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Consistent Bedtime Routines are Linked to Better Sleep Outcomes: Why?

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CONSISTENT BEDTIME ROUTINES ARE LINKED TO BETTER SLEEP OUTCOMES: WHY?

by

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ABSTRACT

Results from nationwide studies estimate that between 81 and 95% of parents in the United States with young children use bedtime routines. This is auspicious given that the use of a consistent bedtime routine is linked with better sleep quality. Indeed, the use of bedtime routines has been determined to have "strong" empirical support for addressing bedtime behavior problems (e.g., bedtime resistance) and for improving children's sleep. However, it is unclear how, or through what mechanism(s), that a consistent bedtime routine is associated with positive sleep outcomes. We evaluated compliance near bedtime and anxious distress at bedtime as possible mechanisms (i.e., mediators) linking bedtime routines and sleep quality. To that end, we recruited 160 parents of a child between the ages of 3 and 5 through Amazon's Mechanical Turk (Mturk) to complete questionnaires assessing the frequency of bedtime routines, compliance near bedtime, anxious distress near bedtime, and sleep quality. We found a significant indirect effect of bedtime routine consistency on sleep quality through anxious distress near bedtime even after controlling for child race, child sleep medication status, and co-sleeping status. Contrary to hypotheses, compliance near bedtime was *not* supported as a mechanism linking bedtime routine consistency and sleep quality once covariates were taken into account. An exploratory analysis revealed that this was due to co-sleeping status explaining a large portion of the variance in compliance near bedtime. In addition, in a serial model, the consistency of bedtime routines was related to sleep quality through first anxious distress and then compliance near bedtime. Moreover, exploratory part correlations revealed that the going to bed at a consistent time each night was the facet of bedtime routine consistency that most strongly correlated with child

sleep quality. Clinically, these results may suggest that if parents can employ strategies to alleviate and manage their child's anxiety before bedtime through consistent routines, compliance around bedtime and a good night sleep will likely follow. Findings are discussed in light of parental accommodation, intolerance of uncertainty, and parental acquiescence of disruptive behaviors. Areas for future research and limitations of the current study are also considered.

Keywords: bedtime routines, compliance, distress, sleep quality, children

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DEDICATION

I would like to dedicate this project to my mom and dad, who instilled in me a love for learning and helping others. Thank you for always answering the phone, no matter the time of day or night. And to Brian, thank you for weathering my weekly, no daily, crises. Thank you for well, everything.

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CHAPTER I – INTRODUCTION

The importance of sleep for young children's health, development, and well-being is undisputed in the literature. Indeed, studies indicate that poor sleep quality and/or quantity in childhood is linked with a host of adverse social, cognitive, emotional, and physical outcomes for children both concurrently and longitudinally. For example, shorter sleep duration is linked with lower verbal and nonverbal cognitive abilities (Touchette et al., 2007), worse grades (Wolfson & Crakadon, 1998), poorer performance on working memory and memory consolidation tasks (Kopascz, et al., 2010), impairment in abstract thinking and in complex tasks requiring higher-order brain functioning (Kopascz et al., 2010; Sadeh Gruber & Raviv, 2003), executive functioning deficits (Bernier, Carlson, Bordeleau, & Carrier, 2010), more behavioral problems and difficulties with impulse control (Lavigne et al., 1999; Sadeh, Mindell, Luedtke, & Wiegand, 2009), school refusal and anxiety symptoms (Hochadel et al., 2014), childhood obesity (Chaput, Brunet, & Tremblay, 2006; Cappuccio et al., 2008), an overall reduction in the effectiveness of the immune system (AlDabal & BaHammam, 2011), and more physical injury accidents (Young Kim, Sim, Kim, & Choi, 2015). Furthermore, the economic costs pertaining to childhood sleep problems is thought to be sizeable (Mindell, Kuhn, Lewis, Meltzer & Sadeh, 2006); for example, for children from birth to age 7, it was estimated that sleep problems cost the Australian health-care system an extra $27.5 million per year (Quach et al., 2013). Thus, identifying the constructs that are linked with high quality sleep and constructs that may help prevent, mitigate, or minimize sleep difficulties in young children is of the utmost importance. This is especially true given that a significant portion of preschool-aged children (i.e., 20-30%) exhibit some form of

bedtime problems or nighttime wakings and that bedtime difficulties are one of the most common behavioral issues brought to the attention of pediatricians (Mindell et al., 2006). Importantly, these sleep problems appear to not remit on their own and predict even later sleep problems (Meltzer, 2010; Simard et al., 2008; Touchette et al., 2005; Zuckerman, Stevenson, & Bailey, 1987).

