table 3.5. *Unconditional Intercept-Only Latent Curve Model of T2 - T4 Parenting Sensitivity in the Resource & Referral Group and in the Full Sample*.....129

ACKNOWLEDGEMENTS

First and foremost, I wish to thank my team of mentors. I am deeply grateful for the chair of my committee, Dr. Monica Oxford, who welcomed me onto her team with open arms. This dissertation is highly influenced by her intellect and empathy, and for that I am grateful. My gratitude goes also to my long-standing mentor, Dr. Teresa Ward, who has an extraordinary capacity to see the potential in people, sometimes long before they ever see it themselves. It was Teresa who first gave me the courage to pursue my PhD in nursing science. My sincerest thanks extend also to Dr. Sue Spieker, for her generosity in sharing with me her fresh perspectives and intellectual prowess. I wish also to thank Dr. Shelby Langer, for her help on even the seemingly simplest of questions, as well as Dr. Rona Levy, who graciously stepped in to fill my need for a Graduate School Representative half-way through my program.

I would like to also thank Charlie Fleming and Mary Jane Lohr, who seemed to always make themselves available to me whenever I needed help. I acknowledge Charlie, for his patient statistical guidance, and Mary Jane Lohr, for her help on all matters administrative. My deepest appreciation extends also to the Supporting Parents Program research personnel and to the families who participated in this research.

I wish to also recognize the sources of funding that provided support for the Supporting Parents Program including the Eunice Kennedy Shriver National Institute of Child Health and Human Development grants R01 HD061362 and U54HD083091, as well as the sources which provided the support for my doctoral training including the University of Washington Top Scholar Award, the University of Washington Magnuson Scholarship, the Gladys Stevenson Travel Award, and the Christie Endowed Travel Award.

I also am so very thankful for my fellow PhD students, for their authenticity, friendship and camaraderie, and for my friends at home, for their warmth and genuine support.

Last but certainly not least, I wish to give thanks for my remarkable parents and grandparents; for my big brother and the special bond we share; for my study buddy, Penny, who is, in fact, a cat; and for Colin, my best friend and love.

Chapter 1. Parent-Reported Sleep and Sleep Problems Among Infants and Toddlers Living in Families with a Child Protective Services Maltreatment Report

Abstract

Introduction: Parent-reported sleep data among infants and toddlers from families involved with Child Protective Services ("CPS sample") were examined and compared to a reference sample ("non-CPS sample"). Method: This was a secondary analysis of cross-sectional data among 113 parent-child dyads (child age ≤ 36 months). Parents completed a questionnaire about their child's sleep. Data about the non-CPS sample were extracted from a previous report. Results: Among the CPS sample, night wakings, difficulty falling asleep independently, and difficulty sleeping alone associated with having a parent-perceived sleep problem. Compared to the non-CPS sample, 24- to 36-month-old children in the CPS sample evidenced longer nighttime sleep, shorter naps, and an equal amount of 24-hour sleep. Discussion: Findings indicate behavioral sleep problems were concerns for parents in the CPS sample. The spread, but not total amount, of sleep across the 24-hour period differed among children in the CPS and non-CPS samples.

Introduction

Infants and toddlers experience the highest rates of maltreatment victimization compared to any other age group, with children ages 0 - 3 years comprising 28.5% of all U.S. child maltreatment victims (U.S. Department of Health & Human Services, Administration for Children and Families, Administration on Children, Youth and Families, Children's Bureau, 2018). Childhood maltreatment, including abuse and neglect, is broadly associated with long-term deficits including poorer social emotional development, educational attainment, health behaviors, and mental and physical wellbeing (Gilbert et al., 2009). The neural plasticity of the young brain renders infants and toddlers especially vulnerable to the consequences of maltreatment (Davies, 2011). Having a sleep problem could further tax maltreated infants and toddlers and their families. Insufficient sleep can stress children's developing cognitive, behavioral, and emotional capacities (Beebe, 2011), social competence (Vaughn, Elmore-Staton, Shin, & El-Sheikh, 2015), emotion processing (Berger, Miller, Seifer, Cares, & LeBourgeois, 2012), language learning flexibility (Gómez, Bootzin, & Nadel, 2006) and behavioral and attentional regulation (Sadeh et al., 2015). Children's sleep problems can also be straining on their families and have been associated with poorer parental general health (Martin, Hiscock, Hardy, Davey, & Wake, 2007), parental daytime sleepiness (Boergers, Hart, Owens, Streisand, & Spirito, 2007), and maternal perceived sleep quality (Meltzer & Mindell, 2007).

According to a recent review, the highest reported rates of pediatric sleep problems occur during the infant and toddler years, of which behavioral problems (e.g., bedtime resistance behaviors, night wakings, difficulty falling asleep), as opposed to physiological problems (e.g., sleep disordered breathing), are the most common (Honaker & Meltzer, 2016). Clinically, 94% of pediatricians report encountering a behaviorally based sleep problem on at least a monthly

basis (Davis et al., 2012), indicating that behavioral sleep problems are a frequent concern in clinical practice. Given the behavioral nature of most infant and toddler sleep problems, listening to parents' concerns about their child's sleep behaviors are principle components in the clinical evaluation of pediatric sleep problems (Mindell & Owens, 2015). Understanding parents' perceptions of their child's sleep is especially important for clinicians, as "sleep problems" can take on different meanings from one parent to the next (Mindell & Owens, 2015). For the pediatric nurse practitioner (PNP) serving maltreated infants and toddlers, addressing behavioral sleep problems may be integral to the care of these children and their families. Yet currently, there is inadequate knowledge to inform the PNP caring for sleep problems among these children. No studies to date have examined how behavioral sleep problems are of concern to parents of maltreated infants and toddlers.

More broadly, there is a paucity of knowledge in general about sleep among maltreated children. Among the handful of studies that have been conducted, findings have indicated maltreated children's sleep may differ from that of their non-maltreated peers in important ways. Compared to their non-maltreated peers, maltreated children take longer to fall asleep, are more active at night (Glod, Teicher, Hartman, & Harakal, 1997), spend more time in restless sleep, spend less total time in bed asleep (Sadeh et al., 1995), and exhibit more parasomnias such as sleep walking or talking (Sadeh, Hayden, McGuire, Sachs, & Civita, 1994). Similarly, children placed in foster care take longer to fall asleep at night in comparison to their community-based peers (Tininenko, Fisher, Bruce, & Pears, 2010). Yet none of these studies examined sleep specifically among the youngest and most vulnerable group of maltreated children, infants and toddlers ages 0 - 3 years. It is possible maltreated infants and toddlers, as a highly stressed population, may sleep less than their non-maltreated peers, as increased emotional arousal can

interfere with a restful night's sleep (Dahl, 1996). Yet it is also possible maltreated infants and toddlers may sleep more than their non-maltreated peers, as some children can respond to trauma by sleeping more, not less (Klein, Devoe, & Miranda-Julian, 2009; Sadeh, Hen-Gal, & Tikotzky, 2008). Sadeh (1996b) suggested children's sleep could, theoretically, respond to stress and trauma in at least two possible ways: either increased vigilance (a "'turn-on' reaction;" p. 695) or increased withdrawal (a "'shut-off' reaction;" p. 695). Yet no studies have examined if maltreated infants and toddlers evidence more or less sleep, compared to non-maltreated infants and toddlers, limiting understanding of how their sleep may differ in important ways.

The Present Study

This study seeks to address these gaps in knowledge by describing and exploring parent-reported sleep and sleep problems among a sample of infants and toddlers ≤ 36 months of age from families with a Child Protective Service (CPS) maltreatment report (denoted as the "CPS sample") and by comparing these reports to previously published data from a reference sample of children not specifically referred to CPS (denoted as the "non-CPS sample"). Specific aims and hypotheses include:

Aim 1. Within the CPS sample only:

a. To describe parent reports about their child's sleep on various sleep parameters including sleep schedules (bedtime, waketime), durations (nocturnal, nap, total 24-hour), specific behavioral sleep problems (night wakings, needing parental assistance to fall back to sleep, ease of falling asleep independently, difficulty sleeping alone), napping behavior (daily napping behavior, consistency of nap time), hygiene (bedtime routines), perceived sleep problems (parents' general concern about their child having a sleep problem) and ecology (method of falling asleep, nocturnal sleep location, nap location).

b. To explore how parent reports about their child's specific behavioral sleep problems (night wakings, difficulty falling asleep independently, and difficulty sleeping alone) associate with their perceived sleep problems (the general concern about their child having a sleep problem). It was hypothesized that these specific behavioral sleep problems would associate with parents' general concerns about their child having a sleep problem.

Aim 2. Between the CPS and non-CPS samples:

To examine whether 24- to 36-month-old children in the CPS sample differ significantly from 24- to 36-month-old children in the non-CPS sample on parent-reported sleep duration (nocturnal, nap, total 24-hour). It was hypothesized that children in the CPS sample would differ significantly in either direction (either longer or shorter sleep durations) from the non-CPS sample.

Methods

Aims 1a and 1b

Design and participants. Aim 1 included a secondary analysis of cross-sections of follow-up data from among a subset of participants enrolled in a larger longitudinal randomized controlled trial (the Supporting Parents Program/SPP) comparing a parenting intervention to a resource and referral control condition (Oxford, Spieker, Lohr, & Fleming, 2016). SPP included a total of 247 biological parent-child dyads (n = 124 treatment condition, n = 123 control condition) living in families with a recent child maltreatment allegation. Dyads were recruited out of five Washington State CPS offices. Inclusion criteria were: (a) parents had a biological child (either the alleged victim of maltreatment or a sibling of the alleged victim) between the ages of 10 and 24 months, (b) the parent spoke English, and (c) the parent had housing within the

study area. Of the 247 children who met the 10- to 24-month-old age criteria, 87% were the alleged victim, and the remaining 13% were siblings. All parents provided informed consent according to Washington State Institutional Review Board approved procedures.

For the purposes of the present analyses, only data from dyads who (a) were allocated to the control condition and (b) remained intact and provided sleep data for at least one follow-up time point were examined. Of the 247 parents initially enrolled in SPP, 123 were randomized to the control condition, and of these 123 parents, 113 remained intact and provided sleep data for at least one follow-up time point. These 113 dyads, therefore, constituted the final sample of participants (denoted here as the "CPS sample") used to address Aim 1 of the present study.

The control condition in the CPS sample. The resource and referral service provided to dyads in the CPS sample randomized to the control condition consisted of a 30-minute, telephone-based needs assessment (e.g., financial needs, housing needs), two 10-minute follow-up phone calls, and a mailed resource packet. The resource and referral service did not specifically address children's sleep.

Data collection procedures. Data among the CPS sample were collected longitudinally during research home visits at baseline (T1) and at three follow-up time points including approximately 3 months post-baseline (T2), 6 months post-baseline (T3), and 9 months post-baseline (T4). At the T2 and T4 time points, parents completed a questionnaire about their child's sleep (described in greater detail below). For the purpose of Aim 1, cross-sections of sleep data from both the T2 and T4 time points were examined.

Measures. Parents retrospectively (in thinking about the previous 2 weeks) reported about their child's usual sleep on a paper-and-pencil version of the Brief Infant Sleep Questionnaire (BISQ; Sadeh, 2004). The BISQ is an established valid and reliable tool (Sadeh,

2004) that has been widely used, including among various cultures (Mindell, Sadeh, Kohyama, & How, 2010; Mindell, Sadeh, Wiegand, How, & Goh, 2010; Sadeh, Mindell, & Rivera, 2011; Sadeh, Mindell, Luedtke, & Wiegand, 2009; Teng, Bartle, Sadeh, & Mindell, 2012) and among both high- and low-income families (Tomalski et al., 2013). For use in the present study, the BISQ was modified (some items were adapted, added, or omitted) in an effort to reduce response burden on participants. Modifications were relevant for Aim 2 (which will be discussed in greater detail below).

For Aim 1, parents in this study reported on the BISQ about the following sleep parameters: *bedtime* (hours after noon), *waketime* (hours after noon), *frequency of night wakings* (0 = *0 times* per night to 3 = *3+ times* per night), whether their child *needed help falling back to sleep* if they woke up at night (0 = *no*, 1 = *yes*), their child's ease of *falling asleep on their own* at night (0 = *very easy* to 4 = *very hard*), whether they had a *usual bedtime routine* (0 = *no*, 1 = *yes*), and whether they had *difficulty sleeping alone* (0 = *no*, 1 = *yes*). Parents were also asked to indicate about daytime sleep parameters, including whether their child took a *daily nap* (0 = *no*, 1 = *yes*) and, if so, whether they usually had a *consistent nap time* from day to day (0 = *no*, 1 = *yes*) and what their average *nap duration* was (hours). Parents were additionally asked to report about their child's sleep ecology, including *nocturnal sleep location*, *nap location*, and *method of falling asleep* at night. Also assessed were *parent-perceived sleep problems* ("Do you consider your child's sleep a problem?" [Sadeh, 2004, p. e576] with response options including 0 = *not a problem at all*, 1 = *a small problem* and 2 = *a very serious problem*). Additional sleep parameters including *nocturnal sleep duration* (hours between *bedtime* and *waketime*) and *total 24-hour sleep duration* (sum of *nocturnal sleep duration* and *nap duration*) were subsequently calculated by research personnel.

Aim 1a. For Aim 1a, all of the BISQ sleep parameters as described above were used.

Aim 1b. For Aim 1b, four of the above BISQ sleep parameters were used and dichotomized including *night wakings* (0 = *no,* did not wake up at night, 1 = *yes,* woke up 1 or more times at night), *ease of falling asleep on own* (0 = had a *very easy* or *somewhat easy* time falling asleep on own, 1 = had a *somewhat hard* or *very hard* time falling asleep on own), *difficulty sleeping alone* (0 = *no* difficulty, 1 = *yes* difficulty), and *parent-perceived sleep problems* (0 = *not a problem*, 1 = *a small* or *very serious problem*).

Aim 2

Participants. Aim 2 was addressed by comparing T4 sleep data from 24- to 36-month-old children in the CPS sample (of the 113 children in the above CPS sample, 69 had sleep data and were 24 to 36 months of age at T4) to previously reported sleep data among 700 children ages 24 to 36 months from a larger cross-sectional study conducted by Sadeh and colleagues (2009). Participants in Sadeh and colleagues' study were U.S. and Canadian caregivers (primarily White-Caucasian, highly educated mothers) and their infant or toddler, recruited via a parenting website to participate in an online study about their child's sleep. For clarity, the 700 children ages 24 to 36 months from Sadeh and colleagues' study are denoted here as the "non-CPS sample."

Data collection and extraction procedures. Data from the CPS sample were collected at T4 as described above. Mean sleep data from the non-CPS sample were extracted from Sadeh and colleagues' (2009) published report.

Measures. As described above, parents in the CPS sample reported about their child's sleep on a modified paper-and-pencil version of the BISQ. For Aim 2, three BISQ sleep

parameters about children's sleep durations were used, including: (a) *nocturnal sleep duration* (hours), (b) *nap duration* (hours), and (c) *total 24-hour sleep duration* (hours).

Among the non-CPS sample (from the Sadeh et al., 2009, study), parents provided 2-week retrospective reports about their child's sleep on an extended online version of the original BISQ. For Aim 2, means for three parameters about sleep duration among these children in the non-CPS sample were extracted from this Sadeh et al. report including: (a) *nocturnal sleep duration* (hours), as measured by the question "How much total time does your child spend sleeping during the NIGHT (between 7 in the evening and 8 in the morning)," (p. 71), (b) *nap duration* (hours), as measured by the question "How much total time does your child spend sleeping during the DAY (between 8 in the morning and 7 in the evening)" (p. 71), and (c) *total 24-hour sleep duration* (hours), as measured by the sum of *nocturnal* and *daytime sleep duration* (J. A. Mindell, personal communication, January 5, 2018).

Table 1.1 gives the specific measures used to assess *nocturnal sleep duration*, *nap duration*, and *total 24-hour sleep duration* for the CPS and non-CPS samples. As shown, measurement strategies differed slightly between the samples. The most notable difference between strategies was: Among the CPS sample, parents were directed to report *nap duration* only if their child took a nap every day whereas, among the non-CPS sample, no such direction was given to parents. For children taking naps on some but not all days of the week, this may have underestimated daily *nap duration* (and, subsequently, *total 24-hour sleep duration*), as averaged across a typical 2-week period, for children in the CPS sample relative to children in the non-CPS sample. (*Nap duration* in the CPS sample was assumed to be zero for children who did not take a nap every day.) However, these differences were considered minimal and unlikely to have a large impact on the present study.

[Table 1.1 about here.]

Analytic Strategy

Aim 1a: Parent-reported T2 and T4 sleep descriptives among the CPS sample. To address Aim 1a, descriptive statistics were examined for both time points (T2 and T4) of the BISQ in the CPS sample. These descriptives were examined both within the full sample and within age bands. Age bands were matched to prior studies (Sadeh et al., 2009; Teng et al., 2012). For the T2 time point, when children ranged in age from 13 to 33 months, three age bands were examined: (a) 13 to 17 months, (b) 18 to 23 months and (c) 24 to 33 months. For the T4 time point, when children ranged in age from 19 to 36 months, two age bands were examined: (a) 19 to 23 months and (b) 24 to 36 months.

Aim 1b: Associations between specific behavioral sleep problems and parents' general concerns about their child having a sleep problem at T2 and T4. After examining correlations (see Table 1.7 in the Appendix), two multiple logistic regression models with standard predictor entry (one model per time point) were used to predict T2 and T4 *parent-perceived sleep problems*, entering specific concurrent behavioral sleep problems (*night wakings*, *ease of falling asleep on own*, and *difficulty sleeping alone*) as the set of indicators and controlling for child age. Raw beta coefficients are reported.

Aim 2: T4 parent-reported sleep duration among the CPS sample compared to parent-reported sleep duration reference means among the non-CPS sample. To address Aim 2, two-tailed single sample *t*-tests were conducted to examine T4 *nocturnal sleep duration*, *nap duration*, and *total 24-hour sleep duration* among the 24- to 36-month-old children in the CPS sample, compared to the non-CPS sample. To avoid Type I error rate inflation, a Bonferroni correction was applied to adjust the significance level to $\alpha = .017$ per test. Cohen's *d* was

calculated for an effect size using the guidelines of 0.20 for a small, 0.50 for a medium, and 0.80 for a large effect size (Cohen, 1988).

Statistical software and missing data. All analyses were conducted in IBM SPSS Statistics Version 19. Of the 113 children in the CPS sample that had sleep data for at least one time point, 109 and 101 had sleep data and were ≤ 36 months of age at the T2 and T4 time points, respectively.

Missing data were managed according to SPSS default missing data procedures, which included: exclusion of cases with missing values in the descriptives, pairwise treatment of missing data in the correlations, exclusion of cases missing data on one or more independent variables in the regressions, and exclusion of cases missing data on the dependent variable in the *t*-tests. Some items were not added to the BISQ until later in the study (*nap duration*, *24-hour sleep duration*, *consistent nap time*, *nocturnal sleep location*, *nap location*, and *method of falling asleep*), which lowered the number of respondents on these items. Missing data were otherwise minimal (e.g., very few parents skipped questions).

Results

Demographics

Baseline demographics for the 113 dyads in the CPS sample who remained intact and had sleep data for at least one time point are given in Table 1.2.

[Table 1.2 about here.]

Aim 1a: Parent-Reported T2 and T4 Sleep Descriptives Among the CPS Sample

Descriptives. The T2 and T4 BISQ sleep descriptives among the CPS sample are given in Table 1.3 and Table 1.4, respectively.

T2. On average, across all age groups of children, parents reported a mean *bedtime* of 8:50 pm and a mean *waketime* of 7:52 am. Mean *nocturnal sleep duration* was 11 hours and 2 minutes, mean *nap duration* was 1 hour and 22 minutes, and mean *total 24-hour sleep duration* was 12 hours and 28 minutes. Fifty-three percent of parents reported at least one *night waking*, and of those reporting night wakings, 68% indicated that their child needed *help falling back to sleep*. Eighty-six percent of children had a *usual bedtime routine*, 34% had at least a somewhat hard time *falling asleep on their own* at night, and 25% had *difficulty sleeping alone*. Eighty-four percent took a *daily nap* and, among daily nappers, 87% had a *consistent nap time*. Twenty-six percent had a small or serious *parent-perceived sleep problem*. *Nocturnal* and *nap locations* varied, with most children sleeping in an infant crib or bed, either in a separate room (25% for nocturnal sleep location, 29% for nap location), parent's room (35% for nocturnal sleep location, 30% for nap location), or sibling's room (16% for nocturnal sleep location, 14% for nap location). *Method of falling* asleep for most children was either in bed alone (49%), near/with a parent (28%), or while feeding (11%). Some developmental shifts in these sleep descriptives were also evidenced: Primarily, mean *nap duration*, *total 24-hour sleep duration*, and *daily naps* decreased with age while having a *usual bedtime routine* increased with age.

[Table 1.3 about here.]

T4. Across all age groups, parents reported a mean *bedtime* of 8:58 pm and a mean *waketime* of 7:52 am. Mean *nocturnal sleep duration* was 10 hours and 54 minutes, mean *nap duration* was 1 hour and 22 minutes, and mean *total 24-hour sleep duration* was 12 hours and 17 minutes. Thirty-eight percent of children had at least one *night waking*, and 76% of night wakers needed *help falling back to sleep*. Eighty-seven percent of children had a *usual bedtime routine*, 33% had at least a somewhat hard time *falling asleep on their own*, and 26% had *difficulty*

sleeping alone. Seventy-five percent took a *daily nap*, of whom 92% had a *consistent nap time*. Twenty-seven percent had a small or serious *parent-perceived sleep problem*. For *nocturnal* and *nap locations*, most children again slept in an infant crib or bed, either in a separate room (24% for nocturnal sleep location, 18% for nap location), parent's room (26% for nocturnal sleep location, 21% for nap location), or sibling's room (23% for nocturnal sleep location, 18% for nap location). Another 24% slept in their parent's or another adult's bed at night. For *method of falling* asleep, most children fell asleep either in bed alone (48%), near/with a parent (33%), or while being held (7%). Developmental shifts primarily included: *Nocturnal sleep duration*, *nap duration*, *total 24-hour sleep duration*, *night wakings*, and *daily naps* decreased with age, and *bedtime* became later with age.

[Table 1.4 about here.]

Aim 1b: Associations Between Specific Behavioral Sleep Problems and Parents' General Concerns About their Child Having a Sleep Problem at T2 and T4

Regressions. Results for the multiple logistic regression models predicting whether children had a *parent-perceived sleep problem* at T2 and T4 are given in Table 1.5.

T2. As shown in the top half of Table 1.5, the chi-square test of model fit was significant, indicating T2 *night wakings*, *ease of falling asleep on own*, *difficulty sleeping alone*, and child age, taken together as a set of indicators, helped to reliably distinguish among children with and without a T2 *parent-perceived sleep problem*, $\chi^2(4) = 26.37$, $p < .001$, Nagelgerke's Pseudo-R^2 = .32 (81% overall hit rate). T2 *night wakings* and *ease of falling asleep on own* uniquely associated with whether or not children had a T2 *parent-perceived sleep problem*. Compared to parents reporting no *night wakings*, parents reporting one or more *night wakings* were 3.59 times more likely to indicate their child had a *sleep problem*. Likewise, compared to parents reporting

their child had a very or somewhat easy time *falling asleep on their own*, parents reporting their child had a somewhat or very hard time were 5.74 times more likely to also indicate their child had a *sleep problem*. T2 *difficulty sleeping alone* failed to uniquely associate with whether or not children had a T2 *parent-perceived sleep problem.*

T4. As shown in the bottom half of Table 1.5, the chi-square test was significant, indicating T4 *night wakings*, *ease of falling asleep on own*, *difficulty sleeping alone*, and child age, taken together as a set of indicators, helped to reliably distinguish between children with and without a T4 *parent-perceived sleep problem*, $\chi^2(4) = 33.26$, $p < .001$, Nagelgerke's Pseudo-R^2 = .42 (79% overall hit rate). T4 *night wakings* and *difficulty sleeping alone* uniquely associated with whether or not children had a T4 *parent-perceived sleep problem*. Compared to parents reporting no *night wakings*, parents reporting at least one *night waking* were 7.45 times more likely to also indicate their child had a *sleep problem*. Similarly, compared to parents reporting their child did not have *difficulty sleeping alone*, parents reporting their child did have *difficulty sleeping alone* were 3.82 times more likely to also indicate their child had a *sleep problem*. T4 *ease of falling asleep on own* was not significantly associated with whether or not children had a T4 *parent-perceived sleep problem* (although this association did trend toward significance).

[Table 1.5 about here.]

Aim 2: T4 Parent-Reported Sleep Duration Among the CPS Sample Compared to Parent-Reported Sleep Duration Reference Means Among the Non-CPS Sample

Single sample *t*-tests. Results for the single sample *t*-tests comparing the CPS and non-CPS samples are given in Table 1.6. As shown, the CPS sample differed significantly from the non-CPS sample on *nocturnal sleep duration*. On average, *nocturnal sleep duration* was 43 minutes longer for the 24- to 36-month-old children in the CPS sample, compared to the 24- to

36-month-old children in the non-CPS sample. *Nap duration* also differed significantly between the samples. On average, *nap duration* was 46 minutes shorter in the CPS sample compared to the non-CPS sample. *Total 24-hour sleep duration* did not differ significantly between the samples.

[Table 1.6 about here.]

Discussion

Aim 1a: Parent-Reported Sleep Among the CPS Sample

Descriptive statistics among the CPS sample showed mean *total 24-hour sleep duration*, which was 12.47 hours across all ages (13 to 33 months) at T2 and 12.28 hours across all ages (19 to 36 months) at T4, was well within the range of the American Academy of Sleep Medicine consensus recommendations of 11 - 14 hours for children ages 12- to 35-months (Paruthi et al., 2016). Descriptives also evidenced some expected developmental trends among children in this CPS sample, including age-related decreases in *nocturnal sleep duration*, *nap duration*, *total 24-hour sleep duration*, *night wakings*, and *daily naps* (Galland, Taylor, Elder, & Herbison, 2012; Iglowstein, Jenni, Molinari, & Largo, 2003). In addition, descriptives showed approximately one-quarter of parents in this CPS sample had concerns about their child's sleep: Across all age groups and time points, 23% had concerns about a small problem, and another 3% - 4% had concerns for a serious problem. These proportions are similar to those reported in Sadeh and colleagues' (2009) study where, among parents of 0- to 36-month-old children, 23% had concerns for a small problem and 2% had concerns for a serious problem.

