Sleep Health Among Children Recently Adopted from Foster Care

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ABSTRACT

Sleep disruption is prevalent among children placed in foster care, elevating the risk for a range of deleterious outcomes. Theoretically, achieving permanency via adoption may have a positive influence on children's sleep via the presence of various factors, but little is known about the sleep health of children adopted from foster care, including predictors and moderators of sleep quality. The current study included 226 parents who adopted a child from foster care (aged 4 to 11 years) within the past two years and propensity score matched sample of 379 caregivers of children currently in foster care. Both samples completed online questionnaires about their child's sleep, physical, and mental health. Comparatively, children in foster care experienced more nightmares, night terrors, moved to someone else's' bed during the night more often and worse overall sleep quality, whereas adopted children were reported to experience more nighttime awakenings. In the adopted sample, a greater number of adverse childhood experiences (ACEs) predicted better sleep quality, but this relationship was moderated by parent-child interactions around sleep. Specifically, child sleep dependence scores (i.e., difficulty going to sleep without parent) falling at both the highest and lowest levels strengthened the relationship between ACEs and sleep quality. Findings suggest that while some sleep problems might remit after children in foster care achieve permanence, nighttime sleep fragmentation may persist. Further, parent-child interactions surrounding sleep may be pivotal in targeting sleep problems in this population.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

Sleep Health Among Children Recently Adopted from Foster Care

In 2019, more than 400,000 children were in the U.S. foster care system (United States Children's Bureau, 2020). Early adversity, including maltreatment, abuse, and/or neglect, render this population of children at high risk for a range of acute and long-term negative outcomes, both physical and psychological. For example, prior studies have found that up to two-thirds of children in foster care exhibit emotional/behavioral problems severe enough to warrant intervention services (Farmer et al., 2001; Landsverk & Garland, 1999; McMillen et al., 2005; Pecora et al., 2009). Up to 80% of children have at least one medical problem, one-third have a chronic medical illness (Leslie et al., 2005; Steele & Buchi, 2008), and more than 60% exhibit developmental delays (Szilagyi et al., 2015). Unfortunately, these health disparities often worsen over time (Barth, 1990; Courtney et al., 2001). One systematic review found that children who aged out of foster care were at greater risk for health, psychiatric, economic, and employment deficits when compared to the general population (Gypen et al., 2017). Courtney and colleagues (2001) found that children who had been in foster care and aged out of care either through adoption, emancipation, or reaching 18 years of age reported less social support, less employment-related preparedness, and less optimism about educational aspirations (Courtney et al., 2001).

There is also burgeoning evidence that children in foster care experience high rates of sleep disruption (Alfano, 2020; Dubois-Comtois et al., 2016; Hambrick et al., 2018; Tininenko et al., 2010) that often goes unaddressed (Hash et al., 2022) and persists over time (McGlinchey et al., 2023). Childhood adversity, maltreatment, and trauma are well-known to

give rise to sleep disturbances in the short-term (Sadeh, 1996) and forecast sleep disorders years later (Kajeepeta et al., 2015; Sadeh, 1996). Because sleep is critical for growth, development and overall functioning, a better understanding of the sleep health and needs of children both currently and formerly in foster care holds the potential to inform clinical practice and policy affecting these vulnerable children. Yet, we are not aware of any studies that have systematically examined sleep among children recently adopted from foster care. The aims of this study are to 1) examine sleep quality and problems among children, ages 4 to 11 years, adopted from foster care within the past two years compared to children currently in foster care; 2) examine change in and potential predictors of sleep quality from the time of initial placement in the home to post-adoption, and 3) examine parental attachment and parent-child sleep interactions as potential moderators of these relationships.

Sleep in Childhood

Sleep is a universal biological process and behavior essential for all aspects of health and well-being. Thus, when persistently disrupted/inadequate, poor sleep has adverse behavioral, emotional, academic, and physical health effects (Medic et al., 2017). Sleep disruption in children can take many forms, including short duration of sleep, irregular timing of sleep, fragmented sleep, problems with circadian rhythms, bedwetting, nightmares, and night terrors (Meltzer & Mindell, 2006). Insomnia is one of the most common sleep disorders in children characterized by difficulty initiating and/or maintaining sleep (National Sleep Foundation, 2015; Owens, 2005) and, like other sleep disturbances, can persist into adolescence and adulthood in the absence of intervention. Childhood sleep problems are also associated with negative physical and mental health consequences, including diabetes

(Knutson & Van Cauter, 2008), heart disease (Matthews & Pantesco, 2016), and psychiatric disorders (Alfano & Gamble, 2009; Ong et al., 2006; Sadeh et al., 2014). The central importance of sleep for early development and growth has led to the recent suggestion that sleep is conceptualized as a 'vital sign' that should be monitored at every well-child visit (Williamson et al., 2020).

Early Adversity/Trauma and Sleep

Children's sleep often becomes disrupted within the context of stress, adverse experiences, and/or trauma (Kliewer & Lepore, 2015; Kovachy et al., 2013). For example, Glod et al. (1997) found that prepubertal abused children had twice as much nocturnal activity (based on actigraphy) compared to both depressed and control groups. These authors also found that physically abused children (compared to sexually abused youth) had the highest nocturnal activity of all children, suggesting that type of maltreatment may have differential effects on sleep (Glod et al., 1997). Similarly, Baddam and colleagues (2019) found that childhood trauma and stressful life events were associated with sleep disturbances (e.g., nightmares, sleeping less, difficulty sleeping) in adolescents even after controlling for depression and anxiety (Baddam et al., 2019). In another study, female adolescents with a history of sexual abuse were more likely to experience insomnia, nightmares, and next day daytime sleepiness compared to demographically similar female adolescents from the same neighborhood with no prior child protective services involvement, even when controlling for depression and PTSD (Noll et al., 2006). These collective findings suggest that sleep disturbances may be independently associated with early adversity/childhood trauma.

Since sleep and vigilance represent opposing processes in a more extensive system of arousal regulation, sleep is highly vulnerable to the effects of adversity and trauma (Dahl, 1996). One well-supported neurobiological mechanism linking trauma and sleep disturbance is the hypothalamic-pituitary-adrenal (HPA) axis, the body's primary stress response system. The HPA system serves two vital functions: maintaining circadian rhythms of hormone production and regulating responses to stress (Spiga et al., 2014). Thus, sleep-wake processes and the HPA axis dynamically and bi-directionally interact throughout development (A. E. Johnson et al., 2011; Kotronoulas et al., 2009). Trauma-induced insomnia, which results from persistent activation of stress response systems following trauma exposure, is now regarded as a distinct nosological entity among adults (Sinha, 2016) and to a lesser extent among children (Brown, 2020).

Children in Foster Care

Children placed into foster care, at the least, have experienced some form of maltreatment/abuse in addition to removal from their primary caregiver. In many cases, multiple forms of abuse or neglect have been endured, including physical, sexual, and/or emotional abuse (United States Children's Bureau, 2020). Abuse may also include physical, emotional, and/or medical neglect, which accounted for 63% of child removals in 2019 (United States Children's Bureau, 2020). Once residing in foster care, one of the most significant risk factors faced by these vulnerable children is the possibility of additional changes in placement/caregivers. Number of placements is routinely shown to be related to greater attachment problems, internalizing and externalizing problems, decreased academic performance, and juvenile delinquency (Newton et al., 2000; Ryan & Testa, 2005; Zima et

al., 2000). A relationship with sleep problems has been reported in at least one study (Dubois-Comtois et al., 2016).

Although limited, a handful of studies have examined sleep among children in foster care (Dubois-Comtois et al., 2016; Hambrick et al., 2018; Lehmann et al., 2021; Tininenko et al., 2010). Lehmann and colleagues (2021) found an increased rate of potentially traumatic events was associated with shorter sleep duration in a group of Norwegian children in foster care. In a study by Hambrick et al. (2018), even after controlling for age, PTSD symptoms, and placement length, sleep partially mediated the relationship between adverse childhood experiences (ACEs) and juvenile delinquency. Dubois-Comtois and colleagues (2016) found that shorter nighttime sleep duration and parasomnias were associated with foster care placement at a younger age. Additionally, poor sleep was significantly associated with placement length, parenting stress, and ACEs (e.g., sexual abuse, neglect, and parenting stress). Some research suggests that the sleep disturbances experienced by children in foster care (e.g., 'trauma-related sleep disturbance') may contribute to placement instability in the short term and persistent sleep and mental health problems over time (Alfano, 2020). Finally, another study based on actigraphy showed children in foster care are 5x more likely to display inattentive/hyperactive behaviors after a night of short sleep compared to community children (Tininenko et al., 2010), suggesting the presence of heightened sensitivity to poor sleep and a specific mechanism through which emotional and behavioral regulation are compromised.