One construct that has been linked with positive sleep outcomes (Mindell & Williamson, 2018), and is frequently provided as a recommendation by pediatricians to struggling parents (Mindell et al., 2006), is the use of a consistent bedtime routine. In the literature, bedtime routines have been defined as, "A set of observable, repetitive behaviors, which directly involve the child and at least one adult acting in an interactive or supervisory role in a consistent environment, which occur with predictable regularity in the hour preceding bed each night" (Henderson & Jordan, 2010, p. 72). Most bedtime routines typically involve physical preparations (e.g., putting on pajamas) and soothing activities (e.g., reading a book; Brown, Rhee, & Gahagan, 2016). Indeed, in a systematic review of pediatric sleep-practice recommendations, the use of a bedtime routine was determined to have "Strong" empirical support to treat sleep problems (Allen et al., 2016). However, crucially, the mechanism(s) or the reason(s) why the consistent use of a bedtime routine is linked with these important sleep-related variables has been subject to limited empirical study (Mindell, Li, Sadeh, Kwon, & Goh, 2015; Mindell & Williamson, 2018). Given that prevalence rates from large scale studies estimate that between 81 and 95% of parents in the United States use bedtime routines with their children (Hale et al., 2009; Mindell et al., 2009a; Mindell & Williamson, 2018), understanding how and why bedtime routines work is paramount.

Consistent Bedtime Routines and Positive Sleep Outcomes

There are robust associations between the use of a consistent bedtime routine and positive sleep outcomes for young children. Specifically, the use of a consistent bedtime routine has been correlated with indicators of better sleep quality such as earlier bedtimes, shorter sleep onset latencies, fewer and shorter incidents of nighttime wakings, longer sleep durations, more continuous sleep episodes, and less daytime sleepiness (see Mindell & Williamson, 2018 for a review). Indeed, these associations have been found whether assessed cross-sectionally or following implementation of an experimental design, across multiple studies, and from independent research groups.

Studies using multiculturally and ethnically diverse samples (e.g., Middle Eastern, North American, Asian, Latino) revealed some universal patterns pertaining to the use of consistent bedtime routines in children. For example, in samples of infants and toddlers, a consistent bedtime routine predicted unique variance, or demonstrated significant improvements in, sleep onset latencies (Mindell et al., 2011a; Mindell, Lee, & Sadeh, 2017a; Mindell et al., 2015; Mindell, Sadeh, Kwon, & Goh, 2013), incidents of night wakings (Mindell et al., 2015; Mindell et al., 2013; Mindell et al., 2017a; Sadeh et al., 2009), total nocturnal sleep duration (i.e., total minutes of nighttime sleep; Brown et al., 2016; Mindell et al., 2015; Mindell, Meltzer, Carskadon, & Chervin, 2009a; Mindell, Sadeh, Koyama, & How 2010; Mindell et al., 2013; Mindell et al., 2017a; Sadeh et al., 2009), and duration of sleep episodes (Mindell et al., 2015; Mindell et al., 2010; Mindell et al., 2013; Sadeh et al., 2009). With a slightly older sample (i.e., 2 to 8-year-old children), more consistent bedtime routines and routines that were considered “adaptive” in nature (i.e., routines characterized by no active play, no video games, no games/toys,

no television, no snack/drinks, and not listening to music) were both associated with better parent-reported sleep quality and sleep hygiene (Henderson, Barry, Bader, & Jordan, 2011; Henderson & Jordan, 2010). Thus, there is converging evidence across multiple cross-sectional studies with culturally diverse populations and diverse age-groups (i.e., infants, toddlers, preschoolers, and elementary-aged children), which suggest that the concurrent use of a bedtime routine is linked with positive sleep outcomes.

In addition to cross-sectional designs, which are limited regarding inferences of causality, intervention studies (i.e., with experimental designs) have assessed the impact of consistent bedtime routines on indicators of good sleep quality (e.g., sleep onset latency; frequency of nighttime wakings) with promising results. For example, in a sample of children between the ages of 5 and 72 months referred to a sleep clinic, Galbraith and Hewitt (1993) found that following the implementation of a bedtime routine, children exhibited a reduction in sleep onset latency and number of nighttime wakings. Similar to Milan, Mitchell, Berger, and Pierson's (1981) findings regarding maintenance effects, 62% of the children in Galbraith and Hewitt's (1993) study maintained their sleep improvements during the follow-up period 2 to 18 months later. Following a baseline period, Mindell et al. (2009b) randomly assigned mother-child dyads of children who had a parent-identified sleep problem, but no evidence of a sleep disorder, to either a 3-step bedtime routine (i.e., bath, massage, and quiet activities with lights out after 30 minutes at the end of the bath) for two weeks or to a control condition. Mothers of infants and toddlers in the intervention condition reported statistically significant improvements in the frequency and duration of nighttime wakings, longer continuous sleep episodes, improved sleep consolidation, and increased maternal