When considering pediatric sleep, it is important to keep in mind that sleep is shaped by the contexts in which children live (Sadeh, Tikotzky, & Scher, 2010). Many families involved with CPS face highly challenging circumstances – challenges like poverty, parental depression,

and domestic violence (Campbell, Thomas, Cook, & Keenan, 2012) – which, if unaddressed, could strain children's sleep health. For example, although following a consistent bedtime routine may help children get to bed earlier, fall asleep more quickly, get more sleep at night, wake up less frequently at night, and spend less time in nocturnal wakefulness (Mindell, Li, Sadeh, Kwon, & Goh, 2015), families living in disadvantaged environments, including families struggling with poverty, may experience extra burdens that could make following consistent bedtime routines more challenging to implement and maintain (Hale, Berger, LeBourgeois, & Brooks-Gunn, 2009). As another example, although quality sleep environments may help children fall asleep more quickly and get more slept at night, 20% of preschoolers from low-income families sleep in suboptimal environments, including environments that are "too loud," "too bright," "too hot," or "too cold" (Wilson, Miller, Lumeng, & Chervin, 2014, p. 301). In the present study, it is possible living in a challenging or stressful environment was salient to how well children slept, although children's sleep may have been strained in ways not captured by the BISQ. For example, stressful life events may have introduced night-to-night variability in children's bedtimes, but this was not assessed on the BISQ. For the PNP serving maltreated young children and their families, addressing unique family needs, including contextual challenges, may be an important component to the success of treating sleep problems and promoting sleep health among these children. Further research is needed to better understand how contextual challenges faced by families with maltreated young children pertain to children's sleep, as well as how PNPs can help support families facing these challenges.

Aim 1b: Associations Between Specific Behavioral Sleep Problems and Parents' General Concerns About their Child Having a Sleep Problem at T2 and T4

As expected, findings indicated children's behavioral sleep problems including *night wakings*, *difficulty falling asleep on own*, and *difficulty sleeping alone* were significant concerns for these parents. Yet, interestingly, how these behavioral sleep problems related to parents' general concerns were not all consistent across time, indicating the meaning of "sleep problems" for these parents changed with their child's development. Children's *difficulty falling asleep on their own* was concerning to parents when their children were, on average, 20.68 months of age, but this concern diminished approximately 6 months later when the cohort was, on average, 27.11 months of age. Conversely, children's *difficulty sleeping alone* was not a significant concern when children were younger (on average, 20.68 months of age) but became a significant concern just 6 months later (when children were, on average, 27.11 months of age). *Night wakings* persisted as a concern across both time points of this study. These findings are similar to a study conducted by Byars, Yolton, Rausch, Lanphear, and Beebe (2012), who found that night wakings were consistently problematic for parents across the first 3 years of their child's life, but frequently falling asleep in a parent's or sibling's bed was problematic only when their child was 24 months of age. Although no developmental hypothesizes were made for the present study, these findings about maturational nuances in the meaning of "sleep problems" could indicate that, among families with a CPS maltreatment report, parents' concerns about their child's sleep change with time for some, but not all, behavioral sleep problems. For the PNP working with maltreated infants and toddlers and their families, inquiring about children's behavioral sleep problems as they grow may help uncover each parent's unique developmental concerns.

Aim 2: Parent-Reported Sleep Durations Among the CPS Sample Compared to the Non-CPS Sample

Findings from the mean comparison analyses showed longer *nocturnal sleep durations* and shorter *nap durations* among 24- to 36-month-old children in the CPS sample, compared to children of the same age in the non-CPS sample. Interestingly, these differences appeared to balance out such that *total 24-hour sleep duration* was equal between the samples. In other words, on average, children in the CPS sample spent less time sleeping during the day and more time sleeping during the night but, overall, obtained equal amounts of total sleep, relative to children of the same age in the non-CPS sample. Another way to conceptualize these findings is that the spread of sleep across the 24-hour period, but not the total amount of sleep itself, differed between the CPS and the non-CPS samples. Similar phenomena have been described before (e.g., Crosby, LeBourgeois, & Harsh, 2005; Thorpe et al., 2015; Ward, Gay, Anders, Alkon, & Lee, 2008). For example, in a study among 3- to 5-year-old preschoolers in daycare, Ward and colleagues (2008) report napping preschoolers spent less time sleeping at night but equal amounts of time sleeping over the 24-hour period compared to non-napping preschoolers. For children in this CPS sample, it may be that sleeping less during the day but more at night served to indicate that these children, and their families, faced broader contextual challenges, which made family routines, such as structured nap times, more difficult to implement and/or maintain. In support of this idea, prior findings have indicated that families cannot always maintain their child's napping schedules when strained by stressful life events (Weissbluth, 1995). That nighttime sleep duration was longer among children in this CPS sample, compared to the non-CPS sample, may simply reflect a "catch up" of missed daytime sleep during the nocturnal hours. It is also possible these findings could reflect disparities in the napping opportunities available to children living in highly stressful contexts. More research is needed to

better understand this phenomenon about the spread of sleep across the 24-hour period among at-risk infants and toddlers.

Strengths and Limitations

There are some limitations of this study. First, as already noted, the sleep duration measures differed slightly between the CPS and non-CPS samples. Although the potential impact of these differences was carefully considered, it is still possible the *nap duration* and *total 24-hour sleep duration* estimates were systematically downward biased in the CPS sample relative to the non-CPS sample. Should this be the case, then it is possible that children in the CPS sample slept equal, if not greater, amounts during the day and more overall, compared to the non-CPS sample. Future study is needed to clarify how sleep duration, and the distribution of sleep across the 24-hour period, may be uniquely different for children from families involved with CPS. Second, data from the two samples were collected in different studies and at different points in time. A more rigorous design would have included a CPS and non-CPS sample simultaneously in one study. Third, parent reports are subject to bias (Sadeh, 2011) and may be limited to parents' knowledge about their child's sleep (Sadeh,1996a); parent reports about their child's sleep may have not accurately captured true sleep in this study. Fourth, children's sleep may function differently in different contexts (e.g., birth home, foster home), and/or around different caregivers (e.g., birth parents, foster parents, next of kin). Findings, therefore, may not generalize to all maltreated infants and toddlers across all types of caregivers and contexts.

Despite these limitations, this study is strengthened by addressing the paucity of knowledge about sleep among a vulnerable group of children from families with a CPS maltreatment report. This study is also strengthened by using a measure based on a tool designed specifically to assess sleep among infants and toddlers (Sadeh, 2004). Finally, despite having its

limitations, the parent reported sleep data is also a strength of this study, as parent reports are clinically relevant and can provide useful information for the PNP caring for children with sleep problems (Mindell & Owens, 2015).

Conclusion

In sum, this study adds new knowledge about specific behavioral sleep problems of concern among parents of infants and toddlers from families with a CPS maltreatment report and how these problems may change with their child's development. Among this sample, night wakings were a consistent concern for parents across time but concerns about their child's difficulty falling asleep on their own and difficulty sleeping alone changed over time. This study also adds new knowledge to suggest this sample of 24- to 36-month-old children from families involved with CPS for maltreatment slept longer at night and less during the day but equal amounts over the 24-hour period, relative to children from the non-CPS sample. For PNPs, the evaluation and treatment of sleep problems may serve as a key target for the overall health and wellbeing of maltreated young children, and their families.

References

Beebe, D. W. (2011). Cognitive, behavioral, and functional consequences of inadequate sleep in children and adolescents. *Pediatric Clinics of North America, 58*, 649-665. doi:10.1016/j.pcl.2011.03.002

Berger, R. H., Miller, A. L., Seifer, R., Cares, S. R., & LeBourgeois, M. K. (2012). Acute sleep restriction effects on emotion responses in 30- to 36-month-old children. *Journal of Sleep Research, 21*, 235-246. doi:10.1111/j.1365-2869.2011.00962.x

Boergers, J., Hart, C., Owens, J. A., Streisand, R., & Spirito, A. (2007). Child sleep disorders: Associations with parental sleep duration and daytime sleepiness. *Journal of Family Psychology, 21*, 88-94. doi:10.1037/0893-3200.21.1.88

Byars, K. C., Yolton, K., Rausch, J., Lanphear, B., & Beebe, D. W. (2012). Prevalence, patterns, and persistence of sleep problems in the first 3 years of life. *Pediatrics, 129*, e276-e284. doi:10.1542/peds.2011-0372

Campbell, K. A., Thomas, A. M., Cook, L. J., & Keenan, H. T. (2012). Longitudinal experiences of children remaining at home after a first-time investigation for suspected maltreatment. *The Journal of Pediatrics, 161*, 340-347. doi:10.1016/j.jpeds.2012.02.039

Cohen, J. (1988). *Statistical power analysis for the behavioral sciences* (2nd ed.). Hillsdale, NJ: Lawrence Erlbaum Associates, Inc.

Crosby, B., LeBourgeois, M. K., & Harsh, J. (2005). Racial differences in reported napping and nocturnal sleep in 2- to 8-year-old children. *Pediatrics, 115*, 225-232. doi:10.1542/peds.2004-0815D

Dahl, R. E. (1996). The regulation of sleep and arousal: Development and psychopathology. *Development and Psychopathology, 8*, 3-27. doi:10.1017/S0954579400006945

Davies, D. (2011). Brain development. In N. Webb (Ed.), *Child development: A practitioner's guide* (3rd ed., pp. 39-59). New York, NY: The Guilford Press.

Davis, D. W., Honaker, S. M., Jones, V. F., Williams, P. G., Stocker, F., & Martin, E. (2012). Identification and management of behavioral/mental health problems in primary care pediatrics: Perceived strengths, challenges, and new delivery models. *Clinical Pediatrics, 51*, 978-982. doi:10.1177/0009922812441667

Galland, B. C., Taylor, B. J., Elder, D. E., & Herbison, P. (2012). Normal sleep patterns in infants and children: A systematic review of observational studies. *Sleep Medicine Reviews, 16*, 213-222. doi:10.1016/j.smrv.2011.06.001

Gilbert, R., Widom, C. S., Browne, K., Fergusson, D., Webb, E., & Janson, S. (2009). Burden and consequences of child maltreatment in high-income countries. *Lancet, 37*, 68-81. doi:10.1016/s0140-6736(08)61706-7

Glod, C. A., Teicher, M. H., Hartman, C. R., & Harakal, T. (1997). Increased nocturnal activity and impaired sleep maintenance in abused children. *Journal of the American Academy of Child and Adolescent Psychiatry, 36*, 1236-1243. doi:10.1097/00004583-199709000-00016

Gómez, R. L., Bootzin, R. R., & Nadel, L. (2006). Naps promote abstraction in language-learning infants. *Psychological Science, 17*, 670-674. doi:10.1111/j.1467-9280.2006.01764.x

Hale, L., Berger, L. M., LeBourgeois, M. K., & Brooks-Gunn, J. (2009). Social and demographic predictors of preschoolers' bedtime routines. *Journal of Developmental & Behavioral Pediatrics, 30*, 394-402. doi:10.1097/DBP.0b013e3181ba0e64

Honaker, S. M., & Meltzer, L. J. (2016). Sleep in pediatric primary care: A review of the literature. *Sleep Medicine Reviews, 25*, 31-39. doi:10.1016/j.smrv.2015.01.004

Iglowstein, I., Jenni, O. G., Molinari, L., & Largo, R. H. (2003). Sleep duration from infancy to adolescence: Reference values and generational trends. *Pediatrics, 111*, 302-307. doi:10.1542/peds.111.2.302

Klein, T. P., Devoe, E. R., & Miranda-Julian, C. (2009). Young children's responses to September 11th: The New York city experience. *Infant Mental Health Journal, 30*, 1-22. doi:10.1002/imhj.20200

Martin, J., Hiscock, H., Hardy, P., Davey, B., & Wake, M. (2007). Adverse associations of infant and child sleep problems and parent health: An Australian population study. *Pediatrics, 119*, 947-955. doi:10.1542/peds.2006-2569

Meltzer, L. J., & Mindell, J. A. (2007). Relationship between child sleep disturbances and maternal sleep, mood, and parenting stress: A pilot study. *Journal of Family Psychology, 21*, 67-73. doi:10.1037/0893-3200.21.1.67

Mindell, J. A., Li, A. M., Sadeh, A., Kwon, R., & Goh, D. Y. (2015). Bedtime routines for young children: A dose-dependent association with sleep outcomes. *Sleep, 38*, 717-722. doi:10.5665/sleep.4662

Mindell, J. A., & Owens, J. A. (2015). *A clinical guide to pediatric sleep: Diagnosis and management of sleep problems* (3rd ed.). Philadelphia, PA: Wolters Kluwer.

Mindell, J. A., Sadeh, A., Kohyama, J., & How, T. H. (2010). Parental behaviors and sleep outcomes in infants and toddlers: A cross-cultural comparison. *Sleep Medicine, 11*, 393-399. doi:10.1016/j.sleep.2009.11.011

Mindell, J. A., Sadeh, A., Wiegand, B., How, T. H., & Goh, D. Y. (2010). Cross-cultural differences in infant and toddler sleep. *Sleep Medicine, 11*, 274-280. doi:10.1016/j.sleep.2009.04.012

Oxford, M. L., Spieker, S. J., Lohr, M. J., & Fleming, C. B. (2016). Promoting First Relationships®: Randomized trial of a 10-week home visiting program with families referred to Child Protective Services. *Child Maltreatment, 21*, 267-277. doi:10.1177/1077559516668274

Paruthi, S., Brooks, L. J., D'Ambrosio, C., Hall, W. A., Kotagal, S., Lloyd, R. M., . . . Wise, M. S. (2016). Recommended amount of sleep for pediatric populations: A consensus statement of the American Academy of Sleep Medicine. *Journal of Clinical Sleep Medicine, 12*, 785-786. doi:10.5664/jcsm.5866

Sadeh, A. (1996a). Evaluating night wakings in sleep-disturbed infants: A methodological study of parental reports and actigraphy. *Sleep, 10,* 757-762. doi:10.1093/sleep/19.10.757

Sadeh, A. (1996b). Stress, trauma, and sleep in children. *Child and Adolescent Psychiatric Clinics of North America, 5*, 685-700.

Sadeh, A. (2004). A brief screening questionnaire for infant sleep problems: Validation and findings for an Internet sample. *Pediatrics, 113*, e570-e577. doi:10.1542/peds.113.6.e570

Sadeh, A. (2011). Sleep assessment methods. In M. El-Sheikh (Ed.), *Sleep and development: Familial and socio-cultural considerations* (pp. 355-371). New York, NY: Oxford University Press.

Sadeh, A., De Marcas, G., Guri, Y., Berger, A., Tikotzky, L., & Bar-Haim, Y. (2015). Infant sleep predicts attention regulation and behavior problems at 3-4 years of age. *Developmental Neuropsychology, 40*, 122-137. doi:10.1080/87565641.2014.973498

Sadeh, A., Hayden, R. M., McGuire, J. P., Sachs, H., & Civita, R. (1994). Somatic, cognitive and emotional characteristics of abused children in a psychiatric hospital. *Child Psychiatry & Human Development, 24*, 191-200. doi:10.1007/BF02353196

Sadeh, A., Hen-Gal, S., & Tikotzky, L. (2008). Young children's reactions to war-related stress: A survey and assessment of an innovative intervention. *Pediatrics, 121*, 46-53. doi:10.1542/peds.2007-1348

Sadeh, A., McGuire, J. P., Sachs, H., Seifer, R., Tremblay, A., Civita, R., & Hayden, R. M. (1995). Sleep and psychological characteristics of children on a psychiatric inpatient unit. *Journal of the American Academy of Child and Adolescent Psychiatry, 34*, 813-819. doi:10.1097/00004583-199506000-00023

Sadeh, A., Mindell, J., & Rivera, L. (2011). "My child has a sleep problem": A cross-cultural comparison of parental definitions. *Sleep Medicine, 12*, 478-482. doi:10.1016/j.sleep.2010.10.008

Sadeh, A., Mindell, J. A., Luedtke, K., & Wiegand, B. (2009). Sleep and sleep ecology in the first 3 years: A web-based study. *Journal of Sleep Research, 18*, 60-73. doi:10.1111/j.1365-2869.2008.00699.x

Sadeh, A., Tikotzky, L., & Scher, A. (2010). Parenting and infant sleep. *Sleep Medicine Reviews, 14*, 89-96. doi:10.1016/j.smrv.2009.05.003

Teng, A., Bartle, A., Sadeh, A., & Mindell, J. (2012). Infant and toddler sleep in Australia and New Zealand. *Journal of Paediatrics and Child Health, 48*, 268-273. doi:10.1111/j.1440-1754.2011.02251.x

Thorpe, K., Staton, S., Sawyer, E., Pattinson, C., Haden, C., & Smith, S. (2015). Napping, development and health from 0 to 5 years: A systematic review. *Archives of Disease in Childhood, 100*(7), 615-622. doi:10.1136/archdischild-2014-307241

Tininenko, J. R., Fisher, P. A., Bruce, J., & Pears, K. C. (2010). Sleep disruption in young foster children. *Child Psychiatry & Human Development, 41*, 409-424. doi:10.1007/s10578-010-0177-2

Tomalski, P., Moore, D. G., Ribeiro, H., Axelsson, E. L., Murphy, E., Karmiloff-Smith, A., . . . Kushnerenko, E. (2013). Socioeconomic status and functional brain development—Associations in early infancy. *Developmental Science, 16*, 676-687. doi:10.1111/desc.12079

U.S. Department of Health & Human Services, Administration for Children and Families, Administration on Children, Youth and Families, Children's Bureau. (2018). *Child maltreatment 2016*. Retrieved from https://www.acf.hhs.gov/sites/default/files/cb/cm2016.pdf

Vaughn, B. E., Elmore-Staton, L., Shin, N., & El-Sheikh, M. (2015). Sleep as a support for social competence, peer relations, and cognitive functioning in preschool children. *Behavioral Sleep Medicine, 13*, 92-106. doi:10.1080/15402002.2013.845778

Ward, T. M., Gay, C., Anders, T. F., Alkon, A., & Lee, K. A. (2008). Sleep and napping patterns in 3-to-5-year old children attending full-day childcare centers. *Journal of Pediatric Psychology, 33*, 666-672. doi:10.1093/jpepsy/jsm102

Weissbluth, M. (1995). Naps in children: 6 months-7 years. *Sleep, 18*, 82-87. doi:10.1093/sleep/18.2.82

Wilson, K. E., Miller, A. L., Lumeng, J. C., & Chervin, R. D. (2014). Sleep environments and sleep durations in a sample of low-income preschool children. *Journal of Clinical Sleep Medicine, 10*, 299-305. doi:10.5664/jcsm.3534

Table 1.1. *Sleep Duration Measures for the CPS and Non-CPS Samples*

Variable (units)	Measurement strategy	
	CPS sample	Non-CPS sample
Nocturnal sleep duration (hours)	Calculated as the time between bedtime and waketime, as assessed by the following questions: Bedtime: "What time did (child) go to bed?" Waketime: "What time did (child) wake up in the morning?"	Assessed by the question: "How much total time does your child spend sleeping during the NIGHT (between 7 in the evening and 8 in the morning)"[a]
Nap duration (hours)	Assessed by the question: "Does your child take a nap every day?" and, if yes, "on average, how long is their nap?"	Assessed by the question: "How much total time does your child spend sleeping during the DAY (between 8 in the morning and 7 in the evening)"[a]
Total 24-hour sleep duration (hours)	Calculated as the sum of nocturnal sleep duration and nap duration	Calculated as the sum of nocturnal sleep duration and nap duration[b]

Note. CPS = Child Protective Services.

[a]Sadeh, Mindell, Luedtke, & Wiegand (2009, p. 71). [b]J. A. Mindell (personal communication, January 5, 2018).

Table 1.2. *Baseline Demographics for the CPS Sample*

Demographic	*M* (*SD*) or *n* %	
Child characteristics		
Age, months	16.71	(4.50)
Gender, female	47	41.6%
Race		
American Indian/Alaska Native	2	1.8%
Black/African American	4	3.5%
White/Caucasian	64	56.6%
Multiracial	40	35.4%
Other	3	2.7%
Hispanic origin	34	30.1%
Parent characteristics		
Age	26.96	(6.06)
Gender, female (mothers)	103	91.2%
Race		
American Indian/Alaska Native	3	2.7%
Asian	3	2.7%
Black/African American	5	4.4%
White/Caucasian	85	75.2%
Multiracial	14	12.4%
Other	3	2.7%
Hispanic origin	21	18.6%
Highest level of education		
Less than high school	4	3.5%
Some high school	48	42.5%
High school	19	16.8%
Some or more college/trade/tech school	42	37.1%
Obtained high school diploma or GED	83	73.5%
Employment status		
Full-time	19	16.8%
Part-time	14	12.4%
Unemployed/looking	30	26.5%
Homemaker	30	26.5%
Student	13	11.5%
Other (disabled/retired)	7	6.2%
Marital Status		
Never married	58	51.3%
Married	34	30.1%
Separated	11	9.7%

Demographic	*M* (*SD*) or *n %*	
Divorced	10	8.8%
Currently living with spouse/partner	56	49.6%
Receiving food stamps	90	79.6%
Receiving Women, Infants, and Children (WIC) Vouchers	78	69.0%
Receiving Medicaid or medical assistance	94	83.2%
Past 12-month household income, U.S. dollars	$24,104.29	($25,601.48)

Note. $N = 113$. CPS = Child Protective Services.

Table 1.3. *T2 Sleep Descriptives for the CPS Sample*

BISQ item	*All ages* *n* = 109		*Age (months)* *13-17* *n* = 36		*18-23* *n* = 44		*24-33* *n* = 29	
	M (*SD*) or *n* %		*M* (*SD*) or *n* %		*M* (*SD*) or *n* %		*M* (*SD*) or *n* %	
Bedtime (hours after noon)	8.84	(1.07)	8.61	(0.92)	9.02	(1.26)	8.84	(0.89)
Waketime (hours after noon)	19.87	(1.14)	19.86	(0.88)	19.74	(1.21)	20.07	(1.31)
Nocturnal sleep duration (hours)	11.03	(1.25)	11.25	(1.04)	10.72	(1.52)	11.22	(0.90)
Nap duration (hours)	1.36	(0.88)	1.54	(0.44)	1.53	(1.02)	0.88	(0.90)
Total 24-hour sleep duration (hours)	12.47	(1.45)	12.77	(1.38)	12.40	(1.67)	12.23	(1.15)
Frequency of night wakings								
0	51	46.8%	14	38.9%	25	56.8%	12	41.4%
1	32	29.4%	8	22.2%	12	27.3%	12	41.4%
2	16	14.7%	8	22.2%	5	11.4%	3	10.3%
3+	10	9.2%	6	16.7%	2	4.5%	2	6.9%
If woke at night, needs help to fall back asleep (% yes)[a]	39	68.4%	16	76.2%	11	57.9%	12	70.6%
Has usual bedtime routine (% yes)	94	86.2%	27	75.0%	40	90.9%	27	93.1%
Ease of falling asleep on own								
Very easy	42	38.5%	16	44.4%	17	38.6%	9	31.0%
Somewhat easy	30	27.5%	9	25.0%	12	27.3%	9	31.0%
Somewhat hard	28	25.7%	7	19.4%	10	22.7%	11	37.9%
Very hard	9	8.3%	4	11.1%	5	11.4%	0	0.0%
Takes daily nap (% yes)	92	84.4%	36	100.0%	36	81.8%	20	69.0%
If naps, takes nap at same time every day (% yes)[b]	79	86.8%	30	83.3%	31	88.6%	18	90.0%
Has difficulty sleeping alone (% yes)	27	25.0%	5	13.9%	14	31.8%	8	28.6%
Parent-perceived sleep problem								
No problem	80	74.1%	24	66.7%	36	81.8%	20	71.4%

BISQ item	*All ages* *n* = 109		*Age (months)* *13-17* *n* = 36		*18-23* *n* = 44		*24-33* *n* = 29	
	M (*SD*) or *n* %		*M* (*SD*) or *n* %		*M* (*SD*) or *n* %		*M* (*SD*) or *n* %	
Small problem	25	23.1%	11	30.6%	6	13.6%	8	28.6%
Serious problem	3	2.8%	1	2.8%	2	4.5%	0	0.0%
Nocturnal sleep location								
Crib/bed in separate room	18	25.4%	10	40.0%	8	28.6%	0	0.0%
Crib/bed in parent's room	25	35.2%	10	40.0%	7	25.0%	8	44.4%
Crib/bed in sibling's room	11	15.5%	3	12.0%	4	14.3%	4	22.0%
Parent's/another adult's bed	12	16.9%	1	4.0%	7	25.0%	4	22.2%
Shared bed with sibling in sibling's room	5	7.0%	1	4.0%	2	7.1%	2	11.1%
Playpen/crib in living or other room	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Method of falling asleep								
While feeding	8	11.3%	7	28.0%	0	0.0%	1	5.6%
Being rocked	4	5.6%	2	8.0%	2	7.1%	0	0.0%
In bed alone	35	49.3%	12	48.0%	17	60.7%	6	33.3%
In bed near/with parent	20	28.2%	2	8.0%	8	28.6%	10	55.6%
Being held	4	5.6%	2	8.0%	1	3.6%	1	5.6%
In bed near/with a sibling	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Nap location								
Crib/bed in separate room	18	28.6%	10	41.7%	8	30.8%	0	0.0%
Crib/bed in parent's room	19	30.2%	9	37.5%	6	23.1%	4	30.8%
Crib/bed in sibling's room	9	14.3%	3	12.5%	4	15.4%	2	15.4%
Parent's/another adult's bed	10	15.9%	1	4.2%	5	19.2%	4	30.8%
Shared bed with sibling in parent's room	1	1.6%	0	0.0%	0	0.0%	1	7.7%
Car seat	1	1.6%	1	4.2%	0	0.0%	0	0.0%
Daycare	3	4.8%	0	0.0%	2	7.7%	1	7.7%

BISQ item	*All ages* *n* = 109		*Age (months)* *13-17* *n* = 36		*18-23* *n* = 44		*24-33* *n* = 29	
	M (*SD*) or *n %*		*M* (*SD*) or *n %*		*M* (*SD*) or *n %*		*M* (*SD*) or *n %*	
Playpen/crib in living or other room	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Couch/floor in living or other room	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Anywhere/varies	2	3.2%	0	0.0%	1	3.8%	1	7.7%

Note. CPS = Child Protective Services. BISQ = Brief Infant Sleep Questionnaire. T2 = approximately 3 months post-baseline, T4 = approximately 9 months post-baseline.