Sleep in Children Adopted from Foster Care

A significant portion of children in foster care will be adopted by related or unrelated families (*The AFCARS Report*, 2019), ending a period of uncertainty and instability. For example, of the children waiting to be adopted in 2019, 54% were in the foster care system for two or more years (United States Children's Bureau, 2020). Little is known about the sleep health of children adopted from foster care, but evidence suggests that sleep problems persist for many children after adoption. One study including 5 to 12-year-old children with a history of maltreatment and adopted from foster care in the U.K., found these children had greater sleep difficulty scores and more clinically significant sleep disorders when compared to a non-maltreated community control group (Cuddihy et al., 2013). In a study comparing low-income young adults (18-24 years) to young adults who were foster care alumni, Fusco (2020) found similar rates of childhood maltreatment between the groups but significantly less sleep, a longer sleep onset latency, and more nighttime awakenings in the latter group. These findings suggest that sleep problems that emerge before or during foster care placement do not necessarily remit over time and suggest a need to better understand sleep health in this population of vulnerable children.

Protective Factors for Child Sleep Among Children in Foster Care

Despite the presence of many risk factors, several potential protective factors may serve to buffer against heightened sleep vulnerability among children currently and formerly placed in foster care. Two factors routinely shown to forecast better child sleep concurrently and over time are attachment security and parent-child interactions around sleep. Securely attached children are confident in their ability to solicit their caregiver's proximity,

responsiveness, and assistance when needed (Bowlby, 1988). Secure attachments with caregivers are associated with a wide range of positive child outcomes across a range of socio-emotional outcomes (Groh et al., 2014, 2017). In the context of sleep, parental presence and reassurance around bedtime/sleep routines provide children with a sense of safety and security at night, allowing for reduced vigilance necessary for sleep onset and maintenance (Bernier et al., 2016; Dahl & Lewin, 2002). Similarly, parent-child interactions prior to sleep set the emotional tone for sleep. Conflictual interactions/arguments, lack of supervision of the child's pre-sleep activities, and/or lax rules governing sleep (behaviors/punishment) are routinely associated with worse child sleep health (Alfano et al., 2013; Pyper et al., 2017). Among a sample of preschoolers, Barrios et al., (2018) found more problematic parent-child bedtime interactions (e.g., conflict) to predict greater sleep problems later between 6 to 9 years of age. Furthermore, children whose evening routine (i.e., bedtime, allotted time for T.V./homework, and mealtime length) was structured by their parents also saw improvements in weekday sleep duration (Adam et al., 2007). Overall, given the importance of attachment and parent-child interactions for healthy child sleep patterns, these factors may be especially critical for children adopted from foster care given early experiences with adversity and trauma.

Present Study & Specific Aims

Despite volumes of research documenting sleep as essential for healthy development and functioning, little is known about the sleep health of children in and adopted from foster care. To address these gaps, this study surveyed caregivers of children ages 4 to 11 years adopted from foster care within the past two years about children's sleep and emotional

functioning. For comparison purposes, we also utilized archival data from a similar survey recently conducted by our group among caregivers of children (4 to 11 years) currently in foster care that assessed sleep quality and problems. Furthermore, since sleep problems are common symptoms of internalizing disorders (Alfano et al., 2009), and children with a history in foster care experience high rates of internalizing problems and disorders (Moussavi et al., 2022), we included child depressive and anxiety symptoms as covariates in our analyses. The aims of this study are as follows:

Aim 1: To examine and compare overall sleep quality and sleep problems among children adopted from foster care within the past two years to children currently residing in foster care using propensity score matching procedures. We hypothesized caregiver reported sleep problems would be significantly more frequent among children currently in foster care compared to children adopted from foster care, including nighttime awakenings, moving to someone else's bed for sleep, bedwetting, teeth grinding, sleepwalking, nightmares, and night terrors (H1). We also hypothesized children currently in foster care will have significantly lower caregiver reported sleep quality than children adopted from foster care (H2). However, we still expect mean scores on a caregiver-reported measure of child sleep problems to fall in the clinical range among children adopted from foster care (H3).

Aim 2: To investigate change in and potential predictors of change in sleep quality from the time children first arrived in the foster home to after adoption. Controlling for other relevant moderators, we hypothesized that children adopted from foster care will show significant improvement in parent-reported sleep quality since first arriving

in-home (H4) and that greater improvements in sleep quality will be predicted by fewer foster placements and younger age at the time of placement (H5).

Aim 3: To examine parental attachment and parent-child sleep-based interactions as potential moderators of relationships between ACEs and current sleep quality. Controlling for other relevant moderators, we hypothesized the relationship between ACEs and current child sleep quality will be moderated by caregiver-reported attachment and parent-child sleep interactions such that higher trust/avoidance (H6a) and communication (H6b) scores will attenuate relationships between ACES and current sleep quality and lower sleep conflict (H7a), higher sleep reinforcement (H7b), and lower sleep dependence scores (H7c) will attenuate relationships between ACEs and child sleep quality.

METHODS

Participants & Procedures

The current study used cross-sectional survey data collected among parents who adopted a child ages 4 to 11 years from the U.S. foster care system within the past two years. Participants were recruited through private Facebook support/community groups for foster/kinship/adoptive caregivers. Adoptive parents provided consent via an online consent form on the Qualtrics platform. After consenting to participate, parents completed an anonymous survey including multiple quantitative questions regarding demographic variables, foster placement history, sleep quality, sleep problems, ACEs, parent-child sleep interactions, and caregiver attachment. The survey required approximately 20 minutes to complete, and parents who opted to provide their email addresses were entered into a raffle to win one of two $25 gift cards. A total of 502 caregivers consented to the survey. Of those,

273 were excluded because they did not start the survey, did not complete all questions included in the current study, were in Level 3 or Level 4 foster care (i.e., advanced medical needs), or their child was outside of the target age range. After propensity score matching procedures (see Propensity Score Matching section) the final sample included 226 adoptive foster parents (*M* child age = 5.9 years, *SD* = 1.97). Other demographic data are provided in Table 1.

For Aim 1, we utilized data from a highly similar recent survey-based study among caregivers of children currently residing in foster care. The same recruitment (i.e., private Facebook support/community groups for foster/kinship caregivers) and data collection methods were used. Foster caregivers were provided a link to a consent form via Qualtrics followed by an anonymous survey about one specific foster child under their care between the ages of 4 and 11 years. The survey required approximately 30 minutes to complete, and parents were given the option to be entered into a raffle to win one of two $50 gift cards. The total sample included 485 caregivers of children (*M* child age = 6.4 years, *SD* = 2.2). Of those, 106 were excluded because of incomplete data, children were in Levels 3 or 4 foster care, or were removed during propensity score matching procedures. A final sample of 379 caregivers (*M* child age = 6.30 years, *SD* = 2.20) with complete data were included in the final comparison sample. Demographic data for the foster sample are also provided in Table 1. Both studies were approved by the Institutional Review Board of the University of Houston.

Propensity Score Matching

We used propensity score matching to estimate the average marginal effect of sample specification group (Foster Care = control vs. Adopted = treated) on sleep quality problems/quality accounting for confounding by eight covariates (child age, child sex, child race, child age when placed in state custody, number of prior foster care placements, foster care level, depression, and anxiety). These covariates were chosen based on theoretical considerations and prior research. Child age, sex, and race are important demographic variables that have been shown to influence outcomes in foster care. For example, younger children may be more vulnerable to developmental delays and behavioral problems, while older children may struggle with issues related to identity and independence (Benson & Johnson, 2009). Similarly, research has shown that gender and race can affect the experiences of children in foster care, with girls and children of color facing unique challenges (Leslie et al., 2000; Sattler & Font, 2021). The age at which a child is placed in state custody and the number of prior foster care placements are also important covariates to consider. Children who enter foster care at a younger age or who have experienced multiple placements may be at increased risk for attachment and developmental problems, as well as trauma-related symptoms (Dozier et al., 2001; Pears et al., 2008).