perception of sleep quality, whereas those in the control condition did not see a significant change in any sleep-related variables (Mindell et al., 2009b). In addition, mothers assigned to the bedtime routines condition perceived sleep to be less of a problem following implementation of the bedtime routine (Mindell et al., 2009b). Similar results (i.e., the implementation of a bedtime routine intervention caused reductions in sleep problems) were found even when the provision of a bedtime routine was implemented electronically (Mindell et al., 2011a). Indeed, a recent telehealth study found that in a sample of children with parent-identified sleep problems, bedtime routine interventions were adequately disseminated and yielded comparable results (Mindell et al., 2011a). Meaning, those randomly assigned to the bedtime routines intervention group had statistically significant improvements in sleep quality as evidenced by reductions in sleep onset latencies, number of nighttime wakings, duration of nighttime wakings, as well as a significant increase in the total number of minutes of nighttime sleep and improved child mood in the morning when delivered over the internet (Mindell et al., 2011a), with gains retained over one year later (Mindell et al., 2011b). In a dismantling study evaluating a more succinct 2-step bedtime routine intervention (i.e., massage and quiet activities with bedtime occurring a maximum of 30 minutes after the massage; Mindell et al., 2018), researchers found that children who were randomly assigned to the bedtime routine intervention exhibited a significant improvement in sleep quality-related variables (e.g., the number of nighttime wakings) compared to children assigned to the control condition; however, the effects were not as robust as the three-step bedtime routine. Mindell and colleagues (2018) speculated that this two-step routine may have been less beneficial than the typical 3-step bedtime routine outlined above because a bath

may be crucial for altering core body temperature to promote sleep, whereas the massage may have just been relaxing and soothing without precipitating any physiological changes. Thus, studies with high experimental rigor (e.g., random assignment) indicate that the use of a bedtime routine yields better quality sleep for young children.

In sum, across numerous studies, there is converging evidence that the use of a consistent bedtime routine is consistently linked with enhanced sleep quality for young children. As described at the outset, this is paramount give the multifaceted influence that sleep has on children's daytime functioning. However, crucially, the mechanism or the reason why the consistent use of a bedtime routine is linked with better sleep quality has been subject to limited empirical study (Mindell, Li, Sadeh, Kwon, & Goh, 2015; Mindell & Williamson, 2018) and is an evident gap in the current literature.

Bedtime Routines and Compliance Near Bedtime

The use of a consistent bedtime routine is often recommended to parents of children who exhibit bedtime resistant behavior (Kuhn & Elliot, 2003; Mindell et al., 2006; Ortiz & McCormick, 2007), which is a common problem in young children (Conway, Miller, & Modrek, 2016; Mindell et al., 2006). Conceptually, bedtime resistant behavior is externalizing in nature and is characterized by the following behaviors: tantrums, stalling, protesting, crying, clinging, refusing to get in bed, "curtain calls," and defying parental directives by getting out of bed numerous times and making requests for snacks, drink, or another story (Mindell et al., 2006; Ortiz & McCormick, 2007). Thus, the construct *compliance near bedtime* reflects the converse of bedtime resistant behavior and encompasses compliant behaviors such as: goes straight to bed, does not make repeated requests at bedtime, follows parental directions near bedtime, does not want to

stay up to complete other activities, does not complain about bedtime, and does not argue with caregivers around bedtime. Of note, bedtime resistant behaviors (i.e., the opposite of compliance around bedtime) are associated with a host of adverse proximal outcomes such as sleep onset delays, more frequent nighttime wakings, and more difficulty awakening in the morning (Blader, Koplewicz, Abikoff, & Foley, 1997) as well as distal outcomes such as concurrent and later externalizing problems (Conway et al., 2016).

The leading theory of how routines operate may be particularly fruitful for understanding why bedtime routines are linked with more compliance around bedtime or less bedtime resistance. Since the best predictor of child compliance for a given task is a history of previous compliance with that task (William & Forehand, 1984), having children perform daily activities in a routine way (e.g., completing activities at a regular time, in the same place, and in the same sequence), may help ensure that those behaviors are exhibited again at a later time (Jordan, 2003; Sytsma, Kelley, & Wymer, 2001). In the context of bedtime routines, parents having their children perform their nightly activities in the same way, may ensure that their children are more likely to complete those behaviors again a subsequent night. Sytsma and colleagues (2001) further explained that routines may operate as setting events for child compliance by allowing for consistent and predictable environmental cues and by fostering the development of rule-governed behavior (Sytsma et al., 2001). Indeed, it has been argued that each activity that comprises a bedtime routine serves as the discriminative stimulus for the next step in the chain (Henderson et al., 2011). Therefore, parent directives (e.g., “Get ready for bed”) can be conceptualized as “contingency-specifying stimuli” (Sytsma et al., 2001, p. 242) that indicate which behaviors are required to gain access to positive contingencies after

completing the behaviors or avoid negative contingencies that arise from not completing the behaviors (Wittig, 2005). And, Wittig (2005) described that the behaviors comprising a bedtime routine are maintained by the consequences (or contingencies accessed) at the completion of the routine. Therefore, based on the theory of how routines are thought to operate, the use of a bedtime routine should be particularly effective for fostering higher rates of compliance in the minutes immediately preceding and immediately following bedtime and minimizing other externalizing tendencies (e.g., arguing/fighting with caretaker, whining about bedtime).