[a]Parents indicating their child had 0 night wakings skipped this question. [b]Parents indicating their child did not take a daily nap skipped this question.

Table 1.4. *T4 Sleep Descriptives for the CPS Sample*

BISQ item	*All ages* $n = 101$		*Age (months)* *19-23* $n = 32$		*24-36* $n = 69$	
	M (*SD*) or *n %*		*M* (*SD*) or *n %*		*M* (*SD*) or *n %*	
Bedtime (hours after noon)	8.97	(1.14)	8.52	(0.91)	9.17	(1.18)
Waketime (hours after noon)	19.86	(1.28)	19.81	(1.10)	19.88	(1.36)
Nocturnal sleep duration (hours)	10.90	(1.44)	11.30	(1.22)	10.71	(1.51)
Nap duration (hours)	1.36	(0.99)	1.85	(0.85)	1.12	(0.97)
Total 24-hour sleep duration (hours)	12.28	(1.67)	13.22	(1.44)	11.82	(1.59)
Frequency of night wakings						
0	62	62.0%	16	51.6%	46	66.7%
1	21	21.0%	7	22.6%	14	20.3%
2	12	12.0%	6	19.4%	6	8.7%
3+	5	5.0%	2	6.5%	3	4.3%
If woke at night, needs help to fall back asleep (% yes)[a]	28	75.7%	10	71.4%	18	78.3%
Has usual bedtime routine (% yes)	87	87.0%	25	80.6%	62	89.9%
Ease of falling asleep on own						
Very easy	32	31.7%	15	46.9%	17	24.6%
Somewhat easy	36	35.6%	10	31.3%	26	37.7%
Somewhat hard	21	20.8%	2	6.3%	19	27.5%
Very hard	12	11.9%	5	15.6%	7	10.1%
Takes daily nap (% yes)	76	75.2%	30	93.8%	46	66.7%
If naps, takes nap at same time every day (% yes)[b]	70	92.1%	26	86.7%	44	95.7%
Has difficulty sleeping alone (% yes)	26	26.3%	8	25.0%	18	26.9%
Parent-perceived sleep problem						
No problem	74	73.3%	25	78.1%	49	71.0%
Small problem	23	22.8%	5	15.6%	18	26.1%

BISQ item	*All ages* *n* = 101		*Age (months)* *19-23* *n* = 32		*24-36* *n* = 69	
	M (*SD*) or *n* %		*M* (*SD*) or *n* %		*M* (*SD*) or *n* %	
Serious problem	4	4.0%	2	6.3%	2	2.9%
Nocturnal sleep location						
Crib/bed in separate room	20	24.7%	8	28.6%	12	22.6%
Crib/bed in parent's room	21	25.9%	8	28.6%	13	24.5%
Crib/bed in sibling's room	19	23.5%	7	25.0%	12	22.6%
Parent's/another adult's bed	19	23.5%	5	17.9%	14	26.4%
Shared bed with sibling in sibling's room	1	1.2%	0	0.0%	1	1.9%
Playpen/crib in living or other room	1	1.2%	0	0.0%	1	1.9%
Method of falling asleep						
While feeding	4	4.9%	1	3.6%	3	5.7%
Being rocked	2	2.5%	0	0.0%	2	3.8%
In bed alone	39	48.1%	19	67.9%	20	37.7%
In bed near/with parent	27	33.3%	5	17.9%	22	41.5%
Being held	6	7.4%	3	10.7%	3	5.7%
In bed near/with a sibling	3	3.7%	0	0.0%	3	5.7%
Nap location						
Crib/bed in separate room	13	18.1%	9	32.1%	4	9.1%
Crib/bed in parent's room	15	20.8%	5	17.9%	10	22.7%
Crib/bed in sibling's room	13	18.1%	6	21.4%	7	15.9%
Parent's/another adult's bed	13	18.1%	3	10.7%	10	22.7%
Shared bed with sibling in parent's room	0	0.0%	0	0.0%	0	0.0%
Car seat	1	1.4%	0	0.0%	1	2.3%
Daycare	3	4.2%	1	3.6%	2	4.5%
Playpen/crib in living or other room	2	2.8%	0	0.0%	2	4.5%

BISQ item	*All ages* *n* = 101		*Age (months)* *19-23* *n* = 32		*24-36* *n* = 69	
	M (*SD*) or *n %*		*M* (*SD*) or *n %*		*M* (*SD*) or *n %*	
Couch/floor in living or other room	11	15.3%	3	10.7%	8	18.2%
Anywhere/varies	1	1.4%	1	3.6%	0	0.0%

Note. CPS = Child Protective Services. BISQ = Brief Infant Sleep Questionnaire. T2 = approximately 3 months post-baseline, T4 = approximately 9 months post-baseline.

[a]Parents indicating their child had 0 night wakings skipped this question. [b]Parents indicating their child did not take a daily nap skipped this question.

Table 1.5. *Multiple Logistic Regression with Standard Predictor Entry Model Results for T2 and T4 Parent-Perceived Sleep Problems Among the CPS Sample*

	$\chi^2(4)$	Pseudo R^2	Sens	Spec	HR	*B*	(*SE*)	*OR*	95% CI
T2 parent-perceived sleep problems	26.37***	.32	.57	.89	.81				
Coefficients									
Intercept						-2.64	(1.24)*	0.07	
T2 child age						-0.01	(0.06)	0.99	[0.89, 1.11]
T2 night wakings						1.28	(0.55)*	3.59	[1.22, 10.57]
T2 ease of falling asleep on own						1.75	(0.53)***	5.74	[2.05, 16.11]
T2 difficulty sleeping alone						0.48	(0.56)	1.62	[0.54, 4.85]
T4 parent-perceived sleep problems	33.26***	.42	.52	.89	.79				
Coefficients									
Intercept						-4.33	(1.84)*	0.01	
T4 child age						0.05	(0.06)	1.06	[0.93, 1.19]
T4 night wakings						2.01	(0.58)***	7.45	[2.38, 23.31]
T4 ease of falling asleep on own						1.11	(0.57)$^{+}$	3.02	[0.99, 9.26]
T4 difficulty sleeping alone						1.34	(0.59)*	3.82	[1.20, 12.16]

Note. n = 108 for the T2 model, n = 98 for the T4 model. CPS = Child Protective Services. T2 = approximately 3 months post-baseline, T4 = approximately 9 months post-baseline. Pseudo R^2 = Nagelkerke's Pseudo-R^2. Sens = sensitivity. Spec = specificity. HR = hit rate. *OR* = odds ratio. CI = confidence interval. Child age = months. Nightwakings dummy coded 0 = no night wakings, 1 = one or more night wakings. Ease of falling asleep on own dummy coded 0 = very or somewhat easy, 1 = somewhat or very hard. Difficulty sleeping alone dummy coded 0 = does not have difficulty, 1 = has difficulty.

$^{+}$ trend at $p < .10$, * $p < .05$, ** $p < .01$, *** $p < .001$.

Table 1.6. *Single Sample t-Tests Comparing Sleep Duration Means Between the CPS and Non-CPS Samples*

Sleep parameter	Non-CPS sample $n = 700$	CPS sample $n = 69$					
	Reference *M*	*M*	(*SD*)	*t*	*df*	*p*	*d*
Nocturnal sleep duration	10.00	10.71	(1.50)	3.92	68	<.001	0.47*
Nap duration	1.89	1.12	(0.97)	-6.13	58	<.001	-0.79*
Total 24-hour sleep duration	11.90	11.82	(1.59)	-0.38	58	.708	-0.05

Note. CPS = Child Protective Services. Sleep durations are in hours. The reference means are from "Sleep and Sleep Ecology in the First 3 Years: A Web-Base Study," by A. Sadeh, J. A. Mindell, K. Luedtke, and B. Wiegand, 2009, *Journal of Sleep Research, 18*, p. 63. Copyright 2008 by the European Sleep Research Society. (© 2008 European Sleep Research Society.) Reproduced with permission.

*$p < .017$ (Bonferroni adjusted alpha level).

Appendix

Table 1.7. *Zero-Order Correlations Among Variables for the Multiple Logistic Regression Models Predicting T2 and T4 Parent-Perceived Sleep Problems*

	1.	2.	3.	4.	5.
Dependent variable					
1. Parent-perceived sleep problems	--	.07	.45 **	.39 **	.36 **
Independent variables					
2. Child age	.01	--	-.12	.21 *	.01
3. Night wakings	.31 **	-.02	--	.28 **	.19
4. Ease of falling asleep on own	.43 **	.03	.25 *	--	.31 **
5. Difficulty sleeping alone	.24 *	.07	.16	.36 **	--

Note. Bottom triangle = concurrent correlations among variables at T2, n = 109. Top triangle = concurrent correlations among variables at T4, n = 101. T2 = 3 months post-baseline, T4 = 9 months post-baseline. Parent-perceived sleep problems dummy coded 0 = no problem, 1 = small or serious problem. Child age = months. Nightwakings dummy coded 0 = no night wakings, 1 = one or more night wakings. Ease of falling asleep on own dummy coded 0 = very or somewhat easy, 1 = somewhat or very hard. Difficulty sleeping alone dummy coded 0 = does not have difficulty, 1 = has difficulty.

* $p < .05$, ** $p < .01$.

Chapter 2. Longitudinal Relations Between Sleep Problems, Daily Napping Behavior, and Social Emotional Development Among Infants and Toddlers from Families Involved with Child Protective Services

Abstract

This study examined longitudinal, transactional relations between sleep and social emotional development among an at-risk sample of infants and toddlers. Participants included 123 parents (*n* = 113 mothers; 77% Caucasian, 6% African American, 3% Asian, 2% American Indian/Alaska Native, 11% mixed/other) and their 10- to 24-month old child (*n* = 71 boys; 59% Caucasian, 4% African American, 1% Asian, 2% American Indian/Alaska Native, 35% mixed/other) from families involved with Child Protective Services. Data were collected at baseline and at approximately 3, 6 and 9 months post-baseline. At all time points, parents completed a questionnaire about their child's internalizing behavior, externalizing behavior, and competence. At 3 months post-baseline, parents reported about their child's sleep problems and daily napping behavior. Results indicated a greater propensity for having a sleep problem at 3 months post-baseline associated with higher internalizing and externalizing behavior at 9 months post-baseline. A greater tendency to take a daily nap at 3 months post-baseline associated with lower internalizing behavior, lower externalizing behavior, and higher competence at 9 months post-baseline. Higher baseline externalizing behavior (and, at the trend level, higher baseline internalizing behavior) associated with a higher propensity for having a sleep problem at 3 months post-baseline. Together these findings suggest, among this sample of at-risk children, daily napping behavior served to indicate later social emotional functioning, but not vice versa. Sleep problems not only served to indicate later behavior problems but also followed earlier behavior problems, especially externalizing behavior problems.

Introduction

Social emotional development, simply defined as "a positive sense of self and of others" (Kelly, Zuckerman, & Rosenblatt, 2008, p. 285), is foundational to infant mental health (Osofsky & Thomas, 2012). During the first 5 years of life, children gradually acquire the capacity to understand and manage their emotions, through the guidance provided by their caregivers, who help to organize and interpret their child's feelings (Shonkoff & Phillips, 2000). This is termed emotion regulation, which includes the capacity of emotions both to regulate and to be regulated (Cole, Martin, & Dennis, 2004). However, maltreatment, including abuse and neglect, can undermine children's emotion regulation, and this in turn may render children more vulnerable to developing internalizing psychopathologies (e.g., withdrawal, depression, anxiety) and externalizing psychopathologies (e.g., defiance, aggression; Heleniak, Jenness, Vander Stoep, McCauley, & McLaughlin, 2016). Although sleep is an important regulator of emotion, and vice versa (Dahl, 1996), little is known about relations between sleep and social emotional development among infants and toddlers who are at risk because of maltreatment. This study addresses this gap in knowledge by examining relations among sleep (parent-perceived sleep problems and daily napping behavior) and social emotional development (internalizing behavior, externalizing behavior, and competence) among a sample of infants and toddlers from families with a Child Protective Services (CPS) maltreatment report.

Sleep Problems in Early Childhood and Their Relation to Social Emotional Development

Night wakings and bedtime problems (such as bedtime resistance) are some of the most common concerns parents caring for infants and toddlers have about their child's sleep (Mindell, Leichman, Puzino, Walters, & Bhullar, 2015). Children's difficulties initiating and/or maintaining sleep, including prolonged sleep onset and frequent night wakings, significantly

distinguish parents who have concerns about their child's sleep from those who do not (Sadeh, Mindell, Luedtke, & Wiegand, 2009). This includes parents of infants and toddlers from families involved with CPS: Children's night wakings, difficulties falling asleep independently, and difficulties sleeping alone significantly associate with parents' concerns about their child having a sleep problem (as discussed in the previous chapter of this dissertation). Children who struggle to fall or stay asleep may then, in turn, get an insufficient night's rest (Mindell & Owens, 2015).

With few exceptions (Mindell & Lee, 2015), there is a growing body of science to suggest that children with sleep problems also face heightened social emotional problems. Cross-sectional studies indicate sleep problems including bedtime resistance and night wakings constitute unique risk factors for children's internalizing and externalizing behavior problems, even after accounting for associated risk factors such as low family income, family dysfunction, caregiver depression, difficult child temperament, and negative parenting (Reid, Hong, & Wade, 2009). Internalizing and externalizing behavior problems are also elevated among children with a parent-perceived sleep problem (Lam, Hiscock, & Wake, 2003) among children with prolonged night wakefulness (Zaidman-Zait & Hall, 2015) and as children have more difficulty settling into sleep (Hall, Scher, Zaidman-Zait, Espezel, & Warnock, 2012). Children evidencing prolonged sleep onsets, frequent and/or prolonged night wakings, and shorter sleep durations are also more likely to screen positive for a social-emotional problem (Hysing, Sivertsen, Garthus-Niegel, & Eberhard-Gran, 2016). Additionally, the shorter the sleep duration, the poorer preschoolers perform on social competency tasks (Vaughn, Elmore-Staton, Shin, & El-Sheikh, 2015).

Longitudinally, shorter sleep durations and later bedtimes in infancy associate with more internalizing behavior problems 6 months later (Mindell, Leichman, DuMond, & Sadeh, 2016). Similarly, poorer sleep quality and more frequent night wakings during infancy associate with

increased externalizing behavior problems in the preschool years (Sadeh et al., 2015). The more frequent the night wakings and the shorter the sleep duration, the greater the risk of later behavior problems (Sivertsen et al., 2015). There is additionally evidence to suggest that sleep problems early on in life can impact trajectories of development. Children with difficulty initiating and/or maintaining sleep at 6, 18, or 30 months of age, for example, are more likely to develop moderate, high, or very high trajectories of dysregulatory behavior from ages 4 to 9.5 years (Winsper & Wolke, 2014). Taken together, these findings indicate sleep problems early in life may constitute a unique risk factor for the development of social emotional problems later in childhood.

Sleep may also interact transactionally with children's social emotional functioning (Staples & Bates, 2011). Not only can tired or sleep-disturbed children struggle to regulate their emotions and behaviors, but symptoms of psychopathology may also alter sleep (Gregory & Sadeh, 2012). Yet despite consensus that maltreatment places children at elevated developmental risk (Cicchetti & Toth, 2015; Shonkoff & Phillips, 2000), studies have not yet examined how sleep may underlie children's social emotional development, or vice versa, among samples of maltreated children. Evidence is needed to enable scholars to understand and disentangle relations between sleep problems and social emotional development among maltreated children.

Naps in Early Childhood and Their Relation to Social Emotional Development

Naps during the toddlerhood and preschool years are a complex phenomenon. Findings about the potential benefits or consequences of napping – particularly after age 2 years – are mixed (Thorpe et al., 2015). On one hand, problems napping or obtaining too little sleep during the day can undermine children's emotion regulation, which may then manifest in problem behavior. Among 12- to 36-month-olds, for instance, increased teacher reports of problem

behavior and lower adjustment ratings in the daycare setting, as well as higher parent-reports about internalizing behavior at home, correlate with children's difficulties settling for naps (Hall et al., 2012). Similarly, children ages 30 to 36 months spend more time responding to a challenge task with increased worry or anxiety after missing a nap, compared to when they have rested (Berger, Miller, Seifer, Cares, & LeBourgeois, 2012). They also spend more time using less mature coping strategies (Miller, Seifer, Crossin, & LeBourgeois, 2014). On the other hand, enforcing naps when they are no longer developmentally necessary could have consequences for children's nocturnal sleep and, subsequently, their social emotional functioning. According to a systematic review, taking naps after age 2 years may associate with poorer nocturnal sleep including later sleep onset, shorter duration, and more fragmented sleep (Thorpe et al., 2015). Typically napping 3 to 5 year olds have been shown to sleep less at night and to have more night wakings, compared to their non-napping peers (Ward, Gay, Anders, Alkon, & Lee, 2008). As discussed above, this poor sleep at night may then contribute to impairments in children's social emotional functioning.

Napping behavior also varies considerably, and whether social emotional functioning is helped or hindered by naps may depend, at least in part, on individual differences in children's developmental readiness to give up daily napping. All infants nap, but over time these naps drop in frequency (both in number per day and days per week) as well as in duration through age 7 years (Iglowstein, Jenni, Molinari, & Largo, 2003; Weissbluth, 1995). Some children give up daily napping as early as 18 months of age, whereas other children continue to take daily naps through age 6 years (Iglowstein et al., 2003). Deep (slow wave) sleep during naps also declines with age, and children's ability to stay awake for longer periods of time during the day without feeling tired could underlie the degree to which naps regulate their social emotional functioning

(Kurth et al., 2016). Some children may be able to tolerate being awake all day earlier on in life than others, and these individual developmental differences may contribute to how naps regulate social emotional functioning.

Yet napping behavior is not driven by developmental processes alone but is also shaped by context. For example, children spend less time napping when they start kindergarten, likely because they need to adapt their sleep schedules to the structure and timing of school (Cairns & Harsh, 2014). For some children, context (such as school entry) can compete with their biological sleep needs or preferences – a phenomenon termed a "poor fit" (Cairns & Harsh, 2014, p. 507). Among some families, the pressures that compete with children's nap times can include not only typical events, such as the transition to school, but also highly stressful events, such as parental death or divorce, as these stressors are likely to disrupt family routines (Weissbluth, 1995). Compared to the general population, families involved with CPS experience higher rates of stressful events including poverty and domestic violence (Campbell, Thomas, Cook, & Keenan, 2012), and the tendency for children to nap (or not) among these families may disproportionately depend upon these stressful contexts. Should these stressors occur in synchrony with the period in which children are developmentally ready to give up naps, then a transition away from napping may have few, if any, adverse effects. However, should these challenges occur in synchrony with the period in which children are not developmentally ready to give up naps, then transitioning away from napping prematurely – or having the opportunity to take naps only sometimes – could contribute to poor social emotional development. Yet, to date, studies have not examined naps in relation to social emotional development among infants and toddlers at-risk because of maltreatment, who may be disproportionately burdened by a poor fit between their biological sleep needs and the stressful contexts in which they live.

The Present Study

This study seeks to address these gaps in knowledge regarding sleep in populations of maltreated children. This study specifically addresses longitudinal, transactional relations among sleep (parent-perceived sleep problems and daily napping behavior) and social emotional development (internalizing behavior, externalizing behavior, and competence) among infants and toddlers from families under investigation for child maltreatment, all while controlling for children's age (and gender). Specifically, this study examines a model (see Figure 2.1) which tests infant/toddler sleep problems (defined as the propensity for parents to indicate their child's sleep is a problem) and daily napping behavior (defined as the propensity to take a daily nap) as factors altering the trajectory of children's social emotional development (rate of growth in, and later level of, internalizing behavior, externalizing behavior, and competence). It additionally tests longitudinal associations among initial levels of social emotional functioning and later sleep (parent-perceived sleep problems and daily napping behavior). It was hypothesized that a higher propensity for having a sleep problem would associate with less favorable social emotional trajectories and that a higher propensity to nap on a daily basis would associate with more favorable social emotional trajectories. It was additionally hypothesized that lower initial levels of internalizing and externalizing behavior, as well as higher initial levels of competence, would associate with a later lower propensity for having a sleep problem and a later higher propensity for napping daily.

[Figure 2.1 about here.]

Methods

Design, Participants and Procedure

This was a secondary analysis of data from the Supporting Parents Program (SPP), a longitudinal randomized controlled trial of a home-visiting parenting intervention among 247 biological parents and their 10- to 24-month-old child living in families with a recent open CPS maltreatment report (Oxford, Spieker, Lohr, & Fleming, 2016). Dyads were invited to participate if they were recently referred to one of five Washington State CPS offices for maltreatment, had a child aged 10 to 24 months, spoke English, and had housing in the target study area. Parents who agreed to participate provided written informed consent and were randomized to receive either the parenting intervention (n = 124) or a basic resource and referral (R&R) comparison condition (n = 123). Only data from the 123 dyads randomized to the R&R comparison condition were used in the present analysis. Of these 123 dyads, most (n = 106) included the alleged victim of the maltreatment report. The remaining 17 dyads included a child who was a sibling of the alleged victim.

Data were collected by trained in-home research visitors masked to treatment assignment. Visits were done at approximately 3-month intervals from baseline (T1) to 9 months post-baseline (T4). Data used in the present analyses were collected via parent report on questionnaires and interviews conducted by the research visitor. Parents reported about their child's social emotional development at all time points and about their child's sleep at the T2 (approximately 3 months post-baseline) time point. The study was conducted in accordance with Washington State IRB approval.

Measures

The Brief Infant Sleep Questionnaire (BISQ). Two items from a modified version of the Sadeh (2004) BISQ were used in the present study. These included parents' retrospective reports (spanning the previous 2 weeks) about their child's: (a) daily napping behavior ("Does

your child take a nap every day?" with 0 = *no* and 1 = *yes* response options; this item was investigator-developed and added to the BISQ for the purposes of the present study) and (b) sleep problems ("Do you consider your child's sleep a problem?" [Sadeh, 2004, p. e576] with response options including 0 = *not a problem at all*, 1 = *a small problem* and 2 = *a very serious problem*; this item was from the original Sadeh, 2004, BISQ). Only a small proportion of parents in the present study indicated *a very serious problem* (*n* = 3, 2.8%); scores were therefore dichotomized (0 = *not a problem* v. 1 = *a small* or *very serious problem*). Validity and reliability of the BISQ has been previously established (Sadeh, 2004).

The Infant-Toddler Social and Emotional Assessment (ITSEA) and the Brief Infant-Toddler Social and Emotional Assessment (BITSEA). The Carter & Briggs-Gowan (2006) ITSEA and Briggs-Gowan & Carter (2002) BITSEA were used to measure children's social emotional development including internalizing and externalizing behavior problems, as well as social emotional competence. The ITSEA and BITSEA are parent report questionnaires about their child's feelings and behaviors. Parents indicate how well statements describe their child on a three-point rating scale (from 0 = *not true/rarely* to 2 = *very true/often*). The ITSEA yields a raw domain and T-score each for children's internalizing behavior (comprised of four subscales including depression/withdrawal, general anxiety, separation distress, and inhibition to novelty) and externalizing behavior (comprised of three subscales including activity/impulsivity, aggression/defiance, and peer aggression; Carter & Briggs-Gowan, 2006). The BITSEA yields a competence total score (comprised of the sum of 11 items; Briggs-Gowan & Carter, 2002). For the purposes of the present analyses, the raw internalizing and externalizing domain scores, as well as the competence total score, were used. Additionally, for the purposes of the present analyses, one item from the internalizing domain score, which addressed sleep, was excluded

from the calculation of the internalizing domain scores. Validity and reliability of the ITSEA and BITSEA have been previously established (Briggs-Gowan & Carter, 1998; Briggs-Gowan, Carter, Irwin, Wachtel, & Cicchetti, 2004; Carter, Briggs-Gowan, Jones, & Little, 2003). Internal consistency for the internalizing domain, externalizing domain, and competence total scores in the present sample ranged from α = .66 - .79, α = .85 - .87, and α = .66 - .71, respectively.

Sociodemographic interview. Control variables including children's baseline age and gender were reported by parents on a sociodemographic interview.

Analytic Approach

First, descriptives and correlations among analysis variables were examined. Cohen's guidelines of r = .10 for a small, r = .30 for a medium, and r = .50 for a large effect size were used to interpret the magnitude of correlations (Cohen, 1988).

Next, three separate unconditional two-factor (intercept and slope) latent growth curve models were examined each for internalizing behavior, externalizing behavior, and competence using maximum likelihood (ML) estimation. These were done as preliminary analyses, to determine whether a two-factor model adequately represented the data. The observed T2 - T4 raw internalizing domain, raw externalizing domain, and competence total scores were used to define the latent growth factors. Time was coded to define the intercept at T4 and to assume equal spacing between assessments. This coding scheme made the intercept interpretable as average social emotional functioning at the T4 time point (9 months post-baseline) and the slope interpretable as average rate of change in social emotional functioning every 3 months from the T2 (3 months post-baseline) to the T4 (9 months post-baseline) time points.

In the case of the unconditional two-factor latent growth curve models for internalizing and externalizing behavior, results (described in greater detail below) indicated that the model

adequately represented the data. Therefore, the full conditional latent growth curve path model, as shown in Figure 2.1, was tested each for internalizing behavior and externalizing behavior, defining the two-factors as described above and controlling for baseline child age and gender (see Figure 2.5 in the Appendix for a representation of the full statistical model). Weighted least squares means and variances adjusted (WLSMV) estimation with the Theta parameterization was used to obtain model fit statistics and parameter estimates. WLSMV in this case performed probit regressions predicting the binary endogenous variables (i.e., T2 sleep problems and T2 naps) and linear regressions predicting the continuous endogenous variables (i.e., the intercept and slope factors; Muthén & Muthén, 1998-2015b). WLSMV also treated the binary endogenous variables in these models (i.e., T2 sleep problems and T2 naps) as underlying continuous latent response variables, both when they acted as dependent variables and as independent variables in the model (Muthén, Muthén, & Asparouhov, 2016). As such, T2 sleep problems and T2 naps in these models should be interpreted, respectively, as the underlying latent propensity to have a sleep problem and to take a daily nap.