Foster care level is another important covariate to consider, as it reflects the level of care, resources, and support provided to children in foster care. Finally, depression and anxiety are important covariates to consider as they can impact both short- and long-term outcomes in foster care and are closely associated with sleep problems. Research has shown that children in foster care are at increased risk for mental health problems, including depression and anxiety, which can impact their ability to form attachments, succeed in

school, and maintain stable relationships (Burns et al., 2004; Heflinger et al., 2000). Taken together, the chosen covariates have a strong theoretical basis for inclusion as covariates.

Before matching, missing data for all covariates were examined in preparation for imputation. Child age, child sex, child race, anxiety, and depression data were complete while foster care level data were missing for less than 1% of responses. Both child age when placed in state custody and number of prior foster care placements were missing the most data (23% and 24%, respectively). The R package 'missRanger' (Mayer, 2019) replaced missing values using multivariate imputation, as random forest imputation interactions can impute large quantities of missing mixed-type data effectively (Stekhoven & Bühlmann, 2012); an approach that outperforms competing methods, even with covariates (Tang & Ishwaran, 2017).

After imputation of missing variables but prior to matching, there were large imbalances in the standardized covariate mean differences between conditions. These imbalances between

groups suggest the presence of baseline differences that need to be addressed. Compared to the foster care group, children in the adopted group were younger, in state custody for less time, had fewer foster care placements, and scored lower on depression and anxiety measures. We therefore used the R package 'MatchIt' (Ho et al., 2011) to pre-process data with semi-parametric and non-parametric matching methods.

We first attempted 1:1 nearest neighbor propensity score matching without replacement with a propensity score estimated using logistic regression of group specification on the covariates. This matching specification yielded poor balance, so we conducted full matching on the propensity score, which yielded adequate balance, as

indicated in Figure 1. The propensity score was estimated using a probit regression of the group on the covariates with a caliper of 0.05 (i.e., the caliper width for the Mahalanobis distance matching algorithm), which yielded better balance than did a logistic regression. After matching, all standardized mean differences for the covariates were below 0.1 and all standardized mean differences for squares and two-way interactions between covariates were below .15, indicating adequate balance. The resulting sample sizes for each group was (Foster care = 379, Adopted = 226; total sample was used in our H1 and H2 analyses discussed below).

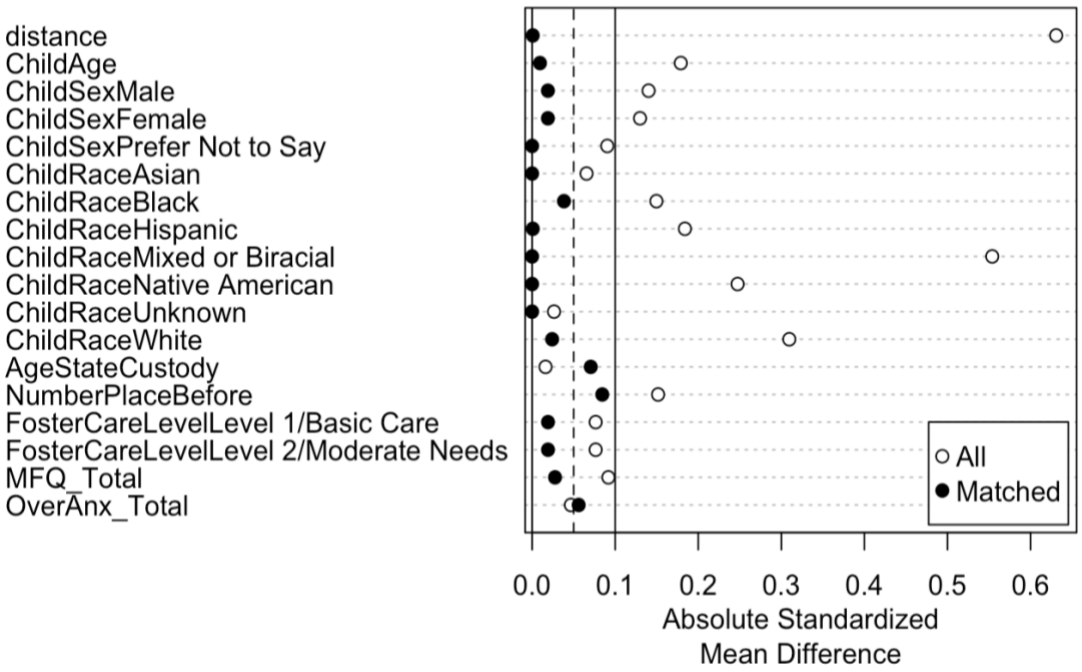

Figure 1. Plot of Covariate Standardized Mean Differences

Instruments

Child Demographics and Background

Caregivers were asked a series of demographic questions about themselves and the child, including age, biological sex, gender identity, and race and ethnicity. Adoptive parents reported the total number of foster placements the child experienced, age at time of current placement, the type of adoption (i.e., relative/kinship versus non-relative), and type/level of foster care (Level 1 = Basic Care, Level = 2 = Moderate Needs, Levels 3 & 4 = Severe or specialized needs) the target child received.

Adverse Childhood Experiences (ACEs)

Caregivers from the adopted sample were also asked about suspected and confirmed types of adverse experiences prior to placement. Specific experiences included: pre-mature birth, in-utero exposure to drugs/alcohol, physical abuse, sexual abuse, emotional abuse, domestic violence, parental use of alcohol/drugs, physical/medical neglect, sex/human trafficking, living in poverty, homelessness, and natural disaster. Total scores based on both suspected and confirmed adverse experiences were used for comparison, with higher scores indicating more ACEs.

Child Sleep Health Characteristics

The Child Sleep Habits Questionnaire (CSHQ; Owens et al., 2000) was completed by adoptive parents to assess child sleep problems and overall sleep quality. The CSHQ has excellent psychometric properties and an established clinical cut-off score such that children with scores >41 is indicative of clinically significant sleep problems (Owens et al., 2000). For comparison purposes, several specific items from the CSHQ were matched to the foster care survey items. Specific child sleep behaviors assessed in both studies included moving to

someone else's bed after bedtime or during the night, nightmares, bedwetting, sleep terrors, and snoring. For any items endorsed, caregivers in both studies reported the frequency with which the behavior occurs, with response options ranging from (1) "Never" to (3) "Usually." Also, in both studies, overall sleep quality was assessed based on the question, "Please rate the overall quality of the child's sleep during the past two weeks using the following scale." Caregivers rated sleep quality on a Likert scale from 1 = Very Poor to 10 = Excellent. A reliability analysis was performed on the full 32-item CSHQ questionnaire, resulting in a Cronbach's alpha coefficient of .87, indicating good internal consistency.

Caregiver Attachment

Caregivers reported their perception of attachment security using the Revised Parental Attachment Inventory (R-IPA; L. N. Johnson et al., 2003). The R-IPA is a 30-item scale designed to assess affective and cognitive dimensions of the caregiver's attachment relationship with their child. The questionnaire yields six subscale scores: trust/avoidance, communication, symptom distress, social role, interpersonal relations, and physical aggression. Johnson and colleagues (2003) altered the wording of the original Inventory of Parent and Peer Attachment (IPPA; Armsden & Greenberg, 1987) to assess parents' views of their relationships with their child making the scale more suitable for our caregiver-report based surveys. The R-IPA is rated on a five-point scale, with (1) indicating "*almost never or never true*" and (5) indicating "*almost always or always true*." In the current study, the trust/avoidance and communication subscale scores were used, with higher scores signifying the caregiver has a more positive attachment relationship perception of their child. Internal

consistency was good for the trust/avoidance (α = .87) subscale and adequate for the communication subscale (α = .72).

Parent-Child Sleep Interactions

Sleep-related behaviors and interactions among parents and children were assessed using the Parent-Child Sleep Interactions Scale (PSIS; Alfano et al., 2013). The PSIS is a 12-item parent-report questionnaire which yields three subscale scores: Sleep Reinforcement (i.e., parental reassurance and reinforcement of child sleep behaviors), Sleep Conflict (i.e., parent child conflict and child noncompliance at bedtime), and Sleep Dependence (i.e., child difficulty going to sleep without parent; Alfano et al., 2013). Each item contains a 5-point Likert scale measuring how frequently each bedtime behavior and interaction occurred over the last month ranging from never to almost always/always. The Sleep Reinforcement subscale includes items such as "I praise my child for good sleep behaviors" and "I reassure my child about his/ her ability to fall/stay asleep." The Sleep Conflict subscale includes items such as "My child and I argue about bedtimes/sleep schedules" and "My child has a tantrum/screams/cries if he/she is made to go to sleep." The Sleep Dependence subscale includes items such as "My child sleeps in my room all night" and "My child comes to my room at bedtime." Higher scores indicate more problematic interactions. The measure has been found to possess strong psychometric properties (Alfano et al., 2013). A reliability analysis showed adequate internal consistency across all subscales; Sleep Dependence (α = .73), Sleep Reinforcement (α = .80), and Sleep Conflict (α = .85).