The early literature on bedtime routines used small case-studies and multiple baseline designs to test bedtime routines as an alternative intervention to extinction procedures and supports the notion that consistent bedtime routines are effective for fostering compliance near bedtime. Bedtime routines were considered to be a more positive and constructive approach because extinction-based interventions are associated with an initial escalation in problem behavior prior to their reduction (i.e., extinction burst), resulting in low rates of treatment acceptability and treatment fidelity by parents (Milan et al. 1981). In seminal case studies, Milan et al. (1981) and Sanders, Boor, and Dadds (1984) found that after the implementation of an individually-tailored bedtime routine, the children in their studies exhibited more cooperative and compliant behavior at bedtime (i.e., reductions in screaming and crying from bed), a reduction in the frequency of disruptive behavior, and a reduction in the frequency of nighttime wakings. In a head-to-head comparison of treatments, Adams and Rickert (1989) directly compared graduated extinction and positive routine interventions and found that both groups exhibited a decrease in the frequency and duration of bedtime tantrums, but the

decrease occurred more rapidly for those in the positive routines condition. Thus, these early studies provide preliminary evidence that bedtime routines may be effective in the treatment of noncompliance near bedtime. Indeed, review articles now frequently recommend bedtime routines as either a stand-alone treatment or a component of a larger treatment package to manage noncompliance at bedtime (e.g., Allen et al., 2016; Kuhn & Weidenger, 2000; Meltzer & Mindell, 2014; Mindell et al., 2006; Morgenthaler et al., 2006; Ortiz & McCormick, 2007). Therefore, it stands to reason that frequent bedtime routines may promote compliance near bedtime, which in turn, may allow children to have better quality sleep.

Although the extant literature indicates that children who are more compliant around bedtime (i.e., less bedtime resistant) fall asleep more quickly, are less likely to experience nighttime awakenings, and have better overall sleep quality (Blader, 1997; Lo, 2016; Owens et al., 2000), the reasoning for this has not yet been empirically studied. Indeed, Gaultney and colleagues (2005) argued that it intuitively makes sense that children who resist going to bed and/or to sleep will obtain an insufficient amount of sleep each night. Based on anecdotal clinical experience, we theorize that the link between compliance near bedtime and sleep quality is attributable to the fact that children who are more compliant at bedtime are less likely to become physiologically or emotionally dysregulated because they are not arguing, protesting, or fighting with their caregivers. Instead, they are calmly and willingly engaging in activities that promote sleep and are sleep compatible (i.e., participating in the routine), which assists in later sleep initiation and maintenance. However, again, the reasoning for this link between compliance near bedtime and sleep quality has not yet been directly tested.

It is important to acknowledge that a wide range of setting events comprise a consistent bedtime routine (i.e., different facets of consistency), which have historically been neglected in the bedtime routine literature. Henderson and Jordan (2010) identified five different aspects of consistency - the same caregiver, the same time, the same place, the same order, and the same activities. Following a factor analysis, Henderson and Jordan (2010) discovered that these constructs clustered into two main factors: routine environment and routine behavior. Of note, the same order of activities (weeknights and weekends) and the same person (weeknights and weekends) were the constructs that had the strongest loadings across the routine behavior and routine environment factors, respectively (Henderson & Jordan, 2010). In an effort to identify the most stream-lined intervention, understanding which aspects of a consistent bedtime routine are most strongly associated with sleep quality is paramount. For parents, this may elucidate what are the most important facets of their routines to elicit significant benefits in their child's sleep quantity and quality (e.g., does it need to be the same parent every night; or does the routine need to occur at the same time each night, etc.).

Bedtime Routines and Anxious Distress Near Bedtime

Previous literature reliably indicates that anxious distress near bedtime is linked with disturbed sleep (e.g., Rafihi-Ferreira, Lewis, McFayden, & Ollendick, 2019; Palmer, Clenti, Meers, & Alfano, 2018; Sadeh 1996). Conway and colleagues (2016) argued that difficulty with regulating fear and arousal contributes to longer sleep onset latencies, which has empirical support in that heightened cognitive and physiological arousal (Alfano et al., 2010) and heightened fear and anxiety (Hansen, Skirbekk, Oerbeck, Richter, & Kristensen, 2011) during bedtime (or the pre-sleep period) have been found to