In the case of the unconditional two-factor latent growth curve model for competence, variance on the slope factor was negative, indicating that a two-factor model was not suitable for children's social emotional competence in these analyses. A multiple linear regression with standard predictor entry predicting T4 social emotional competence was, therefore, specified in lieu of the full conditional latent growth curve path model. Children's sleep (T2 naps and T2 sleep problems) and control variables (baseline child age, gender, and social emotional competence) were entered into the regression model as predictors, using ML estimation to obtain parameter estimates.

Descriptives and correlations were examined in IMB SPSS Version 19 using default missing data procedures, which included listwise treatment of missing data in descriptive analyses and pairwise treatment of missing data in correlation analyses. All other analyses were conducted in Mplus Version 7.31 (Muthén & Muthén, 1998-2015a). Cases with missing data at all follow-up time points were excluded from preliminary analyses of the unconditional latent growth curve models; however, data from all cases, including those with partially missing data, were included in model estimation for all remaining analyses. This was achieved using the default Mplus procedures (Muthén & Muthén, 1998-2015b) in combination with: (a) the specification of baseline behavior as an endogenous variable in the full conditional latent growth curve path models and (b) the modeling of covariate missingness in the multiple linear regression model.

Model fit statistics reported below include the Root Mean Squared Error of Approximation (RMSEA), Comparative Fit Index (CFI), Tucker-Lewis Index (TLI), Standardized Root Mean Residual (SRMR), and the chi-square test statistic. As a general guideline, a non-significant ($p > .05$) chi-square test statistic (Kline, 2016), CFI/TLI values above 0.95, an SRMR value below 0.08, and an RMSEA value below 0.06 (Hu & Bentler, 1999) were together considered evidence that supported the model. Raw parameter estimates are given for the unconditional latent growth curve models. For all other models, standardized parameter estimates are given.

Results

Participant Demographics

Baseline demographics indicated that parents (mean age 27.04 ± 6.25 years) were primarily mothers (91%). Seventy-seven percent reported their race as White or Caucasian, 11%

mixed or other, 6% African American, 3% Asian, and 2% American Indian or Alaska Native. Nineteen percent reported being of Hispanic origin. A little over one-quarter (29%) were employed full- or part-time. Most reported never being married (55%) with just over another quarter being married (28%) and the remainder being divorced or separated (18%). Half (50%) were currently living with a spouse or partner. Approximately three quarters (75%) reported receiving a high school diploma or GED. Children (mean age 16.77 ± 4.55 months, 42% female) were more diverse, with 59% being White or Caucasian, 35% mixed or other, 4% African American, 2% American Indian or Alaska Native, and 1% Asian. Twenty-nine percent were of Hispanic origin. Most families reported receiving assistance, including food stamps (81%), Women, Infants, and Children (WIC) vouchers (69%), and Medicaid or medical assistance (84%). Average yearly household income was $24,174 ± $25,468.

Descriptives and Correlations

Means, standard deviations, and zero-order correlations among the analyses variables are given in Table 2.1. Sleep problems correlated in the expected directions with internalizing behavior, externalizing behavior, and competence across all time points such that having a sleep problem associated with higher internalizing and externalizing behavior but lower competence. These correlations were only significant, however, for internalizing and externalizing behavior across the T2 - T4 time points, indicating two patterns: (a) sleep problems related more strongly with behavior problems than with competence and (b) sleep problems related more strongly with concurrent and later behavior problems than with prior behavior problems.

Naps also correlated in the expected directions with internalizing behavior, externalizing behavior, and competence across all time points such that napping daily associated with lower internalizing and externalizing behavior but higher competence (except for a small negative

correlation with T1 competence). The strength of associations among naps and later social emotional functioning generally grew with time such that naps associated most strongly with the most distal time points (T4 problem behavior and competence). Concurrent relations among napping and problem behavior/competence were fairly weak.

Correlations among internalizing behavior, externalizing behavior, and competence ranged in strength from small to large and were generally in the expected directions. The correlation among sleep problems and naps was weak and negative such that having a sleep problem associated with not napping daily.

[Table 2.1 about here.]

Unconditional Latent Growth Curve Models

Internalizing behavior model. Table 2.2 gives the model fit statistics and results for the unconditional two-factor (intercept and slope) latent growth curve model for internalizing behavior. The mean of the intercept, which was significantly different from zero, indicated, on average, children's raw internalizing behavior score at T4 was 0.49. The mean of the slope was negative and trended toward significance indicating, on average, internalizing behavior decreased from T2 - T4, but only at the trend level. Variance was significant for both the intercept and slope factors, indicating children differed significantly in both their T4 levels of, and rate of change in, internalizing behavior. Covariance between the intercept and slope factors trended toward significance, indicating level of internalizing behavior at T4 was positively associated with rate of change in internalizing behavior from T2 - T4 at the trend level.

Externalizing behavior model. Model fit statistics and results for the externalizing unconditional two-factor latent growth curve model are given in Table 2.2. The mean of the intercept was 0.64, indicating, on average, children's raw externalizing behavior score at T4 was

0.64, and this was significantly different from zero. The mean of the slope was nonsignificant, indicating the average rate of change in externalizing behavior was not significantly different from zero. Variance of the intercept and slope factors, however, was significant, indicating there was significant between individual variance in both of these factors. Covariance among the intercept and slope factors was significant, indicating T4 levels of externalizing behavior were positively associated with rate of change in externalizing behavior from T2 - T4.

[Table 2.2 about here.]

Conditional Latent Growth Curve Path Models for Internalizing and Externalizing Behavior

Internalizing behavior model. Results for the conditional two-factor latent growth curve path model with internalizing behavior are given in Figure 2.2. Significant paths predicting the intercept factor indicated an increased latent propensity for problem sleep at the T2 time point associated with increased levels of internalizing behavior at the T4 time point. In a similar vein, an increased latent propensity for napping daily at the T2 time point associated with decreased levels of internalizing behavior at the T4 time point. Higher T1 internalizing behavior also associated with higher levels of T4 internalizing behavior. Significant paths predicting the slope factor indicated that internalizing behavior at T1 negatively associated with rate of change in internalizing behavior from T2 - T4. Internalizing behavior at T1 also positively associated with sleep problems at T2 such that higher T1 internalizing behavior associated with a greater latent propensity for problem sleep at T2, but only at the trend level (p = .054).

[Figure 2.2 about here.]

Externalizing behavior model. Results for the conditional two-factor latent growth curve path model with externalizing behavior (see Figure 2.3) evidenced patterns of relations

among variables similar to the results from the internalizing model. As in the internalizing model, significant paths predicting the intercept for externalizing behavior indicated a greater latent propensity for problem sleep at T2 associated with higher levels of T4 externalizing behavior. Similarly, a greater latent propensity for napping daily at T2 associated with lower levels of T4 externalizing behavior. Higher T1 externalizing behavior also associated with higher levels of T4 externalizing behavior. Finally, higher T1 externalizing behavior associated with a greater latent propensity for problem sleep at T2.

[Figure 2.3 about here.]

Multiple Linear Regression Model for Social Emotional Competence

Results for the multiple linear regression with standard predictor entry predicting children's T4 social emotional competence are given in Table 2.3. R^2 for the model was significant, indicating the set of predictors together accounted for significant variance in T4 social emotional competence. The intercept was also significant, indicating the value of the intercept was significantly different from zero. T2 naps uniquely and positively associated with T4 social emotional competence scores such that taking a daily nap at T2 associated with greater T4 social emotional competence. T2 sleep problems failed to significantly associate with T4 social emotional competence.

[Table 2.3 about here.]

Discussion

This study is the first to report significant longitudinal relations between sleep (parent-perceived sleep problems and daily napping behavior) and social emotional functioning (internalizing behavior, externalizing behavior, and competence) among infants and toddlers living in families involved with CPS for maltreatment. Specifically, findings indicated a greater

propensity for problem sleep associated with higher internalizing and externalizing behavior 6 months later, while controlling for earlier behavior problems. In a similar vein, a greater propensity to nap daily associated with lower internalizing behavior, lower externalizing behavior, and higher competence 6 months later, also while controlling for earlier behavior problems and competence. Neither parent report of sleep problems nor daily napping behavior evidenced significant relations with rate of change in internalizing or externalizing behavior. Children's prior internalizing and externalizing behavior also failed to significantly associate with daily napping behavior 3 months later; however, higher externalizing behavior (and, at the trend level, higher internalizing behavior) was significantly related to a greater propensity for problem sleep 3 months later. Overall, these findings suggest children's sleep was a better longitudinal precursor of social emotional functioning than social emotional functioning was of sleep.

These results are considered in greater detail below. First, relations between prior sleep (T2 sleep problems and daily napping behavior) and later social emotional functioning (the intercept factors representing level of T4 internalizing and externalizing behavior in the path models and the T4 social emotional competence score in the regression model) are discussed. Next, relations between prior sleep (T2 sleep problems and daily napping behavior) and social emotional development (the slope factors representing rate of change in T2 - T4 internalizing and externalizing behavior) are discussed. Finally, relations between prior social emotional functioning (T1 internalizing behavior, externalizing behavior, and competence) and later sleep (T2 sleep problems and daily napping behavior) are discussed.

Prior Sleep and Later Social Emotional Functioning

Findings about parent-perceived sleep problems indicted that the propensity for parents to express concern about their child's sleep at T2 preceded their child's social emotional functioning 6 months later in the behavior problem domains (internalizing behavior and externalizing behavior) but not in the social emotional competence domain, suggesting that parent-perceived sleep problems related more strongly to later symptoms of psychopathology (e.g., anxiety, depression, aggression) than to deficits in competence. Considering that parent-perceived sleep problems in this study were assessed globally ("Do you consider your child's sleep a problem?" [Sadeh, 2004, p. e576]), these findings additionally suggest that the degree to which parents were inclined to have a *general* concern about their child's sleep served to indicate later behavior problems of the internalizing and externalizing types.

Findings about naps indicated that children's daily napping behavior preceded all three domains of their social emotional functioning 6 months later (internalizing behavior, externalizing behavior, and competence). Interestingly (although somewhat puzzlingly), correlations also indicated that the relation among daily napping behavior and social emotional functioning grew stronger with time such that the benefits of daily napping were not realized until 6 months later. What is puzzling about this finding is, presumably, concurrent relations between children's napping behavior and social emotional functioning should be just as strong, if not stronger, than longitudinal relations. That is, if tired toddlers have more trouble regulating their emotions (Berger et al., 2012), then the social emotional consequences of missed naps should be expressed immediately, when they are acutely tired. Why the influence of daily napping behavior evidenced a delay of 6 months in this study is therefore unclear, but it could indicate that napping behavior among these at-risk children functioned to set the stage for later, but not more immediate, social emotional functioning. It may also be that missing the occasional

nap (acute daytime sleep deprivation) exerts transient strain on children's regulatory capacities, but missing naps repeatedly over time (chronic daytime sleep deprivation) exerts enduring strain, which eventually presents in social emotional deficits across multiple domains of functioning. Further study is needed to better understand this phenomenon of a 6-month delay in the influence of daily napping behavior, including the potential role of chronic versus acute daytime sleep deprivation.

Regarding daily napping behavior, it is also important to recognize the considerable individual variability in the need for daytime naps among children ages 18 to 36 months. Prior work has indicated that 96% - 100% of 18-month-olds still take daytime naps, but this percentage rapidly declines to 40% - 50% by age 36 months (Iglowstein et al., 2003; Weissbluth, 1995). It is within this window, therefore, that the tendency to take a daily nap may, for many children, be largely driven by a developmental readiness to transition out of napping. For some children, however, "mismatches" between their napping opportunities and contextual challenges may be the more prominent drivers of napping behavior (Cairns & Harsh, 2014; Weissbluth, 1995).

In the present study, it is possible that the children (who ranged in age from 13 to 33 months at the T2 time point, when daily napping behavior was assessed) were mixed regarding the factors driving their daily napping behavior. Some may have been less inclined to take a daily nap simply because they were developmentally ready to give up daily naps; others may have been less likely to nap because of one or more contextual mismatches. An interesting hypothesis, therefore, is that the relation between daily napping behavior and later social emotional functioning was stronger among children who needed a daily nap and didn't get it but weaker or nonsignificant among children who were developmentally ready to give up naps.

Should this be the case, then daily napping behavior, much like a canary in a coal mine, could be among the first signs of how contextual challenges undermine the regulatory capacities of children who still need daily naps. If left unresolved, this may later be expressed in their social emotional functioning. At-risk populations of infants and toddlers may be particularly vulnerable to missing needed naps, as a consequence of context (as illustrated in Figure 2.4). Future study is needed to help clarify the contributions of biology (such as individual daytime sleep needs and developmental readiness to drop naps) and context (such as competing life stressors) on children's daily napping behavior and subsequent social emotional functioning.

[Figure 2.4 about here.]

Finally, it is also interesting to recognize that there could be even more individual variability in children's response to missing a nap. For instance, some 30- to 36-month-olds evidence substantially reduced capacities to regulate their emotions in response to missing a usual nap, whereas other 30- to 36-month-olds evidence few if any changes in their emotion regulation capacities after missing a usual nap (Berger et al., 2012). It may be the case that some children in this study were more susceptible to the social emotional consequences of a contextual mismatch than others. Additional research is needed help clarify if and to what extent children may vary in their longitudinal response to daily napping behavior, as well as what factors contribute to individual differences.

Sleep and Social Emotional Development

The null findings for relations between T2 sleep, including both parent-perceived sleep problems and daily napping behavior, and rate of change (the slope factor) in T2 - T4 internalizing and externalizing behavior indicate children's sleep neither slowed nor hastened growth in behavior problems over time. Although parent-perceived sleep problems and daily

napping behavior both uniquely preceded later T4 levels of behavior problems (as discussed about the intercept factor above), rate of change in behavior problems failed to explain how children arrived at that later level of behavior.

Social Emotional Development and Later Sleep

The significant relation between children's prior externalizing behavior at T1 and parent-perceived sleep problems 3 months later at T2 suggests that earlier externalizing behavior problems may give rise to later sleep problems (which may then, in turn, exacerbate later externalizing behavior problems, as evidenced by findings discussed above about the intercept factor). That children's prior T1 internalizing behavior trended toward significance as an antecedent of parent-perceived sleep problems 3 months later suggests a similar, albeit weaker, pattern of relations for internalizing problems. There was little evidence in comparison to indicate that internalizing or externalizing behavior preceded later daily napping behavior, though daily napping behavior did foreshadow later behavior problems (again, as evidenced by the findings discussed above about the intercept factor).

Children's social emotional competence was not explicitly tested as a precursor of sleep problems and daily napping behavior. This was because the failure of children's social emotional competence to evidence growth over time rendered it unsuitable for testing transactional relations among sleep and social emotional competence within the full growth path model. In addition, the very small correlations between children's T1 competence and T2 sleep (*r*s = -.07 and -.05 for sleep problems and naps, respectively) indicated that social emotional competence was unlikely to significantly predict children's sleep had an alternative transactional path model been specified. That the correlation and regression analyses instead suggested children's sleep, particularly daily napping behavior, was a stronger precursor of social emotional competence

than social emotional competence was of sleep agrees with the above findings about naps as operating to *foretell* later social emotional problems (but not vice versa). By contrast, parent-perceived sleep problems failed to evidence significant relations with competence in either direction, suggesting parents' general concerns about their child's sleep neither foreshadowed nor followed their child's social emotional competence.

However, an alternative explanation for these null findings about parent-perceived sleep problems and social emotional competence could be that the competence items measured in this study simply failed to fully capture the elements most salient to sleep problems. Prior work by Vaughn and colleagues (2015) has indicated social competence among preschoolers attending daycare, as measured by observed peer-to-peer interactions, associates with sleep duration, as measured by actigraphy. Certain aspects of sleep may very well serve to regulate certain aspects of social emotional competence, but the measures in this study may have simply failed to illuminate these relations.

Considering all findings together, it is clear that, in general, children's sleep (parent-perceived sleep problems and daily napping behavior) was a stronger precursor of later social emotional problems (internalizing behaviors, externalizing behaviors, and competence) than early social emotional problems were of later sleep (parent-perceived sleep problems and daily napping behavior) among this at-risk sample of infants and toddlers. These findings extend prior literature about sleep as a longitudinal precursor of social emotional functioning among low-risk populations (Jansen et al., 2011; Mindell et al., 2016; Sadeh et al., 2015; Sivertsen et al., 2015) to include similar patterns of relations among this high-risk sample of infants and toddlers living in families involved with CPS. Findings from this study also add new knowledge to indicate that, among this sample of children living in families with a CPS maltreatment report, daily napping

behaviors operated to foretell later social emotional wellbeing across multiple domains of functioning including internalizing behaviors, externalizing behaviors, and competence.

Strengths and Limitations

There are some limitations of this study. First, children's sleep problems, daily napping behavior, and social emotional functioning were all measured according to parent report. This measurement approach may have yielded some shared variance simply by way of having a shared informant. A measurement approach employing at least one objective measure, such as actigraphy for sleep patterns, would have been ideal. Future studies using objective measures alone or in combination with subjective measures can help to address this limitation and shed additional light on the relation between sleep and social emotional functioning among at-risk infants and toddlers. Second, this study did not assess additional factors, such as temperament. Prior research has linked temperament to napping behavior: Children who have trouble settling down for naps evidence higher negative affect and lower effortful control, compared to their peers who easily settle into naps (Ward, Gay, Alkon, Anders, & Lee, 2008). The present study did not, however, assess for the influence of such an additional factor. Third, this study did not measure children's sleep at baseline, which limited a full assessment of the developmental nature of sleep. Fourth, the *p*-value for the association between daily napping behavior and later T4 social emotional functioning was somewhat sensitive to slight changes in analysis methods (e.g., how missing data were handled). However, results were not widely different across methods and, overall, they indicated the propensity to nap daily positively associated with later T4 social emotional functioning. More research replicating these findings about how and for whom daily napping behavior relates to later social emotional functioning is needed.

Despite these few limitations, this study has several strengths. First, the longitudinal design allowed for the examination of relations between sleep and social emotional development over time. Repeated measures of social emotional functioning also allowed for the assessment of developmental trajectories of behavior over time. Second, the ITSEA/BITSEA was designed specifically for use among infants and toddlers (Briggs-Gowan & Carter, 1998) and, as such, was developmentally consistent with this population. Third, the vulnerable population of infants and toddlers from families with a CPS maltreatment report was also a strength of this study, as it addressed an important gap in knowledge about the interdependence of sleep and social emotional functioning in this population. Finally, parent-reported sleep is clinically meaningful; parent reports constitute an important piece in the clinical evaluation of pediatric sleep problems (Mindell & Owens, 2015). Further research about how the clinical evaluation of sleep problems and napping behavior could serve to inform the clinician caring for infants and toddlers at risk because of maltreatment is needed.

Conclusion

This study is the first to examine longitudinal relations between sleep and social emotional functioning in a sample of infants and toddlers from families involved with CPS for maltreatment. Findings indicate parents' general concerns about their child's sleep problems and children's daily napping behaviors relate uniquely, but differently, with children's social emotional functioning. Future research is needed to explore how promoting sleep health and addressing sleep problems may assist in the prevention and treatment of mental health problems among at-risk infants and toddlers.

References

Berger, R. H., Miller, A. L., Seifer, R., Cares, S. R., & LeBourgeois, M. K. (2012). Acute sleep restriction effects on emotion responses in 30- to 36-month-old children. *Journal of Sleep Research, 21*, 235-246. doi:10.1111/j.1365-2869.2011.00962.x

Briggs-Gowan, M., & Carter, A. S. (2002). *Brief Infant-Toddler Social and Emotional Assessment (BITSEA) manual* (version 2.0 ed.). New Haven, CT: Yale University.

Briggs-Gowan, M. J., & Carter, A. S. (1998). Preliminary acceptability and psychometrics of the Infant-Toddler Social and Emotional Assessment (ITSEA): A new adult-report questionnaire. *Infant Mental Health Journal, 19*, 422-445. doi:10.1002/(SICI)1097-0355(199824)19:4<422::AID-IMHJ5>3.0.CO;2-U

Briggs-Gowan, M. J., Carter, A. S., Irwin, J. R., Wachtel, K., & Cicchetti, D. V. (2004). The Brief Infant-Toddler Social and Emotional Assessment: Screening for social-emotional problems and delays in competence. *Journal of Pediatric Psychology, 29*, 143-155. doi:10.1093/jpepsy/jsh017

Buysse, D. J. (2014). Sleep health: Can we define it? Does it matter? *Sleep, 37*, 9-17. doi:10.5665/sleep.3298

Cairns, A., & Harsh, J. (2014). Changes in sleep duration, timing, and quality as children transition to kindergarten. *Behavioral Sleep Medicine, 12*, 507-516. doi:10.1080/15402002.2013.838765

Campbell, K. A., Thomas, A. M., Cook, L. J., & Keenan, H. T. (2012). Longitudinal experiences of children remaining at home after a first-time investigation for suspected maltreatment. *The Journal of Pediatrics, 161*, 340-347. doi:10.1016/j.jpeds.2012.02.039

Carter, A. S., & Briggs-Gowan, M. (2006). *ITSEA: Infant-Toddler Social and Emotional Assessment Examiner's Manual*. San Antonio, TX: Pearson.

Carter, A. S., Briggs-Gowan, M. J., Jones, S. M., & Little, T. D. (2003). The Infant-Toddler Social and Emotional Assessment (ITSEA): Factor structure, reliability, and validity. *Journal of Abnormal Child Psychology, 31*, 495-514. doi:10.1023/A:1025449031360

Cicchetti, D., & Toth, S. L. (2015). Multilevel developmental perspectives on child maltreatment. *Development and Psychopathology, 27*, 1385-1386. doi:10.1017/s0954579415000814

Cohen, J. (1988). *Statistical power analysis for the behavioral sciences* (2nd ed.). Hillsdale, NJ: Lawrence Erlbaum Associates, Inc.

Cole, P. M., Martin, S. E., & Dennis, T. A. (2004). Emotion regulation as a scientific construct: Methodological challenges and directions for child development research. *Child Development, 75*, 317-333. doi:10.1111/j.1467-8624.2004.00673.x

Dahl, R. E. (1996). The regulation of sleep and arousal: Development and psychopathology. *Development and Psychopathology, 8*, 3-27. doi:10.1017/S0954579400006945

Gregory, A. M., & Sadeh, A. (2012). Sleep, emotional and behavioral difficulties in children and adolescents. *Sleep Medicine Reviews, 16*, 129-136. doi:10.1016/j.smrv.2011.03.007

Hall, W. A., Scher, A., Zaidman-Zait, A., Espezel, H., & Warnock, F. (2012). A community-based study of sleep and behaviour problems in 12- to 36-month-old children. *Child: Care Health and Development, 38*, 379-389. doi:10.1111/j.1365-2214.2011.01252.x

Heleniak, C., Jenness, J. L., Vander Stoep, A., McCauley, E., & McLaughlin, K. A. (2016). Childhood maltreatment exposure and disruptions in emotion regulation: A

transdiagnostic pathway to adolescent internalizing and externalizing psychopathology. *Cognitive Therapy and Research, 40*, 394-415. doi:10.1007/s10608-015-9735-z

Hu, L, & Bentler, P. M. (1999). Cutoff criteria for fit indexes in covariance structure analysis: Convential criteria versus new alternatives. *Structural Equation Modeling, 6*, 1-55. doi:10.1080/10705519909540118

Hysing, M., Sivertsen, B., Garthus-Niegel, S., & Eberhard-Gran, M. (2016). Pediatric sleep problems and social-emotional problems: A population-based study. *Infant Behavior & Development, 42*, 111-118. doi:10.1016/j.infbeh.2015.12.005

Iglowstein, I., Jenni, O. G., Molinari, L., & Largo, R. H. (2003). Sleep duration from infancy to adolescence: Reference values and generational trends. *Pediatrics, 111*, 302-307. doi:10.1542/peds.111.2.302

Jansen, P. W., Saridjan, N. S., Hofman, A., Jaddoe, V. W., Verhulst, F. C., & Tiemeier, H. (2011). Does disturbed sleeping precede symptoms of anxiety or depression in toddlers? The Generation R study. *Psychosomatic Medicine, 73*, 242-249. doi:10.1097/PSY.0b013e31820a4abb

Kelly, J. F., Zuckerman, T., & Rosenblatt, S. (2008). Promoting First Relationships: A relationship-focused early intervention approach. *Infants & Young Children, 21*, 285-295. doi:10.1097/01.IYC.0000336541.37379.0e

Kline, R. B. (2016). *Principles and practice of structural equation modeling* (4th ed.). New York, NY: The Guilford Press.

Kurth, S., Lassonde, J. M., Pierpoint, L. A., Rusterholz, T., Jenni, O. G., McClain, I. J., . . . LeBourgeois, M. K. (2016). Development of nap neurophysiology: Preliminary insights

into sleep regulation in early childhood. *Journal of Sleep Research, 25*, 646-654. doi:10.1111/jsr.12427

Lam, P., Hiscock, H., & Wake, M. (2003). Outcomes of infant sleep problems: A longitudinal study of sleep, behavior, and maternal well-being. *Pediatrics, 111*, e203-207. doi:10.1542/peds.111.3.e203

Miller, A. L., Seifer, R., Crossin, R., & Lebourgeois, M. K. (2014). Toddler's self-regulation strategies in a challenge context are nap-dependent. *Journal of Sleep Research, 24*, 279-287. doi:10.1111/jsr.12260

Mindell, J. A., & Lee, C. (2015). Sleep, mood, and development in infants. *Infant Behavior & Development, 41*, 102-107. doi:10.1016/j.infbeh.2015.08.004

Mindell, J. A., Leichman, E. S., DuMond, C., & Sadeh, A. (2016). Sleep and social-emotional development in infants and toddlers. *Journal of Clinical Child & Adolescsent Psychology, 46*, 236-246. doi:10.1080/15374416.2016.1188701

Mindell, J. A., Leichman, E. S., Puzino, K., Walters, R., & Bhullar, B. (2015). Parental concerns about infant and toddler sleep assessed by a mobile app. *Behavioral Sleep Medicine, 13*, 359-374. doi:10.1080/15402002.2014.905475

Mindell, J. A., & Owens, J. A. (2015). *A clinical guide to pediatric sleep: Diagnosis and management of sleep problems* (3rd ed.). Philadelphia, PA: Wolters Kluwer.