Anxiety

Anxiety among both recently adopted children and children currently in foster care was assessed using the NIH Toolbox Fear-Over Anxious Survey (All NIH Toolbox-related materials are ©2015 Northwestern University and the National Institutes of Health). The Over Anxious survey is a caregiver-report measure assessing general fear, worry, and hyperarousal. It is a 6-item survey with a 3-point Likert scale, ranging from "0 = Never or not true" to "2 = Often or very true." Additionally, the NIH Toolbox Fear- Separation Anxiety survey was used to measure fear of being separated from home and loved ones. This scale is a 7-point item survey using a 3point Likert scale ranging from "0 = Never or not true" to "2 = Often or very true." Higher scores are indicative of more caregiver-reported fear, worry, hyperarousal, and separation anxiety. Cronbach's alphas for the 6 overanxious and 7 separation anxiety items were .83 and .78, respectively.

Depression

The Mood and Feelings Questionnaire – Short Form (MFQ; Angold et al., 1995) was used as a screening tool for depression for both recently adopted children and children currently in foster care. The scale is a caregiver-report 13-item survey using a 3-point Likert scale ranging from "0 = Not true" to "2 = True". Higher scores on the MFQ suggest more severe depressive symptoms; scores range from 0-26 with a score of 12 or higher potentially indicating the presence of depression in the child (Angold et al., 1995). The MFQ was found to be highly reliable in the current sample ($\alpha = .88$).

Power and Analytic Plan

In the absence of prior studies of sleep among children adopted from foster care, two statistical power analyses were performed for sample size estimation using the assumption of small effect sizes. With an alpha = .05 and power = .80, the projected total sample size needed with an effect size (f^2) of .02 (GPower 3.1; Faul et al., 2009) is approximately N = 586 to test our most complex analysis with our comparison sample (H1 & H2). Thus, our proposed total sample size of 605 is adequate for the first aim of this study. To examine our final two aims, a second power analysis with an alpha = .05, power = .80, and effect size ($f2$) = .05 projected a needed sample size of 223. Our proposed sample size of 226 is adequate to test our most complex comparison (H6 & H7).

First, bivariate correlations were examined along with means and standard deviations for all study variables. For our first aim (to examine and compare overall sleep quality and specific types of sleep problems among children adopted from and currently residing in foster care), we used a multivariate analysis of variance (MANOVA) analysis to test the effect of the sample group on multiple dependent variables simultaneously. We also conducted a one-sample t-test to compare mean CSHQ scores of the recently adopted children sample to the clinical cutoff score of 41 (H3).

For our second aim and H4, we used a dependent sample t-test to examine if mean differences exist when comparing past-month (i.e., current) sleep quality to first-month sleep quality (i.e., when the child was first placed in the home). Dependent sample t-test for correlated means is an appropriate statistical analysis if each of the two samples can be matched on a particular characteristic. For H5, we conducted hierarchal linear regression to examine predictors of parent reported sleep quality improvement among children adopted

from foster care. On the first step of the model, appropriate covariates were entered. On the second and third steps, focal predictors including adverse experiences, number of prior placements, and age at time of first placement were entered. For our final aim, we conducted moderation analysis using five separate linear regression models to determine whether aspects of caregiver attachment (i.e., trust/avoidance and communication) and parent-child sleep interactions (i.e., sleep conflict, sleep reinforcement, and sleep dependence) moderate the relationship between the predictor variable (i.e., ACEs) and child sleep quality while controlling for appropriate covariates (i.e., number of prior placements, age at time of placement, and the time difference between age at which the child first arrived and current age; H6 & H7). Moderation analyses were conducted using Hayes' PROCESS macro. All predictors were centered to help with interpretation of the intercept term by subtracting the mean of a variable from each participant's score.

To test H6, appropriate covariates were entered on Step 1, the focal moderator (i.e., RIPA total trust/avoidance and then communication scores) on Step 2, and their interaction terms on Step 3. Similarly, for H7, the same model was run with PSIS subscale scores as the moderator (i.e., sleep conflict, sleep reinforcement, and sleep dependence subscale scores) at Step 2, and their interaction terms at Step 3. All analyses were completed using R software.

RESULTS

The adopted sample consisted of 226 participants, 57.5% (n = 130) male, with a mean age of 5.88 (SD = 1.97). The sample was primarily Caucasian (51.3%). Our comparison sample (children currently in foster care) consisted of 379 participants, 51.2% (n =194) male, with a mean age of 6.29 (SD = 2.19). Similarly, the comparison sample was also primarily Caucasian (66.5%). Both sample characteristics are presented in Table 1.

Bivariate Correlations

Pearson correlation coefficients were computed to assess relationships between all relevant study variables and inform the inclusion of covariates for Aims 2 and 3 (which focused solely on the adopted sample). Based on the presence of significant relationships, several variables were entered as covariates including depression scores (H5), R-IPA subscale scores (H6), and PSIS subscale scores (H7). All bivariate correlations are presented in Tables 2 (Foster Care Sample) and 3 (Adopted Sample).

Primary Analyses

Aim 1 Analyses: To examine and compare overall sleep quality and sleep problems among children adopted from foster care within the past two years to children currently residing in foster care using propensity score matching procedures. For H1 and H2, a MANOVA was conducted to examine the effect of group membership (i.e., Foster Care vs Adopted) on eight dependent variables (nightmares, night terrors, moving beds, nighttime awakenings, snoring, sleep walking, wetting the bed, grinding teeth, and current sleep quality).

The MANOVA indicated a significant effect of group membership, Pillai's Trace = 0.45, $F(8, 458) = 16.123$, $p < .001$, partial $\eta^2 = 0.22$. The effect size suggests a large practical significance of the observed difference in the means. Post-hoc tests were conducted using the Games-Howell test, as the assumption of equal variances was violated for some of the dependent variables. Although similar to Tukey's test in its formulation, the Games-Howell test does not assume equal variances and sample sizes. The test compares the difference between each pair of means with appropriate adjustment for the multiple testing (i.e., no additional p-value correction needed).

The Games-Howell tests revealed that a statistically significant difference in sleep nightmare scores between the groups, $M_{FC} = 1.63$, $M_{ADP} = 1.43$; $p < 0.001$, where children currently in foster care were reported to experience more nightmares on average than the adopted group. Similarly, children currently in foster care experienced night terrors, $M_{FC} = 1.34$, $M_{ADP} = 1.22$; $p = 0.01$, and moved to someone else's bed during the night, $M_{FC} = 1.95$, $M_{ADP} = 1.48$; $p < 0.001$, more often than the adopted group.

Conversely, the adopted group were reported to experience more nighttime awakenings compared to children currently in foster care, $M_{FC} = 1.77$, $M_{ADP} = 1.98$; $p = .003$. Lastly, there was a statistically significant difference in current sleep quality scores between the groups, $M_{ADP} = 6.94$, $M_{FC} = 6.12$; $p < 0.001$, where the adopted group were reported to have significantly better sleep quality compared to the foster care group (see Figure 2). Rates of other sleep problems including snoring, sleep walking, wetting the bed, and grinding their teeth were similar in both groups ($p > 0.19$, see Table 4).