interfere with sleep initiation (Palmer et al., 2018). For example, in one study, children classified as fearful took approximately an hour longer to fall asleep than children classified as nonfearful (Mooney, 1985). In another study employing actigraphy data, individuals who rated their bedtime stress/worries as "High" immediately preceding bedtime had a greater percentage of being awake during the night (22.6% versus 15.6%), a lower sleep efficiency (81% versus 85.2%), and longer latencies to stage 3 sleep (i.e., 33.9 minutes compared to 18.3 minutes; Akerstedt, Kecklund, & Axelsson, 2007). The researchers argued that "preoccupations" at bedtime impairs sleep (Akerstedt et al., 2007). In his review article, Sadeh (1996) clearly articulated a theory for this relation, positing that stress at bedtime may lead to increases in anxiety, agitation, and vigilance, which activates the sympathetic adrenergic system, which in turn causes difficulties in initiating and maintaining sleep. Therefore, identifying constructs that may help alleviate anxious distress that is occurring proximally to bedtime and the pre-sleep period may be fruitful for promoting better sleep.

Although less empirically studied, there is some preliminary evidence to suggest that the use of a consistent routine may foster low rates of internalizing behaviors and associated distress (e.g., Bridley & Jordan, 2012; Harris et al., 2014; Jordan, 2003; McRae, Stoppelbein, O'Kelley, Fite, & Greening, 2018). Conceptually, scholars have proposed that routines (in addition to fostering compliance) may provide children with consistency and predictability, which may alleviate feelings of anxious distress (Bridley & Jordan, 2012; Ivanova & Irsael, 2006). A reduction in anxious distress at bedtime may allow children to fall asleep more readily and sleep more soundly. To illustrate this notion, Bridley and Jordan (2012) described that a highly anxious child who has an

inconsistent daily routine may worry that s/he will have insufficient time to complete his/her homework, whereas a child with a consistent routine knows the specific time each day allotted for homework completion, thus reducing homework-related anxiety. Expanding this line of reasoning to a bedtime routine, children with an absent or inconsistent bedtime routine may worry if their parent will read them a story at night, tuck them in, give them a goodnight kiss, or remember to turn on their night light; however, with a consistent bedtime routine, they will know the specific activities and their sequence, likely alleviating some anxious distress. Other sleep researchers have made similar arguments such as Mindell et al. (2006; 2015) who speculated that bedtime routines may cause a decrease in bedtime stress (e.g., separation stress and fear), which in turn may lead to improved sleep throughout the night. Hale, Berger, LeBourgeois, and Brooks-Gunn (2011) argued that a bedtime routine is a context in which the relationship between a parent and child can be nurtured and strengthened, which allows for children to feel safe, and fall asleep more quickly and sleep more soundly during the night. Indeed, feeling safe at night is vital for a child to transition from a wakeful state to sleep (Dahl & El-Sheikh, 2007). Thus, consistent bedtime routines may offer feelings of safety and security, and reduce anxious distress near bedtime, which likely facilitates children's ability to self-regulate their sleep/wake states (Dahl, 1996; Mindell & Williamson, 2018). Fortunately, recent evidence suggests that the use of consistent routines fosters better self-regulatory skills (Bater & Jordan, 2016). It was argued that the structure and predictability in routines provide young children with the opportunity to know what to expect, and as such, regulate their behaviors in in accordance with those expectations (Bater & Jordan, 2016). Although these findings pertained to behavioral self-regulation, it

stands to reason that this may extend to emotional self-regulation as well and suggests that children with consistent bedtime routines may be better able to self-regulate their emotions and mitigate feelings of anxious distress around bedtime. Thus, the inherent nature of a routine (i.e., predictability, consistency, stability) may allow children to feel safe and secure (i.e., less anxious distress near bedtime), which in turn may help them fall asleep more quickly and sleep more soundly for longer periods during the night.

Compliance and Anxious Distress Near Bedtime

It is important to consider that worry, fear, and anxious distress near bedtime, in addition to independently contributing to poor sleep outcomes, may also contribute to bad sleep outcomes through poor compliance near bedtime. Indeed, anxiety symptoms in children are correlated with bedtime noncompliance (Chorney, Detweiler, Morris, & Kuhn, 2008; Iwardi et al., 2015; McMakin & Alfano, 2015). In fact, Muris, Meckelbach, Ollendick, King, and Bogie (2001) found that fear at bedtime is common in that more than 70% of young children in their sample experienced nighttime fears (e.g., fears may span from personal safety fears, separation fears, fear of imaginary creatures [i.e., monsters], fear of scary dreams, fear of the dark, or concerns about academic and social functioning [Chorney et al., 2008]), and in turn, fear near bedtime may elicit less bedtime compliance along with difficulties with sleep initiation (Clementi, 2018; Meltzer & Mindell, 2006). Therefore, in addition to anxious distress around bedtime being hypothesized as an independent mechanism through which the frequency of bedtime routines is linked with sleep outcomes, it is also theorized that a serial mediation may exist such that inconsistent bedtime routines may be associated with greater anxious

distress near bedtime, which in turn may be linked with poor sleep quality through decreased compliance at bedtime.