Muthén, B. O., Muthén, L. K., & Asparouhov, T. (2016). *Regression and mediation analysis using Mplus*. Los Angeles, CA: Muthén & Muthén.

Muthén & Muthén. (1998-2015a). Mplus (Version 7.31) [Statistical software]. Los Angeles, CA: Muthén & Muthén.

Muthén, L. K., & Muthén, B. O. (1998-2015b). *Mplus user's guide* (7th ed.). Los Angeles, CA: Muthén & Muthén.

Osofsky, J., & Thomas, K. (2012). What is infant mental health? *Zero to Three, 33,* 9. Retreived from https://www.zerotothree.org/resources/series/zero-to-three-journal

Oxford, M. L., Spieker, S. J., Lohr, M. J., & Fleming, C. B. (2016). Promoting First Relationships®: Randomized trial of a 10-week home visiting program with families referred to Child Protective Services. *Child Maltreatment, 21*, 267-277. doi:10.1177/1077559516668274

Paruthi, S., Brooks, L. J., D'Ambrosio, C., Hall, W. A., Kotagal, S., Lloyd, R. M., . . . Wise, M. S. (2016). Recommended amount of sleep for pediatric populations: A consensus statement of the American Academy of Sleep Medicine. *Journal of Clinical Sleep Medicine, 12*, 785-786. doi:10.5664/jcsm.5866

Reid, G. J., Hong, R. Y., & Wade, T. J. (2009). The relation between common sleep problems and emotional and behavioral problems among 2- and 3-year-olds in the context of known risk factors for psychopathology. *Journal of Sleep Research, 18*, 49-59. doi:10.1111/j.1365-2869.2008.00692.x

Sadeh, A. (2004). A brief screening questionnaire for infant sleep problems: Validation and findings for an Internet sample. *Pediatrics, 113*, e570-e577. doi:10.1542/peds.113.6.e570

Sadeh, A., De Marcas, G., Guri, Y., Berger, A., Tikotzky, L., & Bar-Haim, Y. (2015). Infant sleep predicts attention regulation and behavior problems at 3-4 years of age. *Developmental Neuropsychology, 40*, 122-137. doi:10.1080/87565641.2014.973498

Sadeh, A., Mindell, J. A., Luedtke, K., & Wiegand, B. (2009). Sleep and sleep ecology in the first 3 years: A web-based study. *Journal of Sleep Research, 18*, 60-73. doi:10.1111/j.1365-2869.2008.00699.x

Shonkoff, J. P., & Phillips, D. A. (Eds.). (2000). *From neurons to neighborhoods: The science of early childhood development*. Washington, D.C.: National Academy Press.

Sivertsen, B., Harvey, A. G., Reichborn-Kjennerud, T., Torgersen, L., Ystrom, E., & Hysing, M. (2015). Later emotional and behavioral problems associated with sleep problems in toddlers: A longitudinal study. *JAMA Pediatrics, 169*, 575-582. doi:10.1001/jamapediatrics.2015.0187

Staples, A. D., & Bates, J. E. (2011). Children's sleep deficits and cognitive and behavioral adjustment. In M. El-Sheikh (Ed.), *Sleep and development: Familial and socio-cultural considerations* (pp. 133-164). New York, NY: Oxford University Press.

Thorpe, K., Staton, S., Sawyer, E., Pattinson, C., Haden, C., & Smith, S. (2015). Napping, development and health from 0 to 5 years: A systematic review. *Archives of Disease in Childhood, 100*, 615-622. doi:10.1136/archdischild-2014-307241

Vaughn, B. E., Elmore-Staton, L., Shin, N., & El-Sheikh, M. (2015). Sleep as a support for social competence, peer relations, and cognitive functioning in preschool children. *Behavioral Sleep Medicine, 13,* 92-106. doi:10.1080/15402002.2013.845778

Ward, T. M., Gay, C., Alkon, A., Anders, T. F., & Lee, K. A. (2008). Nocturnal sleep and daytime nap behaviors in relation to salivary cortisol levels and temperament in preschool-age children attending child care. *Biological Research for Nursing, 9*, 244-253. doi:10.1177/1099800407310158

Ward, T. M., Gay, C., Anders, T. F., Alkon, A., & Lee, K. A. (2008). Sleep and napping patterns in 3-to-5-year old children attending full-day childcare centers. *Journal of Pediatric Psychology, 33*, 666-672. doi:10.1093/jpepsy/jsm102

Weissbluth, M. (1995). Naps in children: 6 months-7 years. *Sleep, 18*, 82-87. doi:10.1093/sleep/18.2.82

Winsper, C., & Wolke, D. (2014). Infant and toddler crying, sleeping and feeding problems and trajectories of dysregulated behavior across childhood. *Journal of Abnormal Child Psychology, 42*, 831-843. doi:10.1007/s10802-013-9813-1

Zaidman-Zait, A., & Hall, W. A. (2015). Children's night waking among toddlers: Relationships with mothers' and fathers' parenting approaches and children's behavioural difficulties. *Journal of Advanced Nursing, 71*, 1639-1649. doi:10.1111/jan.12636

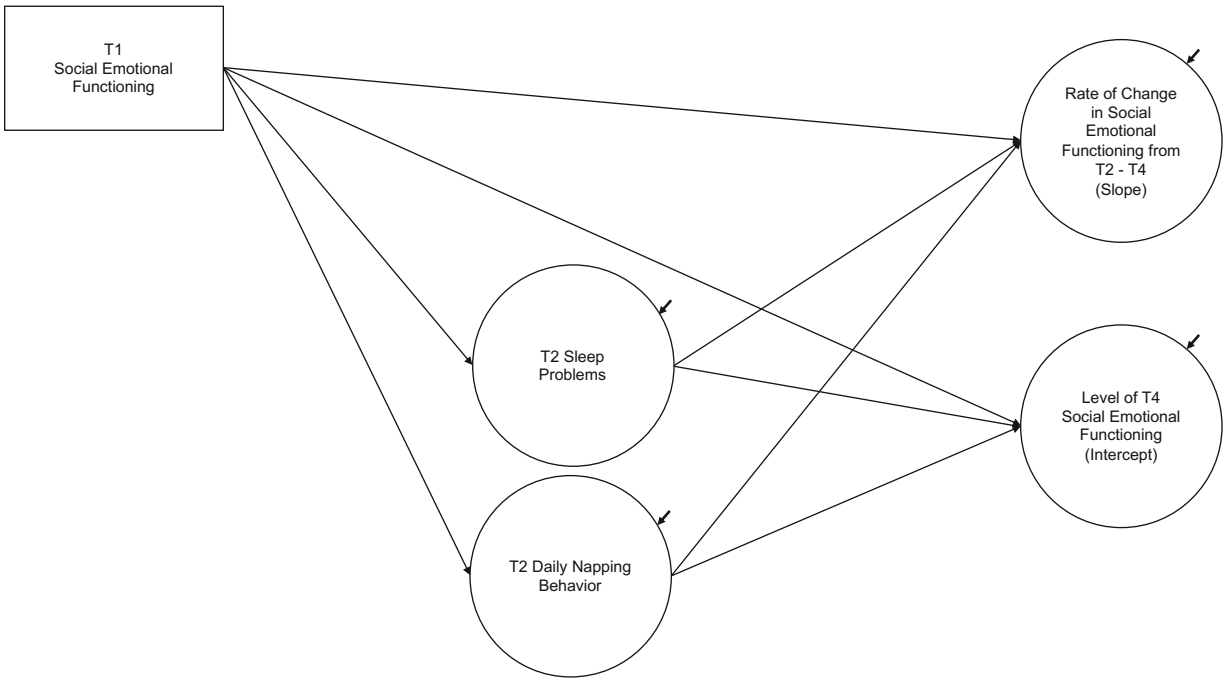

Figure 2.1. Hypothesized model.

A decreased propensity for parents to indicate that they are concerned their child has a sleep problem at T2 is hypothesized to predict more favorable trajectories of social emotional functioning (rate of change in and later level of internalizing behavior, externalizing behavior, and competence). A greater propensity for children to take daily naps at T2 is also hypothesized to predict more favorable trajectories of social emotional functioning. Higher social emotional functioning at T1 is hypothesized to predict a lower propensity for parents to indicate a sleep problem and a higher propensity for children to take a daily nap at T2. T1 = baseline, T2 = approximately 3 months post-baseline, T3 = approximately 6 months post-baseline, T4 = approximately 9 months post-baseline. Not shown for simplicity: residual covariance between the intercept and slope factors, observed raw T2 - T4 internalizing behavior measures, and control variables (T1 child age and gender).

Table 2.1. *Descriptives and Zero-Order Correlations Among Study Variables*

Measure	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.
1. T1 internalizing	--															
2. T2 internalizing	.58**	--														
3. T3 internalizing	.52**	.69**	--													
4. T4 internalizing	.39**	.51**	.67**	--												
5. T1 externalizing	.28**	.18	.13	.14	--											
6. T2 externalizing	.33**	.41**	.27**	.34**	.59**	--										
7. T3 externalizing	.18	.29**	.42**	.41**	.42**	.64**	--									
8. T4 externalizing	.18	.20	.25*	.44**	.42**	.59**	.73**	--								
9. T1 competence	.19*	.12	.03	-.01	-.10	-.15	-.23*	-.28	--							
10. T2 competence	-.04	.05	.00	-.04	-.16	-.27**	-.32**	-.33**	.61**	--						
11. T3 competence	.08	.06	-.10	-.13	-.09	-.19	-.34**	-.28**	.57**	.59**	--					
12. T4 competence	-.09	-.11	-.23*	-.38**	-.32**	-.35**	-.47**	-.59**	.49**	.55**	.48**	--				
13. T2 sleep problems	.16	.24*	.33**	.27**	.18	.28**	.32**	.30**	-.07	-.05	-.02	-.16	--			
14. T2 naps	-.14	-.15	-.22*	-.26*	-.08	-.19	-.13	-.22*	-.05	.07	.05	.22*	-.11	--		
15. T1 child age	.39**	.16	.12	.10	.08	-.06	-.16	-.09	.54**	.29**	.34**	.17	.02	-.34**	--	
16. Child Gender	-.05	-.12	.00	.04	.02	.11	.14	.16	-.05	-.20*	-.16	-.20*	.05	-.15	-.04	--
Mean	0.49	0.53	0.49	0.49	0.59	0.62	0.64	0.64	16.30	17.37	17.41	17.78	0.26	0.84	16.78	0.58
(SD)	0.21	0.23	0.22	0.30	0.31	0.30	0.35	0.36	3.56	2.93	2.93	2.95	0.44	0.36	4.55	0.50

Note. N = 123. T1 = baseline, T2 = approximately 3 months post-baseline, T3 = approximately 6 months post-baseline, T4 = approximately 9 months post-baseline. Internalizing and externalizing = Infant-Toddler Social and Emotional Assessment raw domain scores, higher scores indicate higher internalizing and externalizing behavior. Competence = Brief Infant-Toddler Social and Emotional Assessment raw total scores, higher scores indicate higher competence. Sleep problems dummy coded 0 = no problem, 1 =

small or serious problem. Naps dummy coded 0 = does not nap daily, 1 = naps daily. Child age = months. Child gender dummy coded 0 = females, 1 = males.

* $p < .05$, ** $p < .01$.

Table 2.2. *Unconditional Latent Growth Curve Model Results for T2 - T4 Internalizing and Externalizing Behavior*

	Internalizing		Externalizing	
	B	(*SE*)	*B*	(*SE*)
Means				
Intercept	0.49	(0.02)**	0.64	(0.04)**
Slope	-0.02	(0.01)$^{+}$	0.01	(0.02)
Variances				
Intercept	0.04	(0.01)**	0.12	(0.02)**
Slope	0.01	(0.00)*	0.02	(0.01)*
Covariance				
Intercept with slope	0.01	(0.00)$^{+}$	0.03	(0.01)**
Model fit statistics				
$\mathcal{X}^2$ (*df*)	3.48 (1), $p = .062$		0.34 (1), $p = .562$	
RMSEA	0.15		0.00	
CFI/TLI	0.98/0.94		1.00/1.02	
SRMR	0.03		0.01	

Note. $n = 114$. T2 = approximately 3 months post-baseline, T4 = approximately 6 months post-baseline. RMSEA = Root Mean Square Error of Approximation; CFI = Comparative Fit Index; TLI = Tucker-Lewis Index; SRMR = Standardized Root Mean Square Residual.

$^{+}$ = trend at $p < .10$, * $p < .05$, ** $p < .01$.

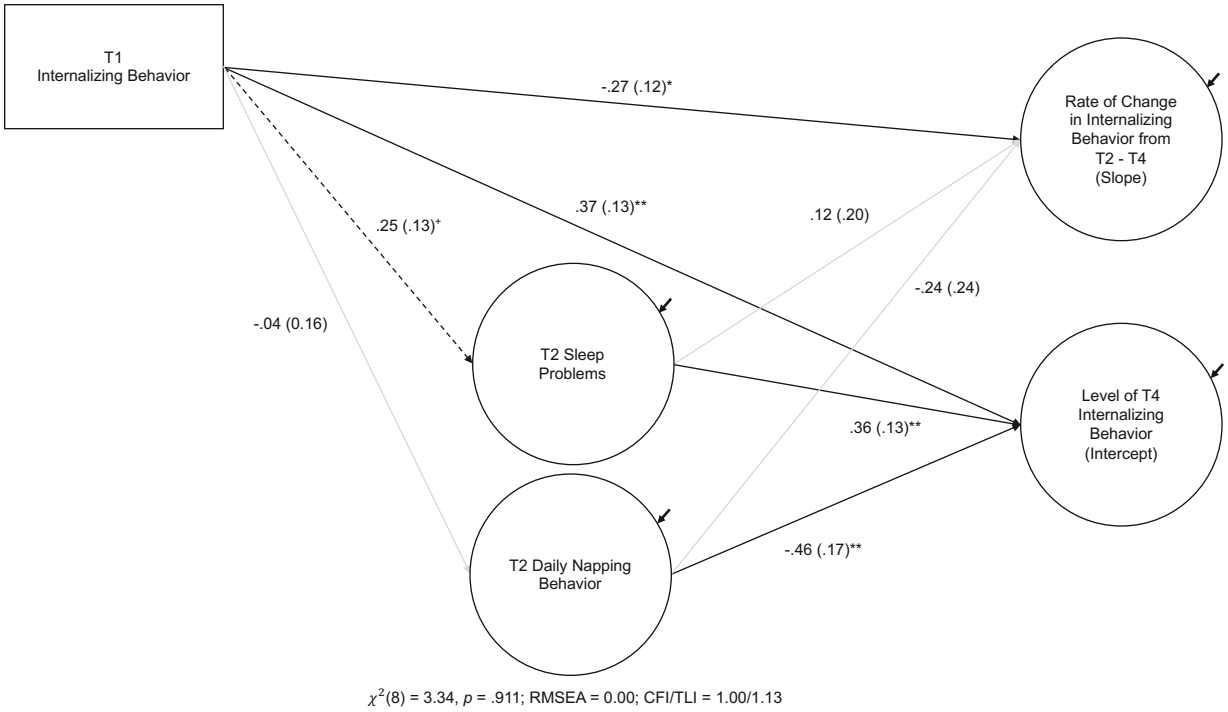

Figure 2.2. Results for the conditional latent growth curve path model with internalizing behavior.

N = 123. Significant paths are solid lines, paths trending toward significance are dashed lines, insignificant paths are gray lines. Path coefficients are standardized. In parentheses are standard errors. Observed T1 - T4 internalizing behavior measures = Infant-Toddler Social and Emotional Assessment raw domain scores, higher scores indicate higher internalizing behavior. Sleep problems = the underlying propensity for parents to indicate their child has a sleep problem (observed scores were dummy coded 0 = no problem, 1 = small or serious problem). Daily napping behavior = the underlying propensity for children to take daily naps (observed scores were dummy coded 0 = does not nap daily, 1 = naps daily). Omitted for simplicity: residual covariance between the intercept and slope factors, observed T2 - T4 internalizing behavior measures, and control variables (T1 child age and gender).

$^{+}$ trend at $p < .10$, * $p < .05$, ** $p < .01$, *** $p < .001$.

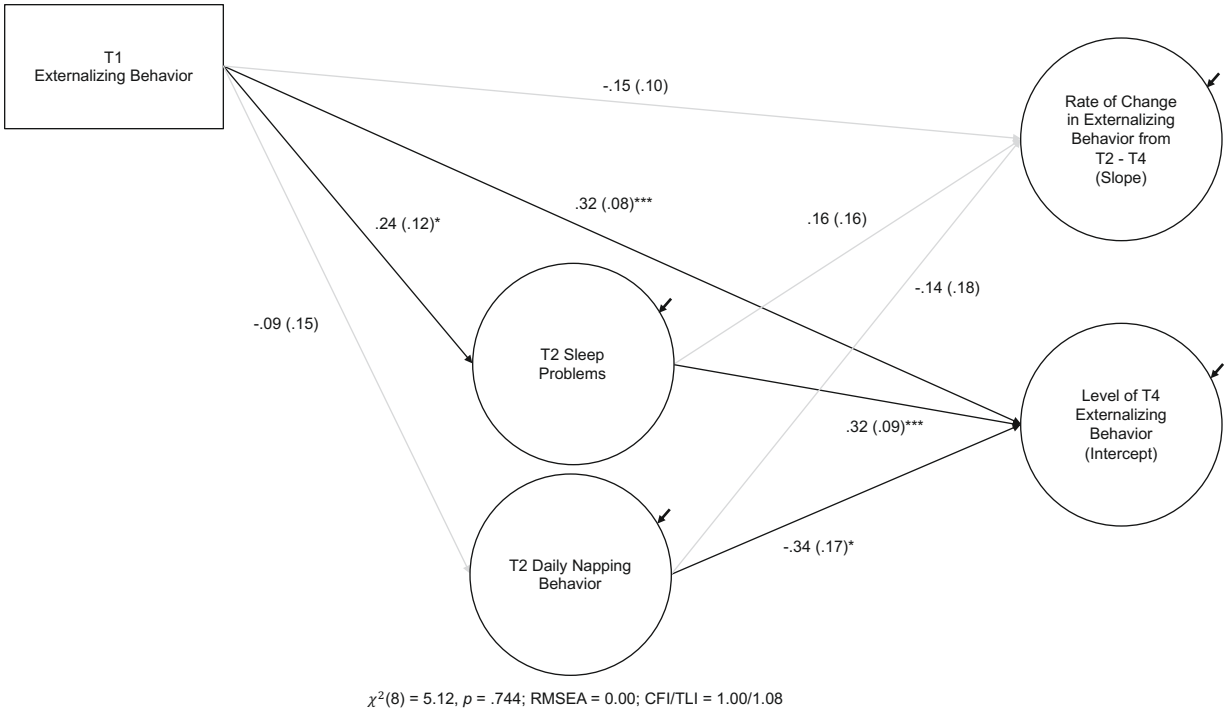

Figure 2.3. Results for the conditional latent growth curve path model with externalizing behavior.

$N = 123$. Significant paths are solid lines, insignificant paths are gray lines. Path coefficients are standardized. In parentheses are standard errors. Observed T1 - T4 externalizing behavior measures = Infant-Toddler Social and Emotional Assessment raw domain scores, higher scores indicate higher externalizing behavior. Sleep problems = the underlying propensity for parents to indicate their child has a sleep problem (observed scores were dummy coded 0 = no problem, 1 = small or serious problem). Daily napping behavior = the underlying propensity for children to take daily naps (observed scores were dummy coded 0 = does not nap daily, 1 = naps daily). Omitted for simplicity: residual covariance between the intercept and slope factors, observed T2 - T4 externalizing behavior measures, and control variables (T1 child age and gender).

$^{+}$ trend at $p < .10$, * $p < .05$, ** $p < .01$, *** $p < .001$.

Table 2.3. *Multiple Linear Regression with Standard Predictor Entry for T4 Social Emotional Competence*

	R^2_{total}	β	(*SE*)
Model Fit	.30***		
Intercept		3.64	(0.68)***
T2 sleep problems		-.10	(.09)
T2 napping behavior		.20	(.09)*

Note. $N = 123$. T1 = baseline, T4 = approximately 9 months post-baseline. Social emotional competence = Infant-Toddler Social and Emotional Assessment raw total score, higher scores indicate greater competence. Sleep problems dummy coded 0 = no problem, 1 = a small or serious problem. Daily napping behavior dummy coded 0 = does not nap daily, 1 = naps daily. Model adjusted for T1 child age, gender, and T1 social emotional competence.

*$p < .05$, **$p < .01$, *** $p < .001$.

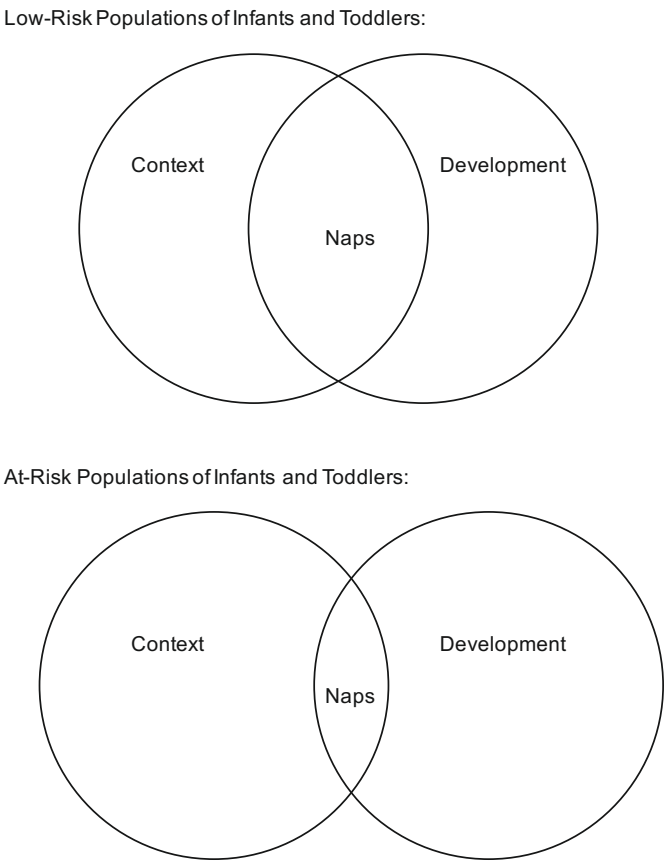

Figure 2.4. How context and development shape napping behavior.

There has been recent interest in the concept of sleep health (Buysse, 2014). There has also been recent interest how sleep, such as adequate sleep duration, can be leveraged to optimize health (Paruthi et al., 2016). For infants and toddlers, naps may be just one component salient to pediatric sleep health. Naps may also be an important factor in how sleep optimizes early life health and development. This figure illustrates how children's context and development may overlap to achieve (or not achieve) nap health. When children's contexts compliment their developmental need for naps, then nap health is achieved (as represented by the overlapping of the circles in the middle). Sub-optimal nap health (as represent by the non-overlapping sections of the circles) arises when children's contexts are discordant with their developmental need for naps (for example, when contextual stressors reduce children's opportunities to take naps). The

overlap between context and development may be smaller for at-risk populations of children, such as maltreated infants and toddlers (as represented by the top half of the figure), compared to lower-risk populations (as represented by the bottom half of the figure). This may disadvantage nap health among at-risk populations of infants and toddlers.

Appendix

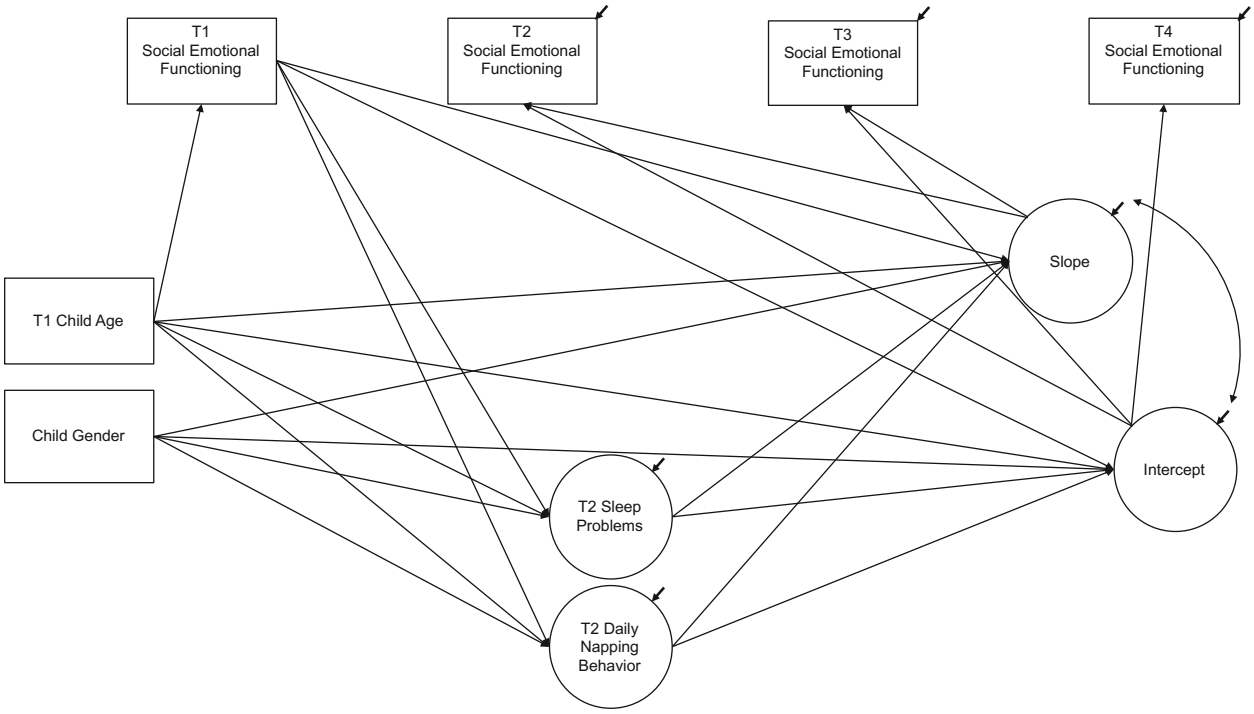

Figure 2.5. Full statistical representation of the hypothesized model.