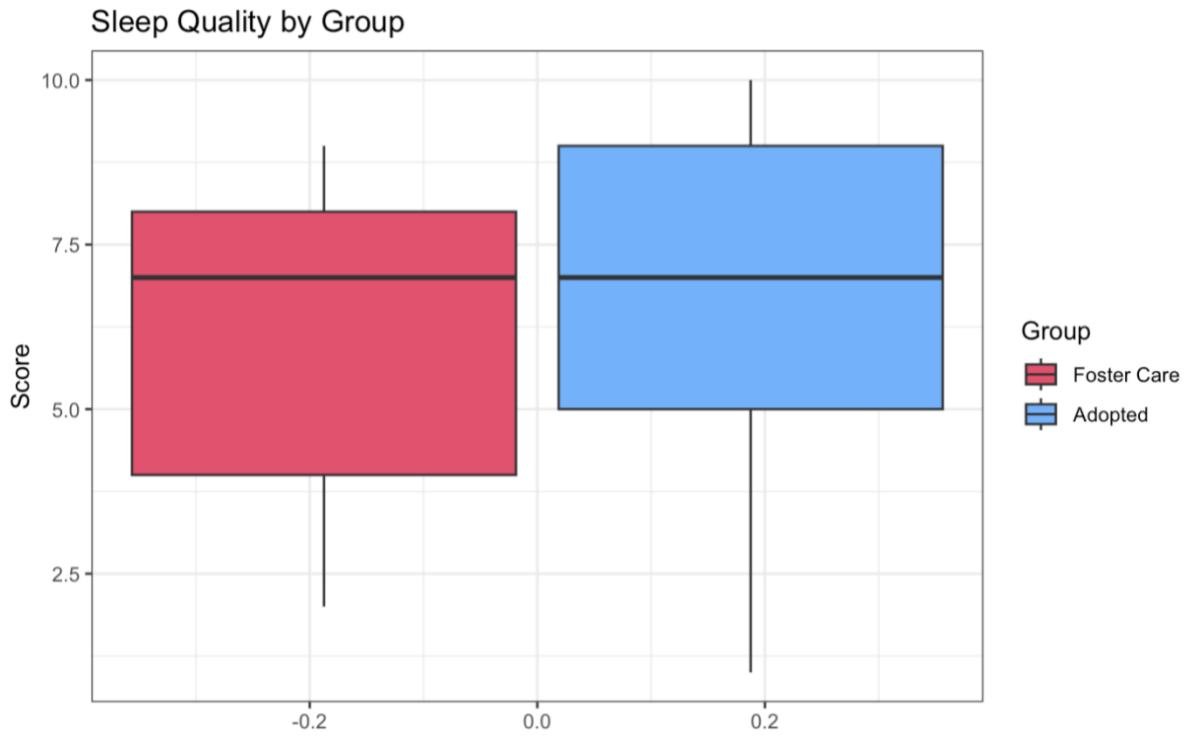

Figure 2. Comparing Sleep Quality Box Plots

Finally, for H3, a one-sample t-test was performed to examine the presence of clinically significant sleep problems among the adopted group compared to a normative sample (i.e., CSHQ total score > 41). The difference was statistically significant, $t(225) = 11.18$, $p < .001$, $d = 0.74$, with 70% of adopted children reported to experience clinically significant sleep problems.

Aim 2: To investigate change in and potential predictors of change in sleep quality from the time children first arrived in the foster home to after adoption. For H4, results indicated that there was a significant difference between first month and current sleep quality in the adopted sample ($t = 12.75$, $df = 225$, $p < .001$). Prior to conducting the t-test, assumption of normality was checked and met using Bartlett's test. The mean difference was 3.07 (95% CI [2.60, 3.55]) indicating better current sleep quality than when the child first arrived in the home.

For H5, the full model was significant, $F(4,220) = 5.32$, $p < .001$. Based on correlational analysis, depression (MFQ) scores were entered as a covariate on step one of linear regression models for H5. Number of ACEs was entered on step two and number of prior placements and age of first placement entered on step three. On step one, depression scores accounted for 2.6% of the variance in sleep quality, $F(1,223) = 5.84$, $p = 0.02$. Number of ACEs explained an additional 3.7% of the variance, $F(2,222) = 7.44$, $p < .001$. Finally, in step three, the addition of number of prior placements and age of first placement explained an additional 2.5% of variation and this R^2 was also significant, $F(4,223) = 5.32$, $p < .001$; however, these coefficients were only marginally significant ($p > .09$). Thus, in this sample, sleep quality scores increased by 0.26 points for every additional ACE ($p = .02$) and increased by 0.18 points for every point decrease in depression scores ($p < .001$; see Table 5). Prior to conducting the linear regression analyses, assumptions of linearity, normality of residuals, and independence (i.e., autocorrelation) were checked and met. However, the assumption of homoscedasticity was violated, as indicated by a significant Non-constant Variance Score test ($x^2 = 7.00$, $p = .008$). Therefore, the assumptions of linear regression were not fully met, and findings should be interpreted with caution.

Aim 3: To examine parental attachment and parent-child sleep-based interactions as potential moderators of relationships between prior adversity and current sleep quality. Prior to the moderation analysis, assumptions of multicollinearity, linearity, and normality were checked and met. For Aim 3, greater ACEs did not independently predict current sleep quality. However, ACEs and PSIS sleep dependency scores interacted to predict current sleep quality ($F(6,214) = 6.81$, $p < 0.001$, $R^2 = .16$; see Table 8) (H7a). When probing the interaction, simple slopes indicated lower ($b = 0.12$, $t(214)$

= 1.98, p = .05, 95% CI [0.00, 0.23]) PSIS sleep dependency scores strengthened the relationship between ACEs and sleep quality. We further used the Johnson-Neyman (1936) technique to probe the interaction and identify the range of values at which the interaction effect was significant (P. O. Johnson & Neyman, 1936). When PSIS sleep dependency scores fell below -4.18 *SD* of the mean (M = 4.7), ACEs and sleep quality were significantly positively related $t(214) = 1.97$, p = .05. Further, when projected sleep dependency scores exceeded 18, the relationship between ACEs and sleep quality became more robust (see Figure 3).

None of the other focal moderators examined (R-IPA Trust/Avoidance (H6a), R-IPA Communication (H6b), PSIS Conflict (H7b), and PSIS Reinforcement (H7c) subscales) interacted significantly with ACEs to predict sleep quality (all ps > .07).

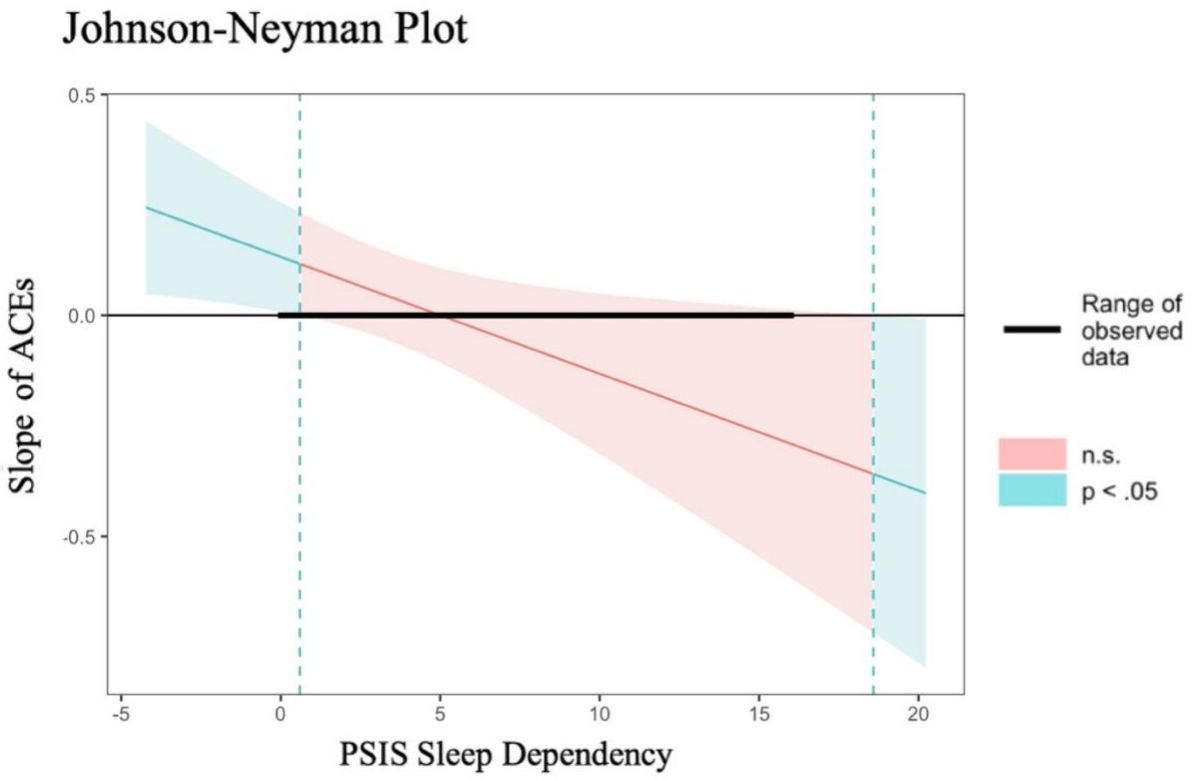

Figure 3. Probing ACEs and PSIS Sleep Dependency Interaction on Sleep Quality

DISCUSSION

Healthy sleep is vital for behavioral, emotional, and physical development as well as overall child wellbeing. Children who have spent time in foster care have been exposed to various forms of adversity, including maltreatment, abuse, and/or neglect, placing them at heightened risk for a wide range of acute and long-term negative outcomes. Evidence has also begun to emerge revealing high rates of unaddressed sleep disruption in this population of youth, which is likely to further elevate the risk for emotional and physical health problems. Such findings are unsurprising since ACEs are well-known to give rise to persistent sleep disturbances (e.g., Noll et al., 2006). In turn, persistently poor sleep independently increases risk for numerous serious conditions including cardiovascular disease, metabolic changes and obesity, psychiatric disorders, and suicidality. Conversely, healthy sleep patterns may serve to mitigate adverse effects of ACEs.