Other Hypothesized Mechanisms of Action

In addition to promoting compliance and a reduction of anxious distress near bedtime, it is important to recognize and acknowledge other hypothesized mechanisms of action cited in the literature, albeit beyond the scope of the current investigation, as well as the expansive benefits of consistent bedtime routines. For example, Kuhn and Weidinger (2000) as well as Kuhn and Elliot (2003) argued that the use of a bedtime routine helps teach children "pre-bedtime behavior" and "sleep onset skills." Moreover, some suggest that bedtime routines assist children in transitioning from a wakeful state to a sleep state (Hale, Berger, LeBourgeois & Brooks-Gunn, 2009) by working as a "behavioral reinforcement chain" or as a context in which sleep onset associations can develop, which inherently links bedtime routine activities to sleep onset and allows for children to fall asleep more readily (Mindell & Williamson, 2018; Owens, 2018; Wolynn, 2011). Similarly, Wolynn (2011) reasoned that a consistent bedtime and bedtime activities (i.e., a routine) are paramount because they serve as cues for children to fall asleep and helps them develop associations between the pre-bedtime period with the upcoming anticipated sleep period. In addition to providing a context for sleep onset associations, Hanley (2013) argued that bedtime routines are a context in which parents can "optimize sleep dependencies" (i.e., events without which children cannot fall asleep) during the pre-sleep period for their children. From a physiological lens, Mindell et al. (2015) argued that a consistent bedtime routine may alter a child's level of arousal, and those modified aspects of the child's physiology (e.g., cortisol levels and core body

temperature) allow the child to initiate sleep more readily. Thus, academics suggest that routines offer a context in which operant and classical conditioning principles set the stage for child sleep.

In sum, there are numerous theories that attempt to explain why bedtime routines are linked to better sleep quality, duration, and maintenance. These leading theories posit that bedtime routines provide a context in which contingency specifying stimuli can be used to promote compliance near bedtime, foster feelings of safety and security (thus minimizing anxious distress at bedtime), develop sleep onset associations, and alter physiological processes that promote sleep. Nevertheless, the mechanisms that explain the link between consistent bedtime routines and sleep quality have been subject to limited scientific inquiry, with the current study focusing on compliance near bedtime and a reduction in anxious distress near bedtime as possible mediators.

To our knowledge, only one study has examined mediators/mechanisms of how bedtime routines relate to sleep outcomes. In a sample of predominantly African American low-income mother-toddler dyads, nighttime wakings mediated the relationship between bedtime routines and nighttime sleep duration (Covington, Rogerts, Armstrong, Storr, & Black, 2019). Mothers who reported using a more consistent bedtime routine with their toddlers, also reported fewer nighttime wakings, and fewer nighttime wakings, in turn, was related to longer nighttime sleep durations among their toddlers (Covington et al., 2019). In fact, Covington and colleagues (2019) found that each additional night that a bedtime routine was implemented was associated with five extra minutes of sleep through a reduction in nighttime wakings. This finding is important when considered in the context that even thirty minutes of less sleep per night

is associated with impairment in daytime functioning (Sadeh et al., 2003). Given this preliminary investigation, there is still substantive room for mechanistic research in the field given its limited exploration.

Additional Benefits of Bedtime Routines Compared to Other Sleep-Related Interventions

This review of the literature provides extensive evidence that the use of a consistent bedtime routine, whether it be assessed cross-sectionally or with an experimental design, is linked with positive sleep outcomes. In addition, bedtime routines are thought to have additive benefits beyond just immediate sleep variables (e.g., distal daytime functioning; Mindell et al., 2015; Mindell & Williamson, 2018) and are purported to positively influence child language and literacy, health and hygiene, the development of a child's adaptive skills and independence, and to foster positive parent-child interactions (Mindell & Williamson, 2018; Ortiz & McCormick, 2007). Moreover, the beneficial effects of a bedtime routine on sleep can be seen very early on (i.e., 3 nights following implementation), which will likely foster parental buy-in to implement the intervention with high fidelity because parents can experience significant improvement, and even relief, within only a few nights (Mindell, Leichman, Lee, Williamson, & Walters, 2017b). In addition to the rapid impact, the implementation of a bedtime routine is not conceptually difficult, making it easy for parents of different educational and cultural backgrounds to use (Milan et al., 1981) and it can be employed with minimal face-to-face contact with a therapist (Mindell et al., 2011a; Mindell et al., 2011b; Sanders et al., 1984). Furthermore, as an intervention, routines are thought to be better than other leading interventions (e.g., extinction, Milan et al., 1981; medication, Kuhn & Weidinger, 2000) for a variety of reasons. First, bedtime routines have been