T1 = baseline, T2 = approximately 3 months post-baseline, T3 = approximately 6 months post-baseline, T4 = approximately 9 months post-baseline.

Chapter 3. Adverse Childhood Experiences, Sleep Problems, and Parenting Sensitivity Among Parent-Child Dyads from Families Involved with Child Protective Services

Abstract

This study examined whether children's adverse childhood experiences (ACEs) increased their risk of having a sleep problem among a sample of infants and toddlers from families with a Child Protective Services maltreatment report. This study also examined whether a parenting intervention could reduce these children's risk of having a sleep problem, both directly and indirectly, by way of improved parenting sensitivity. This was a secondary analysis of a randomized controlled trial of the *Promoting First Relationships*® intervention compared to a resource and referral control condition among 247 parents and their 10- to 24-month-old child. Data were collected across four time points from baseline to 6 months post-intervention. Parenting sensitivity was measured at all four time points using an observed parent-child teaching interaction tool. Children's ACEs were measured across the four time points using various tools including caregiver report and official state records. Whether children had a sleep problem was assessed at 6 months post-intervention by parent report. Results indicated the likelihood of having a sleep problem increased as children's ACEs increased. Treatment assignment failed to predict children's sleep problems, either directly or indirectly, by way of parenting sensitivity. Post hoc analyses evidenced a treatment assignment by ACEs interaction such that children's ACEs increased their odds of having a sleep problem, but only among children in the control condition. These findings indicate ACEs were a risk factor for sleep problems, but only among children who did not receive the intervention. Children who received the intervention were buffered from ACE-related sleep problems.

Introduction

Adverse childhood experiences (ACEs), which include highly stressful exposures to childhood maltreatment and household dysfunction (Felitti et al., 1998), demonstrate a consistent pattern of lifelong consequences for physical and mental health, including increased risk of obesity (Anda et al., 2006), heart disease (Dong et al., 2004), autoimmune disease (Dube et al., 2009), depression (Chapman et al., 2004), substance use (Dube et al., 2003), and behavior problems (Freeman, 2014; Jimenez, Wade, Lin, Morrow, & Reichman, 2016). ACEs likely exert their effects on mental and physical health across the lifespan by way of stress (Anda et al., 2006), including toxic stress (Shonkoff, Boyce, & McEwen, 2009). Some consequences of ACEs, such as coronary heart disease, appear to have decades-long "incubation" periods such that symptoms do not emerge until well into adulthood (Moffitt & The Klaus-Grawe 2012 Think Tank, 2013, p. 1630) whereas other consequences, such as behavior problems, can appear as early in life as kindergarten (Jimenez et al., 2016) and early childhood (Freeman, 2014).

Sleep problems may be among the earlier consequences of ACEs, as sleep is highly and immediately vulnerable to states of vigilance and arousal (Dahl, 1996), including stress (Sadeh, 1996). Yet to date, only studies examining adolescent and adult sleep problems as later-life consequences of ACEs have been conducted (Chapman et al., 2013; Chapman et al., 2011; Koskenvuo, Hublin, Partinen, Paunio, & Koskenvuo, 2010; Wang, Raffeld, Slopen, Hale, & Dunn, 2016). Whether accumulating ACEs could also give rise to sleep problems as early in life as infancy and toddlerhood, or whether sleep problems do not emerge until later in life, remains unknown. Given that sleep is important to many of the same domains of functioning on which ACEs exert their long-term effects including physical health, such as weight gain (Magee & Hale, 2012), and mental health, such as behavior regulation (as discussed in the previous chapter

of this dissertation), then the prevention and treatment of sleep problems among infants and toddlers exposed to adversity could serve as a potential upstream target for addressing the consequences of ACEs.

That ACEs could give rise to sleep problems early on in life may be especially salient for infants and toddlers involved with Child Protective Services (CPS), who constitute a highly vulnerable group of children at risk for toxic stress. For these children, addressing toxic stress through interventions that support children's primary relationships, including parenting sensitivity, may be a key component in the effective treatment of sleep problems. Yet no studies have examined if relationship-based interventions, by way of improved parenting sensitivity, can be leveraged to buffer children from sleep problems when they are faced with adversity.

Infant and Toddler Sleep Problems, Toxic Stress, and ACEs

When parents of infants and toddlers (less than 3 years of age) are concerned their child has trouble sleeping, it is commonly their child's difficulties initiating sleep at bedtime (e.g., prolonged sleep onset, bedtime resistance) or maintaining sleep across the night (e.g., frequent night wakings) that are concerning for them (Byars, Yolton, Rausch, Lanphear, & Beebe, 2012; Sadeh, Mindell, Luedtke, & Wiegand, 2009; see also the first chapter of this dissertation). These common sleep problems are tied to children's stress response systems. Sleep fragmentation is associated with elevated morning cortisol levels (Scher, Hall, Zaidman-Zait, & Weinberg, 2010), and difficulty settling into naps is associated with blunted decreases from morning to afternoon cortisol levels, as well as with higher afternoon cortisol levels (Ward, Gay, Alkon, Anders, & Lee, 2008). This coupling of sleep and cortisol secretion patterns may, in turn, make children more vulnerable to sleep problems when stressed.

ACEs including maltreatment, parental mental illness, domestic violence, and parental substance abuse all constitute highly stressful experiences that, without at least one safe and sensitive caregiver to help children regulate their biological stress response, may give rise to a particularly "strong, frequent, and/or prolonged" stress response called toxic stress (Shonkoff et al., 2009, p. 2256). This toxic stress may, in turn, trigger or exacerbate sleep problems, including difficulties with sleep initiation and maintenance. Although at-risk populations including children involved with CPS (Scherman, Hash, Fleming, & Oxford, 2017) and children placed in or adopted out of foster care (Turney & Wildeman, 2017) bear a high burden of multiple ACE exposures, no studies have examined ACEs as a risk factor for sleep problems in populations of infants and toddlers involved with CPS, among whom the intense biologic stress response characteristic of toxic stress may be particularly salient to the development of sleep problems.

Relationship-Based Interventions as Opportunities for Addressing Sleep Problems

Should ACEs, by way of toxic stress, give rise to sleep problems among at-risk infants and toddlers, then it is possible interventions aimed at supporting children's primary caregiving relationships may be leveraged as opportunities for also preventing or reducing sleep problems, as downstream effects of reduced toxic stress. Already, there is a strong body of science supporting the effectiveness of relationship interventions for regulating children's stress response systems, with a recent systematic review finding consistent evidence to suggest cortisol secretion patterns among at-risk children receiving relationship interventions eventually converge with those of low-risk comparison samples (Slopen, McLaughlin, & Shonkoff, 2014). Moreover, at least one home visiting, relationship-based intervention effective at improving parenting sensitivity (Oxford, Spieker, Lohr, & Fleming, 2016) has also shown promise for regulating children's stress response systems (Nelson & Spieker, 2013) and for reducing sleep problems

(Oxford, Fleming, Nelson, Kelly, & Spieker, 2013; Spieker, Oxford, Kelly, Nelson, & Fleming, 2012). An interesting extension of these findings, therefore, is the possibility that improved parenting sensitivity could be a key pathway through which sleep problems may be prevented or reduced among at-risk populations of infants and toddlers, as an added benefit of relationship-based intervention. In other words, parenting sensitivity may provide unique protective effects for sleep health among populations of children exposed to toxic stress. Yet although the scientific community widely agrees that having at least one safe and sensitive caregiving relationship during the early years of life is critical to development (Shonkoff & Phillips, 2000), no studies have examined improved parenting sensitivity as a mechanism by which relationship-based interventions may prevent or reduce sleep problems among at-risk populations of infants and toddlers involved with CPS, limiting the capacity of researchers and practitioners to leverage already empirically supported relationship-based interventions as opportunities for also preventing or reducing sleep problems among at-risk infants and toddlers.

The Present Study

This study seeks to address these gaps in knowledge by conducting a secondary analysis of a longitudinal randomized controlled trial testing a relationship-based parenting intervention (*Promoting First Relationships®/PFR*) compared to a Resource and Referral (R&R) control condition among parent-child dyads from families involved with CPS for maltreatment. Specifically, this study tested a model (see Figure 3.1) in which it was hypothesized that children's risk of having a sleep problem would increase with increasing ACEs, decrease with increasing parenting sensitivity, and decrease with *PFR* (as both a direct outcome of receiving *PFR* and as an indirect outcome by way of increased parenting sensitivity).

[Figure 3.1 about here.]

Methods

Design and Participants

This was a secondary analysis of a longitudinal randomized controlled trial that has already shown *PFR* to be effective at improving parenting sensitivity (Oxford et al., 2016). Participants included 247 biological parent-child dyads (child age 10- to 24-months at baseline) from families with a recent, open case of child maltreatment reported to one of five Washington State CPS offices at least 2 weeks prior to study recruitment. Eligible parents had a biological 10- to 24-month-old child, spoke English, and had housing in one of three Washington counties. To be eligible for the study, children did not have to be the alleged victim of the recent, open case of maltreatment; however, in a majority of dyads (87%), the child enrolled in the study was the reported victim. After parents provided informed written consent and the researchers collected baseline measures, dyads were randomized to treatment condition (n = 123 R&R, n = 124 *PFR*) using a blocking method that equated groups on race and ethnicity. Figure 3.2 illustrates study flow; Table 3.1 gives baseline participant demographics by treatment assignment. Ethics approval was obtained and overseen by the Washington State Institutional Review Board.

[Figure 3.2 about here.]

[Table 3.1 about here.]

Treatment Assignment Conditions

PFR. *PFR* is a relationship-based parenting intervention (Kelly, Zuckerman, Sandoval, & Buehlman, 2016) that, in the present study, was dosed across 10 in-home visiting sessions, each approximately 1 week apart, by *PFR*-trained and certified community-based providers. Relationship-based means *PFR* providers seek to establish safe and trusting relationships with

parents (Kelly et al., 2016). Relationship-based also means *PFR* supports the parent-child relationship (Kelly et al., 2016). During sessions, providers help guide parents in reflective observation of their child, as well as in reflection of their own and their child's inner needs and feelings (Kelly et al., 2016). *PFR* is aimed at improving parenting sensitivity (Kelly, Zuckerman, & Rosenblatt, 2008).

R&R. Resource and referral participants received a mailed packet with information about local services and resources (e.g., libraries, public internet access, child care, housing, food, employment, mental health services, etc.), as well as three phone call sessions (one initial 30-mintue phone call and two subsequent 10-minute follow-up calls) with a social service provider who identified and provided resources for each family's unique needs. Parents were also given a call-back phone number to use on an as-needed basis.

Data Collection Procedures

Trained research visitors masked to treatment assignment conducted four in-home research visits to assess dyads on the study measures at baseline (T1), immediately post-intervention (T2), 3 months post-intervention (T3), and 6 months post-intervention (T4). Visits included parent interviews and questionnaires, as well as observed videotaped parent-child interaction activities. Official Department of Social and Health Services (DSHS) data were also extracted prior to the close of the study to obtain children's lifetime removal histories (from birth to 12-months post-baseline).

In 14 cases, children were placed with a new non-birth parent caregiver during the study, and this new caregiver enrolled and provided data with the study child. For the measurement of ACE exposure, non-birth parent reports were combined with birth parent reports; however, only data provided by birth parents were used on all remaining measures, including parenting

sensitivity and children's sleep problems. This strategy yielded the most accurate count of children's ACE exposures based on all possible data provided by all enrolled caregivers, regardless of whether they were the child's birth parent.

Measures

Child ACE score. Children's ACEs were measured as an ACE score, which is a total sum of children's ACE exposures. Nine types of ACEs were measured and counted, including potential maltreatment exposure, removal from birth home, caregiver mental illness, caregiver incarceration, domestic violence in the home, household substance use or abuse, caregiver divorce or separation, death of a family member or loved one, and homelessness. Various tools collected across the study period (from T1 - T4) were used to construct children's ACE scores. Table 3.2 gives these tools and maps the time points at which they were assessed. The sections below describe these tools in greater detail and then discuss the procedures for how children's ACE scores were constructed.

[Table 3.2 about here.]

Tools used to construct children's ACE scores. The various tools used to measure children's ACEs included the Difficult Life Circumstances 2nd edition questionnaire (Oxford, Fleming, & Barnard, 2015; administered at T1 and T4), the Center for Epidemiologic Studies Depression Scale (Radloff, 1977; administered at all time points), the Child Life Events questionnaire (Mongillo, Briggs-Gowan, Ford, & Carter, 2009; administered at T4), a sociodemographic interview (administered at all time points), and DSHS data (including maltreatment allegations recorded at least 2 weeks prior to recruitment and lifetime birth home removal histories extracted by the close of the study).

The Difficult Life Circumstances (DLC) 2nd edition questionnaire. The DLC is a 30-item caregiver-report tool examining families' exposures to various stressors, including financial, housing, health, personal, child, and partner-related stressors (Oxford et al., 2015). The DLC was designed specifically with highly stressed families in mind, including families with young children receiving home-visiting services (Oxford et al., 2015). In the present study, caregivers were asked to retrospectively indicate whether or not (*yes* or *no*) their family had experienced a particular stressor over the previous year. Higher scores (calculated as the sum of all endorsed stressors, with an allocation of 1 point for each stressor) on the DLC have been correlated with poorer child social emotional development (increased dysregulation and decreased competence), parenting stress (increased feelings of helplessness), parents' past traumatic experiences (higher reports of childhood maltreatment) and parents' mental health (increased depressive symptoms; Oxford et al., 2015).

The Center for Epidemiological Studies Depression (CES-D) Scale. The Radloff (1977) CES-D is a 20-item retrospective self-report tool measuring caregivers' depressive symptomatology. Caregivers rate the frequency of their depressive symptoms over the previous week on a 4-point rating scale (from 0 = *Rarely* to 3 = *Most or all of the time*). The CES-D yields a total score ranging from 0 - 60, with higher scores indicating greater depressive symptomatology. Validity and reliability of the CES-D has been established (Radloff, 1977). Internal consistency of the CES-D in the current study ranged from $\alpha = .90$ - .91.

The Child Life Events (CLE) questionnaire. The CLE is a 9-item caregiver-report tool assessing children's exposures to various traumatic experiences (Mongillo et al., 2009). The CLE has been shown to produce modest-to-good reliability estimates and to be predictive of social emotional problems and post-traumatic stress symptoms (Mongillo et al., 2009). For the

purposes of the present study, five additional investigator-developed items were included along with the CLE as a means for assessing additional traumatic experiences. These items included homelessness, prolonged separation from a parent, parental divorce or separation, death of a loved one, and serious illness. On all items, caregivers were asked to retrospectively indicate whether or not (*yes* or *no*) their child had experienced a particular traumatic event within the previous year.

The sociodemographic interview. The sociodemographic interview is an investigator-developed tool where caregivers respond to sociodemographic questions administered by the research visitor.

DSHS data. Official DSHS data included maltreatment allegations and birth home removals.

Procedure for constructing children's ACE scores. Using select items from the above DLC, CLE and sociodemographic interview, as well as the total CES-D score and DSHS data, children were assigned 1 point for each ACE if an exposure was indicated at any time point as follows:

Potential maltreatment. All children received 1 ACE point for living in a family with a recent, open case of maltreatment recorded in the Washington State DSHS database at least 2 weeks prior to recruitment.

Removal from birth home. Children received 1 ACE point if the CLE indicated foster care placement or if official DSHS records indicated at least one birth home removal between birth and T4.

Caregiver mental illness. Children received 1 ACE point if, at any time point, their caregiver scored at or above a total score cut-off of 16 points on the CES-D (Radloff, 1977).

Caregiver incarceration. Children received 1 ACE point if, at any time point, the DLC indicated their caregiver had been in prison or jail.[1]

Domestic violence. Children received 1 ACE point if, at any time point, the DLC indicated their caregiver had been physically abused by their partner or if the CLE indicated children had witnessed physical harm or threat to a family member.

Household substance use or abuse. Children received 1 ACE point if, at any time point, the DLC indicated a household member had trouble with drugs or alcohol.

Caregiver divorce or separation. Children received 1 ACE point if, at any time point, the DLC or CLE indicated caregiver divorce or separation.

Death of a family member or loved one. Children received 1 ACE point if, at any time point, the DLC or CLE indicated death of an immediate family member or loved one.

Homelessness. Children received 1 ACE point if, at any time point, the demographics or the CLE indicated homelessness or transitional housing for homelessness.

Children's ACE points were then summed, yielding a total score (range 1 - 9) indicating children's ACE exposures from birth through T4.

Parenting sensitivity. Parent-child interactions were videotaped and observer-coded by trained and masked research personnel according to the Nursing Child Assessment Teaching Scale (NCATS), a 73-item tool used to measure parenting sensitivity among parents of children ages birth to 36 months (Oxford & Findlay, 2013). Parents were instructed to select (from a list) a task they could teach to their child (such as how to zip a zipper up and down). The task was new to their child but still developmentally appropriate. Materials for teaching the task were provided by a research assistant. The NCATS yields a total teaching score, parent total score, child total score, and six subscale scores including sensitivity to cues, response to distress,

social-emotional growth fostering, cognitive growth fostering, clarity of cues, and responsiveness to parent (Oxford & Findlay, 2013). In the present study, a modified total teaching score was used, which included 56 of the original 73 items (17 items were removed for low variability). This yielded a total score ranging from 0 - 56 points. Higher scores indicate more parenting sensitivity. Cronbach's alpha for the 56 items used in this study ranged from α = .61 - .69.

Children's sleep problems. One item from the Sadeh (2004) Brief Infant Sleep Questionnaire (BISQ) measuring parents' perceptions about their child's sleep problems ("Do you consider your child's sleep a problem?" [p. e576]) was used in the present study. Response options included 0 = *not a problem at all*, 1 = *a small problem*, and 2 = *a very serious problem.* Most parents reported no problem or a small problem, and only a small number reported a serious problem (n = 4 R&R, n = 3 *PFR*). Participants were therefore collapsed into two groups (*not a problem* v. *a small* or *very serious problem*).

Data Analytic Strategy

First, descriptives and correlations among study variables were examined in IBM SPSS Version 19 using default procedures for the treatment of missing data (which, in this case, included listwise and pairwise treatment for descriptives and correlations, respectively). All continuous variables were left in their original units, and all categorical variables were dummy coded (treatment assignment was coded 0 = R&R, 1 = *PFR*; sleep problems were coded 0 = *not a problem*, 1 = *a small* or *very serious problem*).

Next, to allow for inclusion of all 247 cases, missing data were treated using multiple imputation (Graham, 2012) in Mplus Version 7.31 (Muthén & Muthén, 1998-2015a). Forty data sets were imputed using the study variables while, again, leaving all continuous variables in their

original units and dummy coding all categorical variables. Also included in the imputation model were an ACE by treatment assignment interaction term (described in greater detail below) and auxiliary demographic variables, all of which were dichotomized, including child gender (0 = female, 1 = male), child race (0 = White/Caucasian, 1 = non-White/Caucasian or mixed), parent race (0 = White/Caucasian, 1 = non-White/Caucasian or mixed), parent high school diploma/GED status (0 = did not receive a high school diploma or GED, 1 = received a high school diploma or GED), and living arrangement (0 = not currently living with a spouse/partner, 1 = currently living with a spouse/partner). These 40 data sets were then used in all remaining analyses to obtain averaged parameter estimates and standard errors according to Rubin's (1987) rules.

Next, to determine whether a single factor representing mean level of post-intervention parenting sensitivity (as illustrated in Figure 3.1) adequately fit the data, preliminary analysis of an unconditional intercept-only latent growth curve model was tested, first in the R&R group alone, followed by in the full sample. The reason the R&R group alone was tested first, followed by the full sample, was to understand how relations among variables in the model operated in the control group alone, before testing for a treatment effect. Maximum likelihood (ML) estimation was used to obtain model fit statistics and parameter estimates.

Following these preliminary analyses, the full hypothesized path model given in Figure 3.1 was examined using structural equation modeling to predict whether children had a parent-perceived sleep problem at 6 months post-intervention. This was done in two steps: first in the R&R group alone (controlling for baseline child age and parenting sensitivity), and second in the full sample (controlling for baseline child age, parenting sensitivity, and time elapsed between T1 and T2[2]). Figure 3.6 and Figure 3.7 in the Appendix provide illustrations of these full

statistical models, including how control variables were entered. ML estimation with the logit link function was used to obtain parameter estimates, which uses a combination of linear and logistic regression in models with combinations of continuous and categorical endogenous variables (Muthén & Muthén, 1998-2015b). In this context, this translated to linear regressions predicting mean post-intervention parenting sensitivity and logistic regressions predicting sleep problems.

Model fit statistics reported below include the chi-square test statistic of the exact-fit hypothesis, Root Mean Squared Error of Approximation (RMSEA), Comparative Fit Index (CFI), Tucker-Lewis Index (TLI), and Standardized Root Mean Residual (SRMR). CFI/TLI values above 0.95, SRMR values below 0.08, RMSEA values below 0.06 (Hu & Bentler, 1999) and a nonsignificant ($p > .05$) chi-square test statistic (Kline, 2016) were used as general guidelines for global fit.

Results

Descriptive Statistics for the R&R and *PFR* Groups

Descriptives are given in Table 3.3 for the R&R and *PFR* groups separately. Aside from potential maltreatment exposure (which was 100% of the sample), caregiver depression was the most frequently reported ACE exposure, followed by caregiver divorce or separation. Caregiver incarceration and removal from birth home were the least frequently reported. Over half (60% R&R; 59% *PFR*) of the sample reported exposure to three or more types of ACEs. Just over one-quarter (27%) of parents in the R&R group and one-fifth (20%) of parents in the *PFR* group considered their child's sleep a problem.

Tests of differences by group on ACE type, score, and mean were non-significant, indicating that ACEs did not differ among children in the R&R group compared to the *PFR*

group; however, as already noted above and by the parent study (Oxford et al., 2016) mean baseline parenting sensitivity scores differed significantly between the R&R and *PRF* groups such that baseline parenting sensitivity was higher among the R&R group, compared to the *PFR* group.

[Table 3.3 about here.]

Correlations Among Study Variables in the R&R Group and Full Sample

Correlations are given in Table 3.4 for the R&R group and full sample (bottom and top triangles, respectively; correlations in the *PFR* group alone available upon request). Children's sleep problems correlated positively and significantly with ACEs, but the magnitude of this correlation decreased by about half in the full sample compared to the R&R group only. This suggests a potential interaction among ACEs and treatment assignment (discussed in greater detail below). Correlations between children's sleep problems and parenting sensitivity were small, insignificant, and mixed in direction, indicating little relation between these variables. The correlation between treatment assignment and sleep problems was insignificant but in the expected direction. Correlations between treatment assignment and parenting sensitivity (all time points) were also in the expected directions.

[Table 3.4 about here.]

Latent Growth Curve Models for Post-Intervention Parenting Sensitivity in the R&R Group and Full Sample

Model fit statistics and results for the one-factor intercept-only latent growth curve models are given for the R&R group and full sample in Table 3.5. The value of the intercept, which represented the average total parenting sensitivity score as aggregated across all post-intervention time points, was 35.64 points in the R&R group and 35.98 points in the full sample,

both of which were significantly different from zero. The variance of the intercept in both the R&R group and full sample models was also significant, indicating mean post-intervention parenting sensitivity scores varied significantly among participants in both the R&R group and full sample models.

Given the possibility that inclusion of a second (slope) factor could improve model fit in the full sample (as mean parenting sensitivity trended upward from T2 - T4), a two-factor intercept and slope model was assessed. The two-factor model did provide better fit statistics ($\chi^2(1) = 1.02$, $p = .313$, RMSEA = 0.01, CFI/TLI = 1.00/1.00, SRMR = 0.02) relative to the one-factor model ($\chi^2(4) = 7.61$, $p = .107$, RMSEA = 0.06, CFI/TLI = 0.85/0.89, SRMR = 0.05) but failed to provide significantly improved fit ($\Delta\chi^2(3) = 6.591$, $p > .05$). The two-factor model also lacked significant variation on the slope (unstandardized $b = 2.19$, $SE = 1.79$, $p = .220$). Therefore, the more parsimonious one-factor intercept-only model was retained.

[Table 3.5 about here.]

Hypothesized Path Model for the R&R Group Alone

Results for the hypothesized model as tested in the R&R group alone are given in Figure 3.3. Findings indicated children's ACEs, but not mean level of post-intervention parenting sensitivity, uniquely and positively predicted children's odds of having a parent-perceived sleep problem at 6 months post-intervention such that, as ACEs increased, the likelihood of having a parent-perceived sleep problem also increased.

[Figure 3.3 about here.]

Hypothesized Path Model for the Full Sample

Results for the hypothesized model as tested in the full sample are given in Figure 3.4. Similar to results in the R&R group alone, findings from the full sample indicated children's

ACEs, but not mean level of post-intervention parenting sensitivity, uniquely and positively predicted having a parent-perceived sleep problem at 6 months post intervention, with increasing ACEs predicting increasing odds of children having a parent-perceived sleep problem. The value of the coefficient for the path between children's ACEs and their parent-perceived sleep problems, however, was attenuated by almost half in the full sample model compared to the R&R group-only model, which again suggests a potential interaction effect among treatment assignment and children's ACEs. As expected, treatment assignment significantly predicted mean level of post-intervention parenting sensitivity; parents in the *PFR* group had higher mean post-intervention parenting sensitivity scores compared to the R&R group, controlling for baseline parenting sensitivity. Treatment assignment, however, failed to predict children's sleep problems either directly or indirectly through improved mean post-intervention parenting sensitivity.

[Figure 3.4 about here.]