In the absence of studies examining sleep among children recently adopted from foster care, we used propensity matching scores to compare sleep quality and rates of several sleep-related problems between children currently in and recently adopted from foster care toward understanding whether common sleep problems might improve after permanence is achieved. We found differences in the rates of several specific sleep problems. Specifically, children currently in foster care were reported to experience more nightmares, night terrors, and moving to someone else's bed during the night compared to the adopted group. However, contrary to our expectation, the adopted group were reported to experience more nighttime awakenings compared to the foster care group. For sleep quality, our findings showed children adopted from foster care had significantly better parent-reported sleep quality than

the foster care sample. This result adds to a growing literature indicating early adversity negatively impacts long-term sleep irrespective of psychopathology (Hamilton et al., 2018; Noll et al., 2006).

Although it was expected that children currently in foster care would experience all sleep problems examined more frequently than the adopted group, nighttime awakenings were reported more frequently by adoptive parents. The precise reason for this difference is unclear since the groups were matched are pertinent variables, including age at the time entering state custody, number of prior placement, and internalizing symptoms. One possibility is that even after other types of sleep problems subside, maintenance of sleep throughout the night remains a challenge (or worsens) for children who have experiences maltreatment and/or trauma. It is also notable that many of the sleep problems found to be more frequent among children in foster care compared to the adopted group are parasomnias that typically subside over time (e.g., night terrors and sleepwalking), whereas other problems (e.g., bedwetting, nightmares) are common symptoms of recent trauma exposure. Still, future research is needed to explore these relationships in more detail to better understand factors that contribute to long-term sleep health among children who spend time in foster care. Overall, our results reveal that establishing permeance through adoption coincides with some improvement in overall sleep quality and sleep health, but certain sleep problems (i.e., nighttime awakenings) may not only persist but worsen in the absence of direct intervention efforts.

Focusing on the adopted sample only, the average ratings of child sleep quality improved significantly from the time the child first arrived in the home to post-adoption. This result may be somewhat misleading however, since 70% of the adopted sample scored well

above the clinical cutoff score on the CSHQ, indicating the presence of impairing sleep problems in majority of the sample. This result is fitting with the known effects of childhood maltreatment and trauma on sleep health. The HPA axis is commonly highlighted as a main pathway through which ACEs disrupt sleep-wake regulation, both acutely and over time. The HPA system controls stress responses and circadian timing of hormone secretion in promoting high quality, restorative sleep. Sleep health, in turn, has a regulatory influence on the HPA system, creating dynamic, reciprocal relationships across development. Childhood exposure to adversity and trauma, even as early as infancy, has been shown to alter cortisol patterns across the 24-hour day during adolescence, illustrating the HPA system's prolonged susceptibility to dysregulation (Kuhlman et al., 2015). Dysregulated diurnal cortisol patterns representative of HPA hyperactivation have also been found among children in foster care (e.g., Bick et al., 2019).

We also examined several potential predictors of current child sleep quality, including number of ACEs, total number of foster placements, and age at first placement. Contrary to findings from numerous studies among maltreated children and adults, greater ACEs predicted better parent-reported sleep quality. Post-hoc analyses might shed some light on this surprising result. When we dichotomized the sample and compared sleep quality at the time of initial placement between children with lesser (i.e., 4 or less) versus greater (i.e., greater than 4) ACEs, children with more ACEs had significantly worse sleep quality. It may be case then, that adoptive parents' reports of current sleep quality were to some degree biased by also being asked about their children's sleep patterns and quality at the time they arrived in the home. It is also possible that children with the greatest sleep problems at the time of placement in a foster home have more opportunity to improve their sleep over time

(i.e., regression to the mean). Lastly, it is important to point out that parents provided both reports of ACEs and sleep quality which introduces shared method variance. Future studies including objective measures of sleep or child welfare reports of ACEs would help to clarify these findings.

Given the research showing that placement instability can worsen sleep problems among children in foster care, number of prior placements and age of first placement were also included as predictors in our model. Although both variables explained additional variance in current sleep quality, their coefficients were non-significant, inconsistent with our hypotheses. Number of foster placements is perhaps the most consistent predictor of adverse child outcomes in the extant literature. For example, a greater number of placements predicts more attachment problems, emotional disorders, poor academic performance, and juvenile delinquency (Newton et al., 2000; Ryan & Testa, 2005; Zima et al., 2000). Dubois-Comtois et al., (2016) found shorter nighttime sleep duration among children in foster care to be associated with a greater number of placements as well as placement at a younger age. However, ours is the first study to examine the relationship between placement history and sleep among children adopted from foster care, and it is possible that this association becomes more attenuated over time. Still, the reason for a non-significant result in our study remains unclear and requires further study.

Lastly, we investigated whether the relationship between ACEs and current sleep quality was moderated by several theoretically and clinically meaningful variables including parent-child attachment and parent-child sleep interactions. Although ACEs did predict child sleep quality, sleep dependency served as a significant moderator of their relationship, such that the lowest sleep dependency scores strengthened the relationship between higher ACEs

and better sleep quality. Although this relationship is not necessarily intuitive, examination of the specific items that comprise this subscale might provide insight. Specifically, children who scored low on the PSIS sleep dependency scale were more likely to sleep in their own bed and stay in their room at bedtime and during the night. Thus, parents who provided low ratings on this scale are likely to also perceive their child as having better quality sleep. Although greater child sleep independence commonly coincides with more restful sleep (e.g., longer durations, higher sleep efficiency), this is not necessarily the case, as parents may simply be less aware of sleep problems among children who do not seek out parental assistance at night. Because the current study did not collect child sleep reports or objective sleep data, it not possible to further explore this possibility in the current study. Still, this finding suggests that behavioral interventions focused on fostering child sleep independence may serve to improve sleep quality in this vulnerable population.

In interpreting the findings discussed above, it is important to emphasize that adoptive caregivers were asked about suspected and confirmed ACEs rather than utilizing child records. The extent to which adoptive caregivers are aware of children's specific experiences prior to placement through foster care is likely to be highly variable and at times inaccurate. Further, even if adoptive parents were able to provide accurate reports of ACEs, our assessment approach did not capture the severity and/or duration of these experiences, which likely created considerable 'noise' in the data. Finally, according to our prior research (Alfano, 2020; Alfano et al., 2022), foster caregivers receive little, if any, education or training with regard to children's sleep (including the impact of trauma on sleep) and, as such, specific factors and behaviors that inform reports of good versus poor quality sleep remains unclear.

Limitations and Future Directions

Despite our use of a large novel sample of children, our study is cross-sectional, and it is not possible to determine causality or precisely know how sleep patterns and problems may change over time. Future research should examine sleep longitudinally, including relationships with various aspects of health and wellbeing. As mentioned, our study did not use a validated measure of ACEs or rely on child records to confirmed ACEs or other information (e.g., number of prior placements). We also note that a sole reliance on parent/caregiver reports in our study, likely introduced systematic measurement error. Future studies including child reports, CPS records, and/or objective sleep measures are needed. It is also worth noting that data collection took place between May and October 2020, a period that coincided with the COVID-19 pandemic. Finally, although a matched comparison sample of children still in foster care is a strength of the project, these data were collected in a separate study using somewhat different measures of the same sleep problems.