implemented by parents with superior treatment integrity relative to extinction (Milan et al., 1981). Second, routines minimize the presence of an extinction burst, which parents often find aversive when attempting to implement extinction procedures (Milan et al., 1981; Ortiz & McCormick, 2007). Third, routines teach and reinforce adaptive, appropriate behaviors, whereas extinction procedures do not (Kuhn & Elliot, 2003; Kuhn & Weidinger, 2000). Fourth, high levels of treatment acceptability are reported for routines. In one study, 91% of mothers reported being satisfied with the bedtime routine at the end of the intervention (Mindell et al., 2018). Fifth, bedtime routines do not have the potential for medication side effects and withdrawal, which may occur when implementing pharmacological treatment for sleep problems (Kuhn & Weidinger, 2000). Lastly, preliminary results suggest that routines-based interventions can be easily, effectively, and efficiently delivered via telehealth with high fidelity, reaching a wider audience than traditional intervention modalities (Mindell et al., 2011a; Mindell et al., 2011b).

However, again, possible mechanisms that account for the link between bedtime routines and these positive outcomes have been minimally examined (Mindell et al., 2015; Mindell & Williamson, 2018). Since compliance near bedtime (empirically and theoretically) and anxious distress near bedtime (theoretically) are constructs that have been linked with both bedtime routines (Brown et al., 2016; Dahl 1996; Larsen & Jordan, 2019; Mindell et al., 2015) and indicators of sleep quality (Conway et al., 2016; Mindell et al., 2015; Mindell et al., 2009b; Palmer et al., 2018; Sadeh et al., 2009), compliance near bedtime and anxious distress near bedtime may be independent mechanisms through which consistent bedtime routines relate to sleep quality. For example, a regular bedtime

routine promotes compliance near bedtime (i.e., the pre-sleep period), which may prevent a child from becoming dysregulated (i.e., physiologically or cognitively) from arguing or fighting with their guardians, which in turn may allow the child to initiate sleep more readily and sleep more soundly throughout the night. Similarly, a bedtime routine may offer stability, consistency, and predictability, which may lessen a child's feelings of anxious distress around bedtime (e.g., possibly separation stress or fears; Mindell et al., 2015), which in turn may also minimize physiological and cognitive arousal, allowing the child to initiate sleep more readily and sleep continuously through the night. In addition, to functioning as independent mediators, anxious distress and compliance near bedtime may work as serial mediators as well. Meaning, children with inconsistent bedtime routines may have feelings of anxious distress near bedtime, which in turn may be linked with less compliance in the pre-sleep period (e.g., protests or refusals to get into bed stemming from fear), which in turn predicts poor sleep quality. Thus, compliance near bedtime and anxious distress near bedtime may function as independent mediators, but also work together in a serial model (i.e., anxious distress predicting less compliance around bedtime).

Current Study

The primary aim of the current study was to empirically test if there is a significant indirect effect of bedtime routine consistency on parent-reported sleep quality through compliance near bedtime (as one distinct mediator) and through anxious distress near bedtime (a second distinct mediator) in a community sample of children ages 3 to 5. In other words, does compliance around bedtime (and anxious distress around bedtime, separately) mediate the relationship between bedtime routines and sleep quality? Given

that prevalence studies indicate that the vast majority of parents in the United States use bedtime routines with their children (Hale et al., 2009; Mindell et al., 2009a; Mindell & Williamson, 2018), understanding how and why bedtime routines work is important. We hypothesized that consistency of the bedtime routine would positively correlate with compliance around bedtime and sleep quality and be inversely related to anxious distress near bedtime. We also hypothesized that compliance near bedtime would positively correlate with sleep quality, whereas the other mediator, anxious distress near bedtime, would be inversely correlated with sleep quality. It was also expected that the two hypothesized mediators would be negatively correlated with one another. Secondly, in separate simple mediation models, we expected simple indirect effects of bedtime routines on sleep quality through compliance near bedtime and anxious distress near bedtime, separately. A serial mediation was also examined with bedtime routines being linked with sleep quality through first anxious distress near bedtime and then compliance near bedtime.

A secondary aim of this study was to conduct an exploratory evaluation of the different facets of consistency that are involved in bedtime routines (i.e., the same caregiver; the same place; the same time; the same order; the same activities) to determine which of these possible explanatory variables was most associated with sleep quality. To answer this question, part (semi-partial) correlations were examined. Given the exploratory nature of this research question (i.e., no previous literature upon which to make informed hypotheses), no specific hypotheses were made regarding which facet of consistency would most strongly correlate with the parent-reported sleep quality. However, given the factor loadings of Henderson and Jordan's (2010) study, which

elucidated how well the different facets of consistency intercorrelated to form factors, it was tentatively anticipated that the same order and same person constructs would most strongly correlate with sleep outcomes.