Post Hoc Analyses for an Interaction Effect Between Treatment Assignment and Children's ACEs

Post hoc analyses were conducted to probe for a potential interaction effect between treatment assignment and children's ACEs on their odds of having a parent-perceived sleep problem at 6 months post-intervention. This was done using multiple logistic regression with standard predictor entry to predict whether children had a parent-perceived sleep problem at 6 months post-intervention, controlling for baseline child age and time between T1 and T2. Included in the model as predictors were children's ACEs (standardized), treatment assignment (effect coded -1 = R&R, 1 = *PFR*), and an ACE by treatment assignment interaction term. Results indicated the interaction was significant (unstandardized b = -0.37, SE = 0.17, p = .030),

as was the variable of children's ACEs (unstandardized $b = 0.42$, $SE = 0.17$, $p = .015$) but not treatment assignment (unstandardized $b = -0.14$, $SE = 0.18$, $p = .439$).

To gain a better understanding of this interaction, predicted probabilities for having a sleep problem were calculated and graphed (see Figure 3.5) for scores of 1 ACE (-1.36 standard deviations away from the mean), 3 ACEs (-0.04 standard deviations away from the mean), and 5 ACEs (+1.29 standard deviations away from the mean) in the R&R and *PFR* groups, holding all else constant. As shown, predicted probabilities of having a sleep problem gradually increased as ACEs increased, but only among children in the R&R group. In contrast, the predicted probability of having a sleep problem was relatively stable as ACEs increased among children in the *PFR* group.

[Figure 3.5 about here.]

Discussion

Findings from this study suggest that increased early life adversity may undermine sleep health among infants and toddlers from families involved with CPS for maltreatment, but this is prevented when families are provided with a home visiting, relationship-based intervention. As hypothesized, increasing ACEs conferred increasing risk of sleep problems among this sample of infants and toddlers from families with a CPS maltreatment report. This finding extends prior literature about the sleep-related consequences of ACEs to include the earliest years of life, not just adolescence and adulthood (Chapman et al., 2013; Chapman et al., 2011; Koskenvuo et al., 2010; Wang et al., 2016). These findings additionally suggest sleep is among the more immediately affected domains of functioning in contexts of adversity and may be an early sign of toxic stress. That ACEs continue to render sleep vulnerable in adolescence and adulthood

(Chapman et al., 2013; Chapman et al., 2011; Koskenvuo et al., 2010; Wang et al., 2016) further suggests that sleep problems may persist or reoccur in contexts of adversity.

Despite this risk, however, findings about the interaction among treatment assignment and children's ACEs provide promising evidence to indicate that increased ACEs need not always give rise to sleep problems. *PFR*, as a home visiting, relationship-based intervention, appeared to buffer children in this study. Specially, findings showed the probability of having a sleep problem gradually increased as ACEs increased among children randomized to the control group, whereas the probability of having a sleep problem remained relatively stable with increasing ACEs among children assigned to the *PRF* intervention group. One interpretation of these findings is that children in the *PFR* group had fewer sleep problems as their external stressors increased. Yet another interpretation of these findings is that, as external stressors increased, parents in the *PFR* group simply perceived their child's sleep as less straining. Parents in the *PFR* group did receive content about how their child's behaviors reflected their inner social emotional needs, and this may have changed how they viewed their child's sleep behaviors. Future research is needed to untangle these possibilities.

Despite this buffering effect, *PFR* failed to directly reduce children's risk of sleep problems (or parents' perceptions of sleep problems) among this sample of infants and toddlers from families with a CPS maltreatment report. Although contrary to study hypotheses, this finding is not particularly surprising, as *PFR* was not designed to act directly on sleep. Yet to another extent, this finding is puzzling, particularly in light of a prior study reporting fewer sleep problems among infants and toddlers in families randomized to *PFR* (Oxford et al., 2013; Spieker et al., 2012). There are at least two possible explanations for these discrepant findings. First, the present study examined a population different from that of the prior study. Whereas a

high-risk population of infants and toddlers in families with a CPS maltreatment report was recruited in the present sample, an even higher-risk population (e.g., children recently removed from their birth home, children recently placed back with their birth parents) was recruited in the prior study (Oxford et al., 2013; Spieker et al., 2012). It may be the case that *PFR* is effective for reducing sleep problems, but only among the highest risk populations. This interpretation is supported by the buffering effect of the interaction between ACEs and treatment assignment, where children with the highest ACE scores evidenced the greatest benefit from *PFR* with regard to having a reduced risk of sleep problems.

Second, the present study measured sleep differently from the prior study (Oxford et al., 2013; Spieker et al., 2012). Whereas only one non-specific item measuring parents' global concerns about their child's sleep was used in the present study, multiple items measuring primarily behavioral sleep problems, including problems initiating and maintaining sleep, were used in the prior study (Oxford et al., 2013; Spieker et al., 2012). It could be that specific elements of *PFR* operate to reduce specific behavioral sleep problems (for instance, response to distress may reduce bedtime resistance and prolonged night wakings), but the lack of specificity in the parent-perceived sleep problems variable in the present study might have been too broad to capture these specific effects. This possibility was subsequently explored by examining correlations between treatment assignment and specific behavioral sleep problems at 6 months post-intervention (including night wakings, difficulty falling asleep independently, and difficulty sleeping alone). Correlations evidenced very weak associations, however, indicating *PFR* likely had little direct long-term effects on specific behavioral sleep problems among children in this study (*r*s ranged from -.03 to .08). Further research is needed to better understand what sleep

problems *PFR* may directly improve, and for whom *PFR* may be most effective at improving these sleep problems.

The failure of parenting sensitivity to show a significant relationship with children's sleep problems either in the R&R group alone or in the full sample suggests that sensitivity, as measured among parents in this study, had little influence on their child's sleep problems. That *PFR* failed to reduce risk of sleep problems indirectly, by way parenting sensitivity, further suggests that improved parenting sensitivity likely was not the mechanism by which *PRF* provided its buffering effect. There are several possible explanations for these findings. First, it may again be that the sleep problems variable, as measured in this study, was too broad to fully capture relations between sleep and parenting sensitivity. Parenting sensitivity, as a skill, may help parents better negotiate challenging sleep behaviors, such as bedtime resistance, but a lack of specificity in measuring problem sleep behaviors most responsive to parenting sensitivity in this study may have obscured these relations. Second, it is possible that parenting sensitivity in this study, as measured by a teaching task, simply failed to capture the dimensions of sensitivity most relevant to children's sleep problems. More proximal interactions, such as maternal emotional availability at bedtime, may be more relevant (Teti, Kim, Mayer, & Countermine, 2010). Third, it is possible *PFR* has the capacity to exert protective effects on sleep among at-risk young children by way of other mechanisms. In support of this possibility, the earlier study by Oxford and colleagues (2013) found that the effect of *PFR* on reducing sleep problems among infants and toddlers recently reunified with their birth parents was mediated by a reduction in children's separation distress, suggesting increased trust and connection may be the "active ingredient" by which children's sleep can be improved. Further study is needed to better

understand how home visiting, relationship-based interventions can be leveraged to prevent or reduced sleep problems among at-risk infants and toddlers.

Strengths and Limitations

This study is not without its limitations. First, children's baseline sleep problems were not assessed. Although children were randomized to treatment assignment, it is not known whether the proportion of children with and without sleep problems was truly equal at baseline across the R&R and *PFR* groups. Second, all children were assigned a single undifferentiated ACE point for potential maltreatment, such that the ACE score lacked variability in types of maltreatment (e.g., neglect, physical abuse, emotional abuse). However, results can still be understood with careful interpretation. Among this population of children living in families with a CPS maltreatment report, each ACE point, in addition to the point for potential maltreatment of any type, increased children's odds of having a sleep problem. Third, the parent report tools used in this study were retrospective, covering various time periods (e.g., the DLC and CLE covered the previous year; the BISQ covered the previous 2 weeks), and as such may have been subject to recall bias. However, many of the events assessed (e.g., domestic violence, homelessness, divorce) were significant stressors unlikely to introduce systematic error in recall. Fourth, although the types of ACEs measured in this study were carefully selected to capture key adversities, an established ACEs tool was not used. Fifth, sleep problems including difficulties falling and staying asleep are among children's responses to a wide range of potentially traumatic events (Mongillo et al., 2009), but this study did not examine additional stressors beyond ACEs. Finally, children with different attachment strategies could be more or less prone to certain sleep problems. For example, Simard, Bernier, Bélanger, and Carrier (2013) have suggested children with resistant attachment behaviors (including behaviors that amplify their

distress) may be particularly prone to "signal" (p. 479) their night wakings to their parent. Attachment strategies were not examined, however, as factors in this study.

Despite these limitations, this study also has a number of strengths. First, the randomized controlled design with pre- and post-intervention measurement of parenting sensitivity added rigor to the assessment of a treatment effect on children's sleep problems by way of parenting sensitivity. Second, the longitudinal nature of the study allowed for the examination of prospective relations. The longitudinal nature of the study also allowed for the measurement of ACEs and parenting sensitivity over time. Third, combined observational measures (i.e., parenting sensitivity), official records (i.e., DSHS reports) and parent-report tools (i.e., parent-reported ACEs and sleep problems) were used, which likely minimized shared variance.

Conclusion

Findings from this study add new knowledge to indicate that increasing ACEs may render infants and toddlers increasingly vulnerable to sleep problems, but a home visiting, relationship-based intervention holds promise for reducing children's risk of sleep problems in contexts of increasing adversity.

References

Anda, R. F., Felitti, V. J., Bremner, J. D., Walker, J. D., Whitfield, C., Perry, B. D., . . . Giles, W. H. (2006). The enduring effects of abuse and related adverse experiences in childhood - A convergence of evidence from neurobiology and epidemiology. *European Archives of Psychiatry and Clinical Neuroscience, 256*, 174-186. doi:10.1007/s00406-005-0624-4

Byars, K. C., Yolton, K., Rausch, J., Lanphear, B., & Beebe, D. W. (2012). Prevalence, patterns, and persistence of sleep problems in the first 3 years of life. *Pediatrics, 129*, e276-e284. doi:10.1542/peds.2011-0372

Chapman, D. P., Liu, Y., Presley-Cantrell, L. R., Edwards, V. J., Wheaton, A. G., Perry, G. S., & Croft, J. B. (2013). Adverse childhood experiences and frequent insufficient sleep in 5 U.S. States, 2009: A retrospective cohort study. *BMC Public Health,* 13:3. doi:10.1186/1471-2458-13-3

Chapman, D. P., Wheaton, A. G., Anda, R. F., Croft, J. B., Edwards, V. J., Liu, Y., . . . Perry, G. S. (2011). Adverse childhood experiences and sleep disturbances in adults. *Sleep Medicine, 12*, 773-779. doi:10.1016/j.sleep.2011.03.013

Chapman, D. P., Whitfield, C. L., Felitti, V. J., Dube, S. R., Edwards, V. J., & Anda, R. F. (2004). Adverse childhood experiences and the risk of depressive disorders in adulthood. *Journal of Affective Disorders, 82*, 217-225. doi:10.1016/j.jad.2003.12.013

Dahl, R. E. (1996). The regulation of sleep and arousal: Development and psychopathology. *Development and Psychopathology, 8*, 3-27. doi:10.1017/S0954579400006945

Dong, M., Giles, W. H., Felitti, V. J., Dube, S. R., Williams, J. E., Chapman, D. P., & Anda, R. F. (2004). Insights into causal pathways for ischemic heart disease: Adverse childhood

experiences study. *Circulation, 110*, 1761-1766. doi:10.1161/01.cir.0000143074.54995.7f

Dube, S. R., Fairweather, D., Pearson, W. S., Felitti, V. J., Anda, R. F., & Croft, J. B. (2009). Cumulative childhood stress and autoimmune diseases in adults. *Psychosomatic Medicine, 71*, 243-250. doi:10.1097/PSY.0b013e3181907888

Dube, S. R., Felitti, V. J., Dong, M., Chapman, D. P., Giles, W. H., & Anda, R. F. (2003). Childhood abuse, neglect, and household dysfunction and the risk of illicit drug use: The adverse childhood experiences study. *Pediatrics, 111*, 564-572. doi:10.1542/peds.111.3.564

Felitti, V. J., Anda, R. F., Nordenberg, D., Williamson, D. F., Spitz, A. M., Edwards, V., . . . Marks, J. S. (1998). Relationship of childhood abuse and household dysfunction to many of the leading causes of death in adults: The Adverse Childhood Experiences (ACE) Study. *American Journal of Preventative Medicine, 14*, 245-258. doi:10.1016/S0749-3797(98)00017-8

Freeman, P. A. (2014). Prevalence and relationship between adverse childhood experiences and child behavior among young children. *Infant Mental Health Journal, 35*, 544-554. doi:10.1002/imhj.21460

Graham, J. (2012). *Missing data: Analysis and design*. New York: Springer.

Hu, L, & Bentler, P. M. (1999). Cutoff criteria for fit indexes in covariance structure analysis: Convential criteria versus new alternatives. *Structural Equation Modeling, 6*, 1-55. doi:10.1080/10705519909540118

Jimenez, M. E., Wade, R., Jr., Lin, Y., Morrow, L. M., & Reichman, N. E. (2016). Adverse experiences in early childhood and Kindergarten outcomes. *Pediatrics, 137*(2):e20151839. doi:10.1542/peds.2015-1839

Kelly, J. F., Zuckerman, T., & Rosenblatt, S. (2008). Promoting First Relationships: A relationship-focused early intervention approach. *Infants & Young Children, 21*, 285-295. doi:10.1097/01.IYC.0000336541.37379.0e

Kelly, J. F., Zuckerman, T. G., Sandoval, D., & Buehlman, M. A. (2016). *Promoting First Relationships: A program for service providers to help parents and other caregivers nurture young children's social and emotional development* (3rd ed.). Seattle, WA: NCAST Programs.

Kline, R. B. (2016). *Principles and practice of structural equation modeling* (4th ed.). New York, NY: The Guilford Press.

Koskenvuo, K., Hublin, C., Partinen, M., Paunio, T., & Koskenvuo, M. (2010). Childhood adversities and quality of sleep in adulthood: A population-based study of 26,000 Finns. *Sleep Medicine, 11*, 17-22. doi:10.1016/j.sleep.2009.03.010

Magee, L., & Hale, L. (2012). Longitudinal associations between sleep duration and subsequent weight gain: A systematic review. *Sleep Medicine Reviews, 16*, 231-241. doi:10.1016/j.smrv.2011.05.005

Moffitt, T. E., & The Klaus-Grawe 2012 Think Tank. (2013). Childhood exposure to violence and lifelong health: Clinical intervention science and stress-biology research join forces. *Development and Psychopathology, 25*, 1619-1634. doi:10.1017/s0954579413000801

Mongillo, E. A., Briggs-Gowan, M., Ford, J. D., & Carter, A. S. (2009). Impact of traumatic life events in a community sample of toddlers. *Journal of Abnormal Child Psychology, 37*, 455-468. doi:10.1007/s10802-008-9283-z

Muthén & Muthén. (1998-2015a). Mplus (Verson 7.31) [Statistical software]. Los Angeles, CA: Muthén & Muthén.

Muthén, L. K., & Muthén, B. O. (1998-2015b). *Mplus user's guide* (7th ed.). Los Angeles, CA: Muthén & Muthén.

Nelson, E. M., & Spieker, S. J. (2013). Intervention effects on morning and stimulated cortisol responses among toddlers in foster care. *Infant Mental Health Journal, 34*, 211-221. doi:10.1002/imhj.21382

Oxford, M., & Findlay, D. (Eds.). (2013). *NCAST: Caregiver/parent-child interaction teaching manual.* Seattle, WA: NCAST Programs.

Oxford, M., Fleming, C., & Barnard, K. (2015). *Difficult Life Circumstances scale: A resource manual* (2nd ed.). Seattle, WA: NCAST Programs.

Oxford, M. L., Fleming, C. B., Nelson, E. M., Kelly, J. F., & Spieker, S. J. (2013). Randomized trial of Promoting First Relationships: Effects on maltreated toddlers' separation distress and sleep regulation after reunification. *Children and Youth Services Review, 35*, 1988-1992. doi:10.1016/j.childyouth.2013.09.021

Oxford, M. L., Spieker, S. J., Lohr, M. J., & Fleming, C. B. (2016). Promoting First Relationships®: Randomized trial of a 10-week home visiting program with families referred to Child Protective Services. *Child Maltreatment, 21*, 267-277. doi:10.1177/1077559516668274

Radloff, L. S. (1977). The CES-D scale: A self-report depression scale for research in the general population. *Applied Psychological Measurement, 1*, 385-401. doi:10.1177/014662167700100306

Rubin, D. B. (1987). *Multiple imputation for nonresponse in surveys.* New York, NY: John Wiley & Sons.

Sadeh, A. (1996). Stress, trauma, and sleep in children. *Child and Adolescent Psychiatric Clinics of North America, 5*, 685-700.

Sadeh, A. (2004). A brief screening questionnaire for infant sleep problems: Validation and findings for an Internet sample. *Pediatrics, 113*, e570-e577. doi:10.1542/peds.113.6.e570

Sadeh, A., Mindell, J. A., Luedtke, K., & Wiegand, B. (2009). Sleep and sleep ecology in the first 3 years: A web-based study. *Journal of Sleep Research, 18*, 60-73. doi:10.1111/j.1365-2869.2008.00699.x

Scher, A., Hall, W. A., Zaidman-Zait, A., & Weinberg, J. (2010). Sleep quality, cortisol levels, and behavioral regulation in toddlers. *Developmental Psychobiology, 52*, 44-53. doi:10.1002/dev.20410

Scherman, A., Hash, J. B., Fleming, C., & Oxford, M. (2017, April). *Adverse experiences in childhood and preschool language development.* Poster session presented at the meeting of the Western Institute of Nursing, Denver, CO.

Shonkoff, J. P., Boyce, W. T., & McEwen, B. S. (2009). Neuroscience, molecular biology, and the childhood roots of health disparities building a new framework for health promotion and disease prevention. *JAMA, 301*, 2252-2259. doi:10.1001/jama.2009.754

Shonkoff, J. P., & Phillips, D. A. (Eds.). (2000). *From neurons to neighborhoods: The science of early childhood development*. Washington, D.C.: National Academy Press.

Simard, V., Bernier, A., Bélanger, M. E., & Carrier, J. (2013). Infant attachment and toddlers' sleep assessed by maternal reports and actigraphy: Different measurement methods yield different relations. *Journal of Pediatric Psychology, 38*, 473-483. doi:10.1093/jpepsy/jst001

Slopen, N., McLaughlin, K. A., & Shonkoff, J. P. (2014). Interventions to improve cortisol regulation in children: A systematic review. *Pediatrics, 133*, 312-326. doi:10.1542/peds.2013-1632

Spieker, S. J., Oxford, M. L., Kelly, J. F., Nelson, E. M., & Fleming, C. B. (2012). Promoting First Relationships: Randomized trial of a relationship-based intervention for toddlers in child welfare. *Child Maltreatment, 17*, 271-286. doi:10.1177/1077559512458176

Teti, D. M., Kim, B. R., Mayer, G., & Countermine, M. (2010). Maternal emotional availability at bedtime predicts infant sleep quality. *Journal of Family Psychology, 24*, 307-315. doi:10.1037/a0019306

Turney, K., & Wildeman, C. (2017). Adverse childhood experiences among children placed in and adopted from foster care: Evidence from a nationally representative survey. *Child Abuse & Neglect, 64*, 117-129. doi:10.1016/j.chiabu.2016.12.009

Wang, Y., Raffeld, M. R., Slopen, N., Hale, L., & Dunn, E. C. (2016). Childhood adversity and insomnia in adolescence. *Sleep Medicine, 21*, 12-18. doi:10.1016/j.sleep.2016.01.011

Ward, T. M., Gay, C., Alkon, A., Anders, T. F., & Lee, K. A. (2008). Nocturnal sleep and daytime nap behaviors in relation to salivary cortisol levels and temperament in preschool-age children attending child care. *Biological Research for Nursing*, 9, 244-253. doi:10.1177/1099800407310158

Footnotes

[1]The item assessing caregiver incarceration was not added to the DLC until later in this study, which resulted in missing data from 47 participants on this ACE exposure. These cases were assigned a score of 0 for incarceration.

[2]Groups differed significantly on T1 parenting sensitivity, as well as on the amount time it took to schedule their first phone v. *PFR* session: Compared to the R&R group, parents in the *PFR* group scored lower on T1 parenting sensitivity and took longer to schedule their first *PFR* session (Oxford et al., 2016). Analyses adjust for these differences.

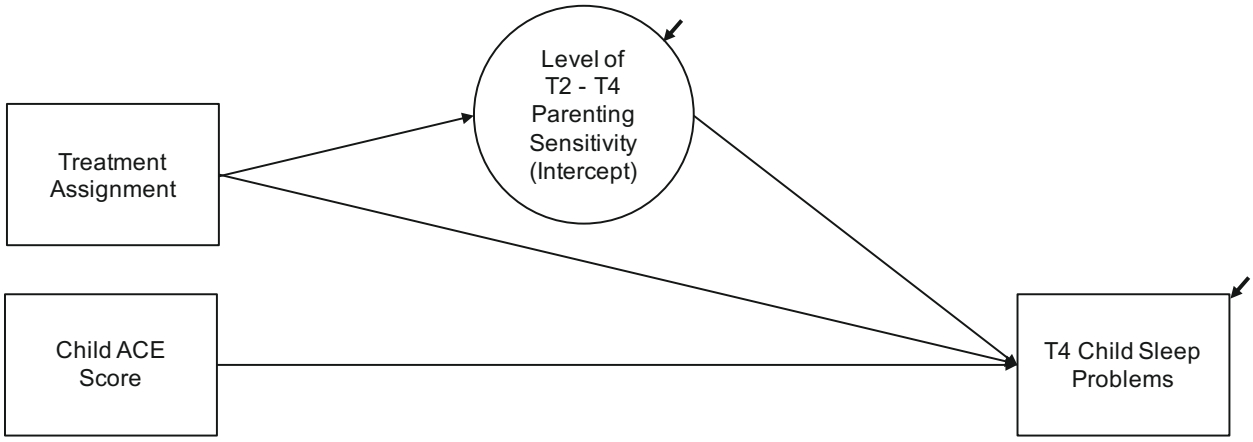

Figure 3.1. Hypothesized model.

Illustrated is the hypothesized model for this secondary analysis of a longitudinal randomized controlled trial comparing the *Promoting First Relationships*® (*PFR*) intervention to a Resource and Referral (R&R) control condition. Children's Adverse Childhood Experiences (ACEs) are hypothesized to predict their odds of having a sleep problem at T4 (6 months post-intervention), with more ACEs (higher ACE scores) predicting higher odds of having a sleep problem. A latent variable representing the average level of post-intervention parenting sensitivity, as aggregated across three post-intervention time points (T2 = immediately post-intervention, T3 = 3 months post-intervention, T4 = 6 months post-intervention) is also hypothesized to predict children's sleep problems at 6 months post-intervention, with higher parenting sensitivity predicting reduced odds of children having a sleep problem. Assignment to the *PFR* condition is hypothesized to reduce children's odds of having a sleep problem at 6 months post-intervention, both directly and indirectly by way of increased parenting sensitivity. This model is tested in two steps: first, in the R&R group alone (without the Treatment Assignment variable entered into the model) and, second, in the full sample (with the Treatment Assignment variable entered into the model). Not shown for simplicity are: control variables (baseline child age, baseline parenting sensitivity, time elapsed between T1 and T2) and observed T2 - T4 post-intervention parenting

sensitivity measures; see Figure 3.6 and Figure 3.7 in the Appendix for an illustration including these elements.

Table 3.1. *Baseline Characteristics by Intervention Condition*

	R&R (*n* = 123)	PFR (*n* = 124)
	n (%)	*n* (%)
Parent female/mother	113 (91.1)	112 (90.3)
Parent race		
American Indian or Alaska Native	3 (2.4)	4 (3.2)
Asian	4 (3.3)	6 (4.8)
African American	7 (5.7)	6 (4.8)
White	95 (77.2)	96 (77.4)
Mixed/Other	14 (11.4)	12 (9.7)
Parent Hispanic	23 (18.7)	25 (20.2)
Child male	71 (57.7)	62 (50.0)
Child race		
American Indian or Alaska Native	2 (1.6)	0
Asian	1 (0.8)	4 (3.2)
African American	5 (4.1)	5 (4.0)
White	72 (58.5)	81 (65.3)
Mixed/Other	43 (35.0)	34 (27.4)
Child Hispanic	36 (29.3)	42 (33.9)
Parent education		
High school graduate	58 (47.2)	54 (43.5)
GED	35 (28.5)	40 (32.5)
Neither high school graduate nor GED	30 (24.4)	30 (24.4)
Parent employment status		

	R&R (*n* = 123)	PFR (*n* = 124)
Employed full-time	21 (17.1)	19 (15.3)
Employed part-time	14 (11.4)	22 (17.7)
Unemployed/looking	33 (26.8)	37 (29.8)
Homemaker	32 (26.0)	24 (19.4)
Student	14 (11.4)	17 (13.7)
Other (disability/retired)	9 (7.3)	5 (4.0)
Parent marital status		
Never married	67 (54.5)	72 (58.1)
Married	34 (27.6)	26 (21.0)
Separated	12 (9.8)	14 (11.3)
Divorced	10 (8.1)	12 (9.7)
Parent lives with spouse/partner	62 (50.4)	54 (43.9)
Receives food stamps	99 (80.5)	96 (78.0)
Other children in the household	87 (70.7)	79 (63.7)
	M (*SD*)	*M* (*SD*)
Child age in months at baseline	16.77 (4.55)	15.97 (4.37)
Parent age at baseline	27.04 (6.25)	26.41 (5.19)
Past year household income ($)	24,174 (25,468)	19,591 (18,944)

Notes. R&R = Resource and Referral, PFR = Promoting First Relationships, GED = General Education Diploma. From "Promoting First Relationships®: Randomized Trial of a 10-Week Home Visiting Program with Families Referred to Child Protective Services," by M. L. Oxford, S. J. Spieker, M. J. Lohr, and C. B. Fleming, 2016, *Child Maltreatment, 21,* p. 270. Copyright 2016 by SAGE Publications. Reprinted with permission.