Conclusion

Ours is the first study we are aware of to examine the presence of sleep problems among children recently adopted from foster care and report nighttime awakenings to commonly occur. On the other hand, results also suggest that overall child sleep quality may improve among children in foster care after they achieve permanence. These results emphasize a potentially critical avenue for assessment and intervention for this vulnerable population. Future research should continue to investigate these relationships, including the presence of other sleep-related problems and patterns as well as possible moderators, as such information can provide a better understanding of next steps for policy and practice (e.g., screening, assessment, and intervention approaches). For example, specific moderators of

interest include those that attenuate the effects of ACEs and placement changes on children's sleep, such as caregiver involvement in bedtime routines, consistent sleep schedules, and sleep duration. Other factors to consider include the availability of resources, support, and training for foster/adoptive caregivers focused on developmental sleep needs and good sleep hygiene practices.

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TABLES

Table 1: *Full Sample Characteristics*

Group	Total (*N*=605)	Foster Care (*N*=379)	Adopted (*N*=226)
Child Sex			
Male	324 (53.6%)	194 (51.2%)	130 (57.5%)
Female	281 (46.4%)	185 (48.8%)	96 (42.5%)
Prefer Not to Say	0 (0%)	0 (0%)	0 (0%)
Child Age (years)			
Mean (SD)	6.16 (2.12)	6.29 (2.19)	5.88 (1.97)
Median [Min, Max]	6.00 [4.00, 11.0]	6.00 [4.00, 11.0]	5.00 [4.00, 11.0]
Child Race			
Asian	0 (0%)	0 (0%)	0 (0%)
Black	85 (14.0%)	60 (15.8%)	25 (11.1%)
Hawaiian or Pacific	0 (0%)	0 (0%)	0 (0%)
Hispanic	60 (9.9%)	44 (11.6%)	16 (7.1%)
Mixed or Biracial	92 (15.2%)	23 (6.1%)	69 (30.5%)
Native American	0 (0%)	0 (0%)	0 (0%)
Unknown	0 (0%)	0 (0%)	0 (0%)
White	368 (60.8%)	252 (66.5%)	116 (51.3%)
Caregiver Sex			
Male	9 (1.5%)	6 (1.6%)	3 (1.3%)
Female	592 (97.9%)	371 (97.9%)	221 (97.8%)
Prefer Not to Say	2 (0.3%)	0 (0%)	2 (0.9%)
Missing	2 (0.3%)	2 (0.5%)	0 (0%)
Caregiver Race			
Asian	3 (0.5%)	2 (0.5%)	1 (0.4%)
Black	19 (3.1%)	11 (2.9%)	8 (3.5%)
Hispanic	22 (3.6%)	17 (4.5%)	5 (2.2%)
Mixed or Biracial	11 (1.8%)	0 (0%)	11 (4.9%)
Native American	1 (0.2%)	0 (0%)	1 (0.4%)
Other	2 (0.3%)	0 (0%)	2 (0.9%)
White	544 (89.9%)	346 (91.3%)	198 (87.6%)
Hawaiian or Pacific	2 (0.3%)	2 (0.5%)	0 (0%)
Missing	1 (0.2%)	1 (0.3%)	0 (0%)
Child Age State Custody (years)			

Mean (SD)	2.19 (1.91)	2.19 (1.76)	2.18 (2.15)
Median [Min, Max]	2.00 [0, 11.0]	2.17 [0, 11.0]	1.95 [0, 11.0]
Foster Care Level			
Level 1/Basic Care	409 (67.6%)	251 (66.2%)	158 (69.9%)
Level 2/Moderate Needs	196 (32.4%)	128 (33.8%)	68 (30.1%)
Level 3/Severe or specialized needs	0 (0%)	0 (0%)	0 (0%)

Table 2: *Foster care sample means, standard deviations, and correlations*

Variable	*M*	*SD*	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
1. Child Age	6.29	2.19																	
2. Age State Custody	2.19	1.76	.18**																
3. Age Under Care	4.96	2.6	.87**	-0.02															
4. Placements Before	1.85	1.66	0	.16**	0.03														
5. Caregiver Age	37.55	8.53	0.08	0	-0.02	-0.09													
6. Past SQ	3.62	2.48	0.04	-0.05	0.04	0.06	-0.06												
7. Current SQ	6.12	2.18	0.01	-0.09	.13*	0.04	0	0.14											
8. Wet Bed	1.46	0.74	-.16**	-0.03	-.17**	0	-0.01	-0.12	-.11*										
9. Sleepwalk	1.13	0.39	.10*	-0.03	0.06	0.08	0.08	-0.12	-0.1	-0.02									
10. Move Beds	1.95	0.44	-0.03	0.02	-0.03	-0.03	-0.1	0.04	0.02	-0.05	-0.04								
11. Grind Teeth	1.34	0.62	-0.09	0.07	-.18**	0.02	0.05	-0.14	-.18**	0.09	.19**	-.15**							
12. Snore	1.42	0.65	-0.02	-0.01	-0.06	0.05	0.01	-0.1	-0.05	0.02	0.07	-0.04	.25**						
13. Nightmare	1.34	0.6	-0.08	-0.07	-.12*	0.04	0.03	-.26**	-.28**	0.09	.23**	0.07	.21**	.17**					
14. Night Terror	1.63	0.72	0	-0.02	-0.02	0.08	0	-.26**	-.31**	.11*	.18**	-0.01	.24**	.21**	.65**				
15. Awake Once	1.77	0.83	-0.06	0.06	-0.09	-0.06	-0.02	0	-.30**	0.01	0.05	0.08	0.05	-0.04	0.07	0.01			
16. Sep Anx	4.17	3.34	-0.03	-0.06	0.01	0.01	-0.03	-.24**	-.14*	0.02	0.1	-0.05	.21**	.11*	.21**	.33**	0.04		
17. Over Anx	4.34	3.35	0.09	-0.04	.12*	.12*	-0.05	-.18*	-.15**	-0.01	0.09	0.01	.15**	.17**	.16**	.32**	0.03	.67**	
18. Depression	4.96	5.24	.13**	-0.06	.14**	0.03	-0.04	-0.12	-.26**	0.08	.11*	-0.01	.15**	.17**	.19**	.34**	0.04	.51**	.64**

Note. *M* and *SD* are used to represent mean and standard deviation, respectively. Values in square brackets indicate the 95% confidence interval for each correlation. The confidence interval is a plausible range of population correlations that could have caused the sample correlation (Cumming, 2014). * indicates $p < .05$. ** indicates $p < .01$.
Abbreviations: SQ = sleep quality, ACEs = adverse childhood experiences, Sep Anx = separation anxiety, Over Anx = general anxiety, R-IPA = revised inventory of parent attachment, Com = communication, TA = trust/ avoidance, PSIS = parent-child sleep interactions scale, Dep = sleep dependence, Con = sleep conflict, Rein = sleep reinforcement

Table 3: *Adopted sample means, standard deviations, and correlations*

Variable	*M*	*SD*	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
1. Child Age	5.88	1.97																					
2. Age State Custody	2.11	2.08	.66**																				
3. Age Under Care	2.94	2.48	.74**	.83**																			
4. Placements Before	1.58	1.78	.29**	0.13	.44**																		
5. Caregiver Age	39.12	8.17	-0.01	-.16*	-.18**	-0.1																	
6. Current SQ	6.92	2.41	0.12	.16*	.21**	0.12	0																
7. Wet Bed	1.53	0.78	-.14*	-0.08	-0.13	-0.06	0.01	-.18**															
8. Sleepwalk	1.17	0.45	-0.05	-0.1	-0.06	0.08	-0.06	-.27**	0.08														
9. Move Beds	1.48	0.77	-.24**	-.34**	-.41**	-.16*	.15*	-.40**	0.1	.16*													
10. Grind Teeth	1.4	0.67	-0.09	-.19**	-.23**	-0.12	0.05	-.16*	.18**	.19**	.15*												
11. Snore	1.36	0.63	-0.06	-.13*	-0.13	0	-0.02	-0.09	0.13	.18**	.15*	.23**											
12. Nightmare	1.44	0.59	-0.03	-0.02	-0.09	0	0.03	-.33**	0.07	.29**	0.04	0.1	0.13										
13. Night Terror	1.22	0.48	-0.1	-.15*	-.15*	-0.02	-.14*	-.34**	0.12	.44**	.18**	.24**	.26**	.43**									
14. Awake Once	2	0.82	-0.08	-.18**	-.19**	-0.06	0.07	-.52**	0.09	.22**	.44**	.17**	.17*	.32**	.23**								
15. Sep Anx	4.05	3.05	.17**	0.1	0.08	0.09	-0.11	-.16*	0.06	0.12	0.07	0.1	0.06	.37**	.17**	.15*							
16. Over Anx	4.21	3.4	.34**	.28**	.29**	.19**	-.15*	-.15*	0.06	0.1	-0.1	0.06	0.02	.25**	0.06	0.09	.68**						
17. Depression	4.55	4.97	.24**	.14*	.15*	.14*	-0.12	-.30**	0.1	0.06	-.14*	0.08	-0.01	.25**	0.09	.21**	.40**	.57**					
18. PSIS_Dep	4.73	4.21	-.18**	-.33**	-.38**	-.17**	.15*	-.37**	0.05	.17*	.58**	.19**	.17*	.26**	.28**	.32**	.24**	0.02	-0.08				
19. PSIS_Rein	7.38	4.51	-0.04	-.14*	-.16*	0	-0.03	-.42**	0.08	.24**	.28**	.23**	.17**	.47**	.33**	.31**	.41**	.37**	.27**	.46**			
20. PSIS_Con	5.04	4.16	-.23**	-.29**	-.33**	-0.12	-0.07	-.51**	.20**	.22**	.32**	.31**	.19**	.38**	.40**	.39**	.28**	.22**	.26**	.49**	.62**		
21. RIPA_TA	76.07	27.37	0.01	0.03	0.03	-0.03	0.02	0.11	-0.07	-0.01	0.01	-0.03	-0.01	0.03	-0.02	-.14*	.18**	.13*	-0.05	0.12	0.1	0.02	
22. RIPA_C	14.33	6.21	.23**	.16*	.15*	0.09	-0.04	0.03	-0.07	0.03	-0.08	0.03	0.05	0.1	0	-0.07	.26**	.30**	.19**	0.09	.21**	0.1	.72**

Note. *M* and *SD* are used to represent mean and standard deviation, respectively. Values in square brackets indicate the 95% confidence interval for each correlation. The confidence interval is a plausible range of population correlations that could have caused the sample correlation (Cumming, 2014). * indicates $p < .05$. ** indicates $p < .01$.
Abbreviations: SQ = sleep quality, ACEs = adverse childhood experiences, Sep Anx = separation anxiety, Over Anx = general anxiety, R-IPA = revised inventory of parent attachment, Com = communication, TA = trust/ avoidance, PSIS = parent-child sleep interactions scale, Dep = sleep dependence, Con = sleep conflict, Rein = sleep reinforcement

Table 4: *Multivariate Analysis of Variance Results*

	Foster Care		Adopted		Games-Howell	
Variable	*Mean*	*SD*	*Mean*	*SD*	Estimate	*p* (adjusted)
Sleep Health						
Move Beds	**1.95**	**0.44**	**1.48**	**0.78**	-0.46	**< .001**
Wet Bed	1.46	0.74	1.51	0.77	0.05	0.402
Grind Teeth	1.34	0.62	1.40	0.66	0.07	0.227
Sleepwalk	1.13	0.39	1.18	0.48	0.05	0.189
Nightmare	**1.63**	**0.72**	**1.43**	**0.60**	-0.20	**< .001**
Night Terror	**1.34**	**0.60**	**1.22**	**0.50**	-0.12	**0.012**
Awake Once	**1.77**	**0.83**	**1.98**	**0.82**	0.21	**0.003**
Sleep Quality	**6.12**	**2.18**	**6.94**	**2.41**	0.82	**< .001**
MANOVA	Pillai's Trace = 0.45, $F(8, 458) = 16.12$, $p < .001$, partial $\eta^2 = 0.22$					

Note. Text in bold are results significant at $p < .05$

Table 5: *Hierarchical Regression Analysis of Predictors of Sleep Quality with Depression as a Covariate*

Predictor Variables		*B*	*SE*	*t*	R2	ΔR2
Step 1					0.03*	
	Depression	-0.12	0.05	-2.41*		
Step 2					0.06**	0.03
	Depression	-0.16	0.05	-3.27**		
	ACEs	0.31	0.11	2.97**		
Step 3					0.09**	0.03
	Depression	-0.18	0.05	-3.55***		
	ACEs	0.26	0.11	2.40*		
	Number of Placements	0.22	0.13	1.69		
	Age State Custody	0.19	0.12	1.63		
Full model: $F(4, 220) = 5.04$, $p < .001$						

Note. *p < 0.05, **p < 0.01, *** p < 0.001
Abbreviations: ACEs = adverse childhood experiences

Table 6: *Moderator Analysis: ACEs Predicting Sleep Quality with Covariates and R-IPA as Moderator*

	Estimate	*SE*	95% CI		*p*
			LL	*UL*	
R-IPA Trust/Avoidance					
Intercept	7.13	0.49	6.16	8.10	<.001
ACEs	0.03	0.11	-0.19	0.25	0.77
R-IPA T/A	0.02	0.01	0.00	0.03	0.03
ACEs x R-IPA T/A	0.00	0.00	0.00	0.01	0.34
Time Difference	-0.23	0.10	-0.43	-0.02	0.03
Age State Custody	0.10	0.08	-0.06	0.25	0.23
Number of Placements	0.12	0.09	-0.06	0.30	0.20
Note. R^2 = .08, p = .006; Interaction $R^2\Delta$ = .004, p = .35					
R-IPA Communication					
Intercept	7.26	0.50	6.27	8.24	<.001
ACEs	-0.01	0.08	-0.17	0.14	0.86
R-IPA Com	0.01	0.03	-0.05	0.07	0.67
ACEs x R-IPA Com	0.00	0.01	-0.02	0.01	0.64
Time Difference	-0.23	0.11	-0.44	-0.02	0.03
Age State Custody	0.09	0.08	-0.07	0.25	0.26
Number of Placements	0.12	0.09	-0.07	0.30	0.21

Note. R^2 = .06, p = .04; Interaction $R^2\Delta$ = .000, p = .64

Abbreviations: SQ = sleep quality, ACEs = adverse childhood experiences, Sep Anx = separation anxiety, Over Anx = general anxiety, R-IPA = revised inventory of parent attachment, Com = communication, TA = trust/ avoidance, PSIS = parent-child sleep interactions scale, Dep = sleep dependence, Con = sleep conflict, Rein = sleep reinforcement

Table 7: *Moderator Analysis: ACEs Predicting Sleep Quality with Covariates and PSIS as Moderator*

	Estimate	*SE*	95% CI		*p*
			LL	*UL*	
PSIS Dependency					
Intercept	7.25	0.46	6.34	8.16	<.001
ACEs	0.01	0.05	-0.10	0.12	0.85
PSIS Dep	-0.19	0.04	-0.26	-0.11	<.001
ACEs x PSIS Dep	-0.03	0.01	-0.05	0.00	0.02
Time Difference	-0.14	0.10	-0.34	0.06	0.16
Age State Custody	0.00	0.08	-0.16	0.15	0.98
Number of Placements	0.07	0.09	-0.10	0.25	0.40
Note. $R^2 = .16$, $p < .001$; Interaction $R^2\Delta = .02$, $p = .02$					
PSIS Conflict					
Intercept	7.41	0.43	6.57	8.25	<.001
ACEs	0.05	0.05	-0.05	0.16	0.33
PSIS Con	-0.28	0.04	-0.35	-0.21	<.001
ACEs x PSIS Con	-0.02	0.01	-0.04	0.00	0.07
Time Difference	-0.16	0.09	-0.34	0.02	0.08
Age State Custody	-0.06	0.07	-0.20	0.08	0.43
Number of Placements	0.10	0.08	-0.06	0.26	0.23
Note. $R^2 = .29$, $p < .001$; Interaction $R^2\Delta = .01$, $p = .07$					
PSIS Reinforcement					
Intercept	7.04	0.45	6.15	7.92	<.001
ACEs	0.06	0.06	-0.05	0.17	0.27
PSIS Rein	-0.23	0.03	-0.30	-0.17	<.001
ACEs x PSIS Rein	-0.01	0.01	-0.03	0.01	0.19
Time Difference	-0.13	0.10	-0.32	0.06	0.17
Age State Custody	0.04	0.07	-0.11	0.18	0.63
Number of Placements	0.15	0.08	-0.01	0.32	0.07

Note. $R^2 = .23$, $p = .19$; Interaction $R^2\Delta = .01$, $p = .19$

Abbreviations: SQ = sleep quality, ACEs = adverse childhood experiences, Sep Anx = separation anxiety, Over Anx = general anxiety, R-IPA = revised inventory of parent attachment, Com = communication, TA = trust/ avoidance, PSIS = parent-child sleep interactions scale, Dep = sleep dependence, Con = sleep conflict, Rein = sleep reinforcement