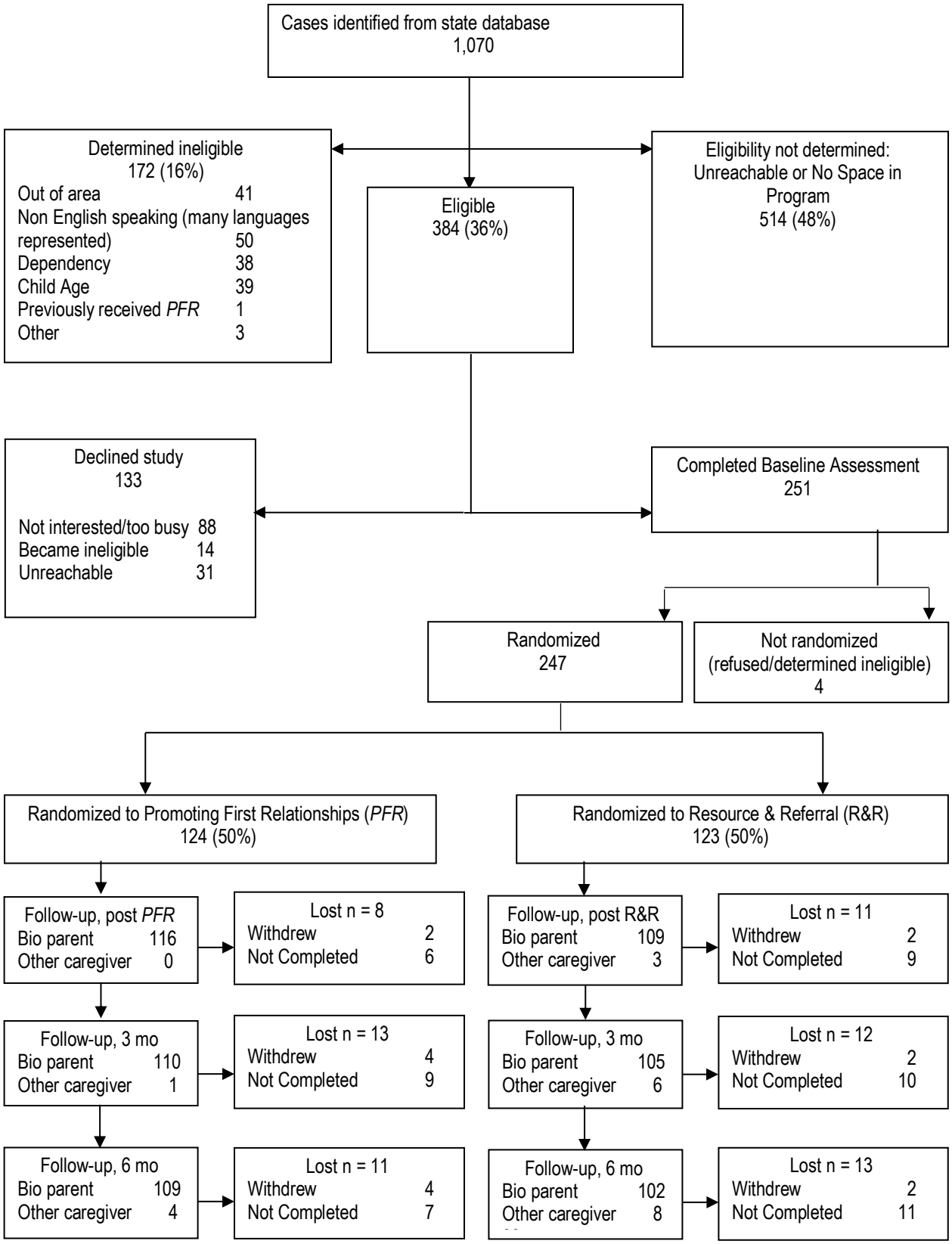

Figure 3.2. Supporting Parents Program study flowchart.

From “Promoting First Relationships®: Randomized Trial of a 10-Week Home Visiting Program with Families Referred to Child Protective Services,” by M. L. Oxford, S. J. Spieker, M. J. Lohr, and C. B. Fleming, 2016, *Child Maltreatment, 21,* p. 269. Copyright 2016 by SAGE Publications. Reprinted with permission.

Table 3.2. *Measurement Tools and Assessment Time Points used to Construct the Child ACE Score*

ACE exposure	Assessment tool	Assessment time point			
		T1	T2	T3	T4
Potential maltreatment	WA State DSHS database of maltreatment cases	X			
Removal from birth home	WA State DSHS lifetime removal history				X
	Child Life Events Questionnaire[a]				X
Caregiver mental illness (depression)	Center for Epidemiological Studies Depression Scale[b]	X	X	X	X
Caregiver incarceration	Difficult Life Circumstances Questionnaire[c]	X			X
Domestic violence	Difficult Life Circumstances Questionnaire[c]	X			X
	Child Life Events Questionnaire[a]				X
Household substance use/abuse	Difficult Life Circumstances Questionnaire[c]	X			X
Caregiver divorce or separation	Difficult Life Circumstances Questionnaire[c]	X			X
	Child Life Events Questionnaire[a]				X
Death of a family member or loved one	Difficult Life Circumstances Questionnaire[c]	X			X
	Child Life Events Questionnaire[a]				X
Homelessness	Sociodemographics interview	X	X	X	X
	Child Life Events Questionnaire[a]				X

Note. ACE = Adverse Childhood Experience. T1 = baseline, T2 = immediately post-intervention, T3 = 3 months post-intervention, T4 = 6 months post-intervention. WA = Washington. DSHS = Department of Health and Human Services.

[a]Mongillo, Briggs-Gowan, Ford, and Carter (2009). [b]Radloff (1977). [c]Oxford, Fleming, and Barnard (2015).

Table 3.3. *Descriptives for Analysis Variables*

Variable	R&R *n* = 123		*PFR* *n* = 124	
	M	*(SD)*	*M*	*(SD)*
Baseline child age, months	16.78	(4.55)	15.98	(4.37)
T1 parenting sensitivity, total score	36.60	(4.75)	35.44	(4.27)
T2 parenting sensitivity, total score	35.07	(5.03)	35.65	(4.86)
T3 parenting sensitivity, total score	36.04	(4.83)	36.46	(4.85)
T4 parenting sensitivity, total score	35.82	(5.46)	36.90	(4.60)
Child ACE score, total count	3.11	(1.52)	3.01	(1.51)
	n	*%*	*n*	*%*
Child ACE type, % exposed				
Potential maltreatment	123	100.0%	124	100.0%
Caregiver mental illness (depression)	68	55.3%	71	57.3%
Caregiver incarceration[a]	7	7.1%	9	8.8%
Domestic violence	36	29.3%	31	25.0%
Household substance use/abuse	20	16.3%	21	16.9%
Caregiver divorce or separation	51	41.5%	49	39.5%
Death of a family member or loved one	29	23.6%	29	23.4%
Homelessness	31	25.2%	27	21.8%
Removal from birth home	18	14.6%	12	9.7%
Child ACE category, % exposed				
1	18	14.6%	23	18.5%
2	31	25.2%	28	22.6%
3	31	25.2%	29	23.4%
4	15	12.2%	23	18.5%
5	20	16.3%	12	9.7%
6 or more	8	6.5%	9	7.3%
T4 child sleep problem, % yes	27	26.5%	22	20.2%

Note. R&R = Resource and Referral, *PFR = Promoting First Relationships*®. T1 = baseline, T2 = immediately post-intervention, T3 = 3 months post-intervention, T4 = 6 months post-intervention. ACE = Adverse Childhood Experience.

[a]*n* = 98 and *n* = 102 in the R&R and *PFR* groups, respectively.

Table 3.4. *Zero-Order Correlations Among Study Variables in the Resource & Referral Group and in the Full Sample*

Measure	1.	2.	3.	4.	5.	6.	7.	8.	9.
1. T4 child sleep problems	--	-.02	-.02	-.02	-.04	.18**	.00	-.07	.01
2. T1 parenting sensitivity	-.02	--	.23**	.20**	.30**	-.05	.18**	-.13*	.04
3. T2 parenting sensitivity	.05	.27**	--	.25**	.14*	.06	.11	.06	.15*
4. T3 parenting sensitivity	.03	.24**	.33**	--	.25**	.06	.21**	.04	.05
5. T4 parenting sensitivity	-.01	.37**	.18	.31**	--	-.06	.15*	.11	.03
6. Child ACE score	.34**	-.05	.04	-.01	-.02	--	.03	-.04	.11
7. T1 child age	.02	.23*	.15	.28**	.15	.02	--	-.09	.03
8. Treatment assignment								--	.17*
9. Time elapsed									--

Note. Bottom triangle is Resource & Referral group only, $n = 123$. Upper triangle is full sample, $N = 247$. T1 = baseline, T2 = immediately post-intervention, T3 = 3 months post-intervention, T4 = 6 months post-intervention. Sleep problems dummy coded 0 = no problem, 1 = small or serious problem. Parenting sensitivity = Nursing Child Assessment Teaching Scale raw total score, higher scores indicate more parenting sensitivity. Child ACE score = total count of Adverse Childhood Experiences, higher scores indicate more ACEs. Child age = months. Treatment assignment dummy coded 0 = Resource & Referral, 1 = *Promoting First Relationships*®. Time elapsed = time elapsed in months between T1 and T2.

* $p < .05$, ** $p < .01$.

Table 3.5. *Unconditional Intercept-Only Latent Curve Model of T2 - T4 Parenting Sensitivity in the Resource & Referral Group and in the Full Sample*

	R&R group		Full sample	
	B	*SE*	*B*	*SE*
Mean				
Intercept	35.64	0.35***	35.98	0.23***
Variance				
Intercept	6.85	1.87***	5.14	1.18***
Model fit statistics				
$\chi^2(df)$	4.18(4), $p = .382$		7.61(4), $p = .107$	
RMSEA	0.02		0.06	
CFI/TLI	0.99/0.99		0.85/0.89	
SRMR	0.05		0.05	

Note. $n = 123$ for the R&R group, $N = 247$ for the full sample. R&R = Resource & Referral. T2 = immediately post-intervention, T4 = 6 months post-intervention. RMSEA = Root Mean Square Error; CFI = Comparative Fit Index; TLI = Tucker-Lewis Index; SRMR = Standardized Root Mean Square Residual.

* $p < .05$, ** $p < .01$, *** $p < .001$

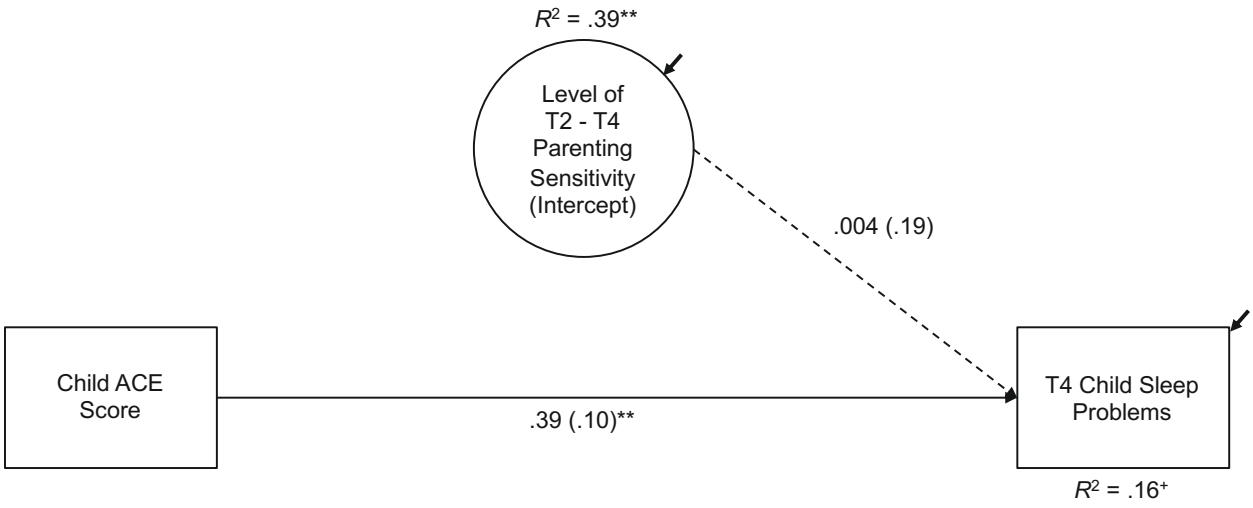

Figure 3.3. Results for the hypothesized model tested in the Resource & Referral group alone. *n* = 123. Solid lines indicate significant paths. Dashed lines indicate insignificant paths. Reported are standardized path coefficients and, in parentheses, standard errors. Child ACE score = total count of Adverse Childhood Experiences, higher scores indicate more ACEs. Level of T2 - T4 parenting sensitivity is a latent variable estimating the mean level of parenting sensitivity across all post-intervention time points, higher levels indicate more parenting sensitivity. Child sleep problems dummy coded 0 = no problem, 1 = small or serious problem. Not shown for simplicity are: control variables (T1 child age and T1 parenting sensitivity) and observed T2 - T4 parenting sensitivity measures. T1 = baseline, T2 = immediately post-intervention, T3 = 3 months post-intervention, T4 = 6 months post-intervention.

$^{+}$ = trend, * $p < .05$, ** $p < .01$.

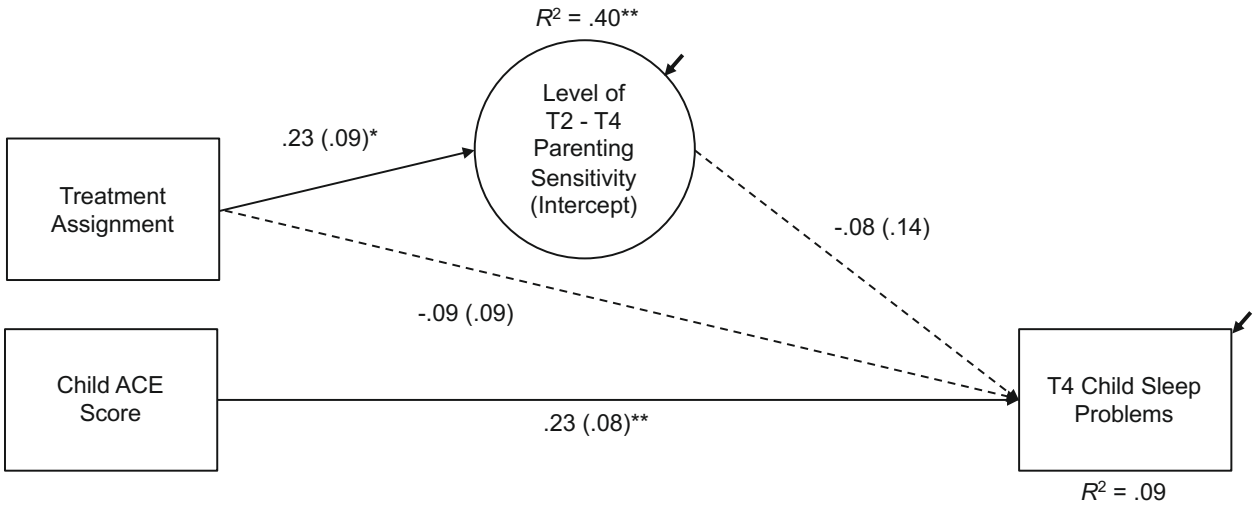

Figure 3.4. Results for the hypothesized model tested in the full sample.

N = 247. Solid lines indicate significant paths. Dashed lines indicate insignificant paths. Reported are standardized path coefficients and, in parentheses, standard errors. Child ACE score = total count of Adverse Childhood Experiences, higher scores indicate more ACEs. Level of T2 - T4 parenting sensitivity is a latent variable estimating the mean level of parenting sensitivity across all post-intervention time points, higher levels indicate more parenting sensitivity. Child sleep problems dummy coded 0 = no problem, 1 = small or serious problem. Treatment assignment dummy coded 0 = Resource & Referral, 1 = *Promoting First Relationships*®. Not shown for simplicity are: control variables (T1 child age, T1 parenting sensitivity, and time between T1 - T2) and observed T2 - T4 parenting sensitivity measures. T1 = baseline, T2 = immediately post-intervention, T3 = 3 months post-intervention, T4 = 6 months post-intervention.

$^{+}$ = trend, * $p < .05$, ** $p < .01$.

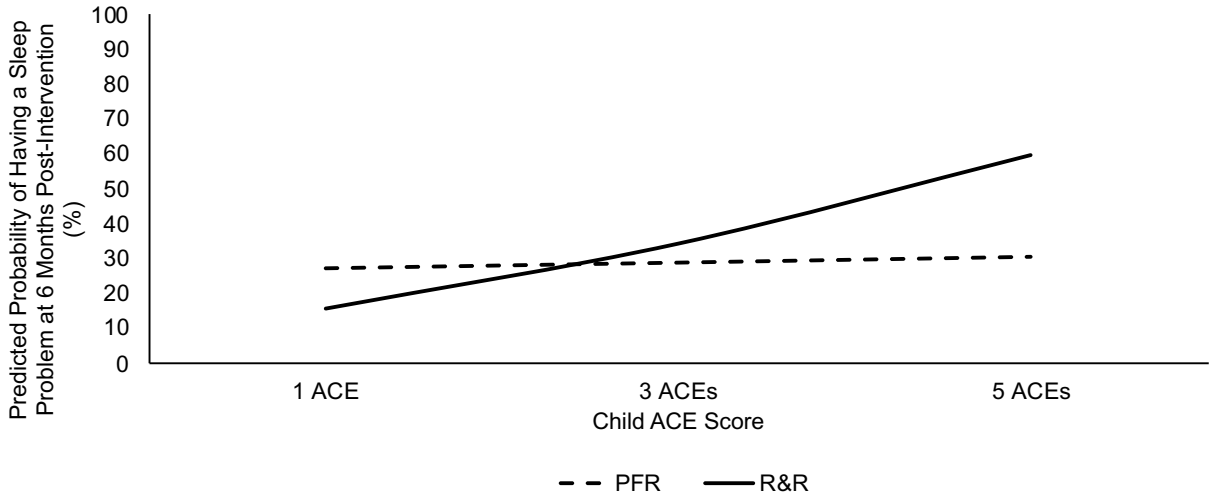

Figure 3.5. Predicted probabilities of having a sleep problem at 6 months post-intervention for children in the R&R and PFR groups, by ACE score

ACE = Adverse Childhood Experience. R&R = Resource and Referral, *PFR* = *Promoting First Relationships*®.

Appendix

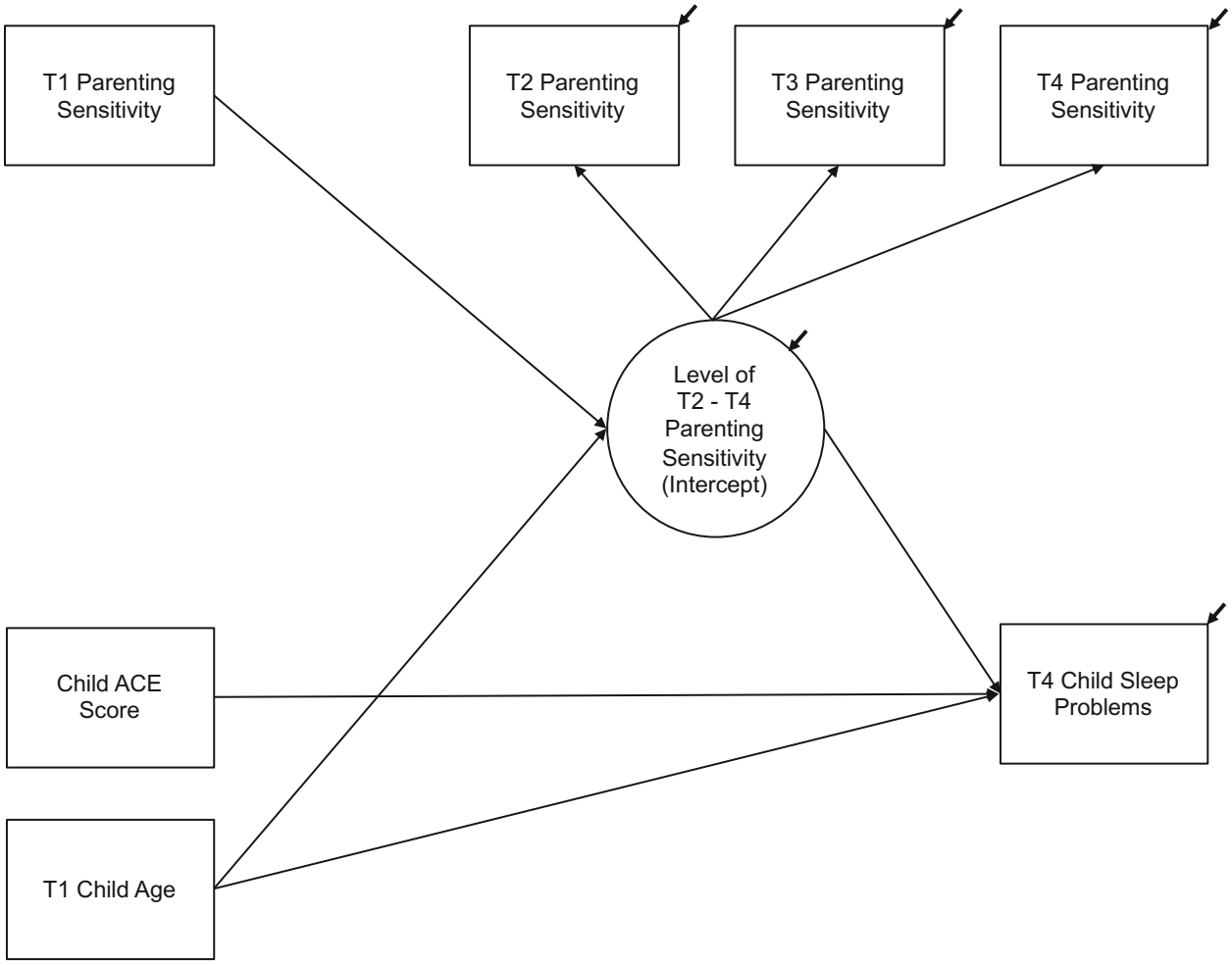

Figure 3.6. Full statistical model tested in the Resource & Referral group alone.

T1 = baseline, T2 = post-intervention, T3 = 3 months post-intervention, T4 = 6 months post-intervention. ACE = Adverse Childhood Experience.

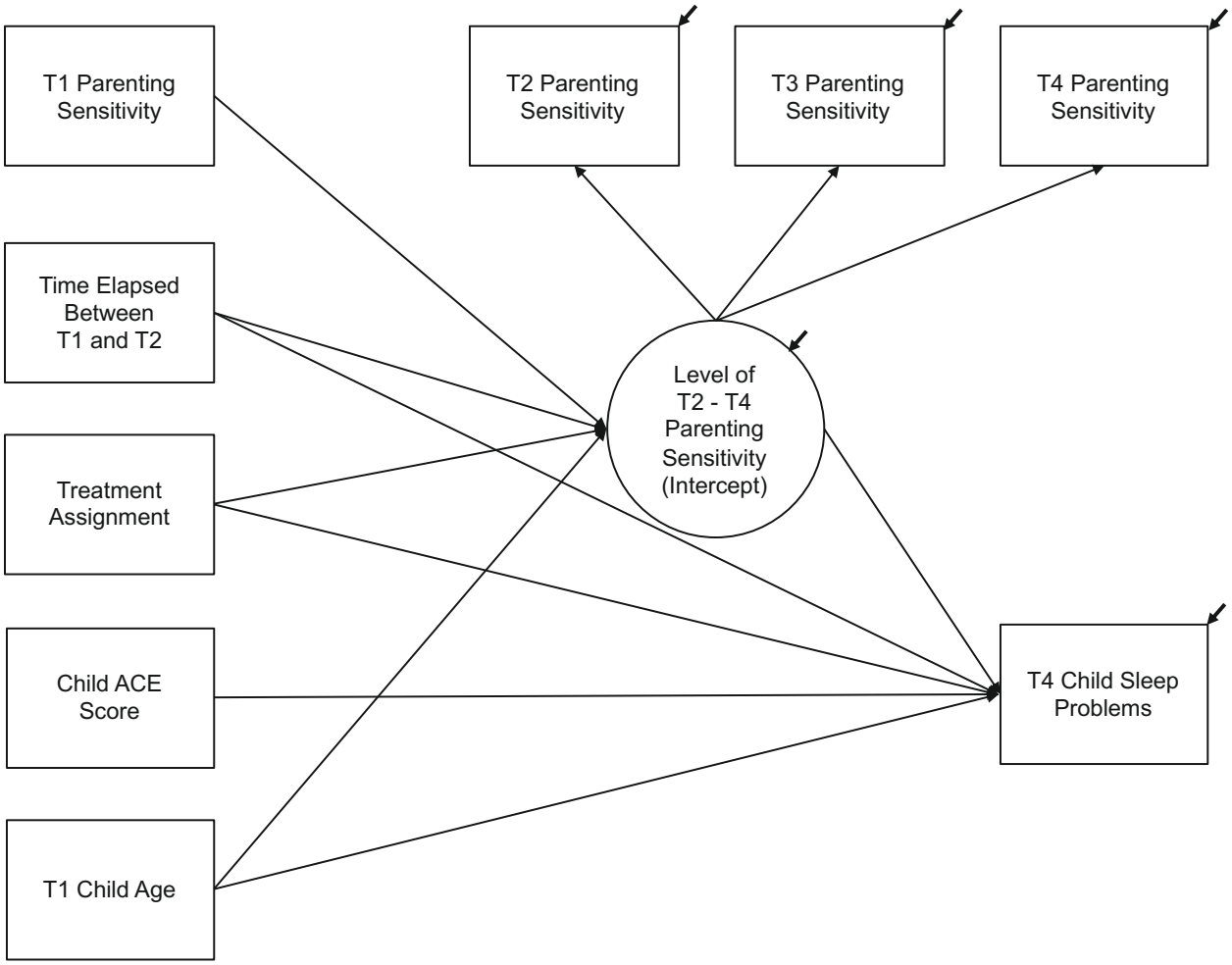

Figure 3.7. Full statistical model tested in the full sample.

T1 = baseline, T2 = immediately post-intervention, T3 = 3 months post-intervention, T4 = 6 months post-intervention. ACE = Adverse Childhood Experience