CHAPTER II – METHOD

Participants

One hundred and sixty parents of children between the ages of 3 and 5 were recruited for this study. This sample size was empirically derived to ensure sufficient power (0.8) to detect statistically significant indirect effects using a bias-corrected bootstrap methodology (Fritz & McKinnon, 2007). Indeed, Fritz and McKinnon (2007) reported that a sample size of 118 would have sufficient power to detect a simple mediating effect for a model with a projected medium-small a path (i.e., the predictor to the mediator path) and a medium projected b path (i.e., the mediator to the outcome path). However, given that a serial mediation model was also tested in the current study, it is equivocal if the posed sample size by Fritz and McKinnon (2007) would have sufficient power to detect significant indirect effects in a serial model. Therefore, a larger sample than Fritz and McKinnon (2007) posed was collected to help ensure sufficient power for a serial mediation model.

This study had specific inclusionary criteria. First, the participant had to be a primary caregiver of a child between the ages of 3 and 5. This age group was selected due to the extant literature suggesting that sleep problems are more prevalent in this younger age group rather than elementary-aged children or adolescents (Mindell, et al., 2006). Second, the participant had to be a resident of the United States. This is due to differences in sleep behaviors found cross-culturally (e.g., shifted sleep schedules and increased room-sharing in the Middle East; Mindell et al., 2017a). Third, the participant had to be able to read and write in English because all measures were in English. There were no

other exclusionary criteria. This study was approved by the Institutional Review Board at the University of Southern Mississippi (see Appendix B).

As stated above, 160 parents of children between the ages of 3 and 5 completed the study and passed the quality assurance check criteria to warrant compensation. After screening for multivariate outliers and inappropriate data (see preliminary analyses in the Results section), the final sample consisted of 155 caregivers. The caregiver sample was relatively split regarding gender of the respondent, with 41.3% being male and 58.7% being female. The majority of caregivers (*n* = 141; 91%) reported being the child's biological parent. Most caregivers indicated that they were married (76.1%) and only 8.4% were single (never married). The median family income was reported to be between $50,000-$74,999. This sample was highly educated in that 62.6% of female and 45.1% of male caregivers had at least a college degree. Table 1 provides comprehensive descriptive information regarding the respondents.

The sample of target children was also relatively evenly split between males (56.1%) and females (43.9%), with the sample being predominantly White (77.4%) with an average age of 3.90 (SD = 0.81). Caregivers reported that 74.2% of the children took at least one nap per day, with a median nap duration of 30 to 60 minutes. Additionally, just over half the sample reported that their child sleeps in his/her own bed in his/her own room at night (54.2%). Of note, approximately 29.7% (n = 46), of the children, per parent report, had at least one clinical disorder, with 11.6% of the children in the sample reportedly being prescribed medication for their attention and/or behavior. Regarding comorbid clinical disorders, 8.4% (n = 13) had two clinical disorders and 1.3% (n = 2) had 3 or more comorbidities. In addition, mirroring epidemiological findings from

community samples (e.g., Mindell et al., 2006), 25.8% of the children in the sample had at least one sleep disorder (e.g., 10.3% were diagnosed with Sleep Terrors) and 14.2% of the children were reported to take medications of some kind to help with sleep (e.g., 9% take melatonin). See Table 1 also for descriptive statistics about the target child.

Materials

Demographic Information

Participants completed a demographic questionnaire to obtain descriptive information about the caregiver and the child. This questionnaire asked descriptive questions about the child such as the child's age, sex, race/ethnicity, educational status (e.g., daycare, 3-year-old preschool, 4/5 year-old preschool, kindergarten), diagnostic status pertaining to developmental delays, neurodevelopmental disorders, or other forms of psychopathology (e.g., Separation Anxiety; Oppositional Defiant Disorder), medication status (i.e., with a particular focus on medications for behavioral/attentional functioning and for sleep), sleeping arrangements, and frequency and duration of naps. The questionnaire also inquired about descriptive characteristics of the caregiver such as his/her marital status, age, race/ethnicity, highest level of education, and family income. Certain demographic variables that were correlated with the outcome (i.e., sleep quality) were included as covariates in the models (Carlson & Wu, 2012).

Bedtime Routines

The Bedtime Routines Questionnaire (BRQ; Henderson & Jordan 2010) is a 31-item parent report measure of bedtime routines for children between the ages of 2 and 8. The measure has three scales: Consistency (routine behavior and routine environment), Reactivity (response to change in routines), and Activities (adaptive or maladaptive

activities within a bedtime routine). In this study, the Consistency scale was used as a measure of bedtime routines. The Consistency scale is comprised of 10 items and is rated on a 5-point scale ranging from 1 (*almost never*) to 5 (*nearly always*). Items were averaged with greater scores indicating a greater consistency in bedtime routines. Sample items include, "Performs the same activities in the hour before going to bed" and "Sleeps in the same place." The BRQ demonstrated good internal consistency in this study (α = .89). In prior studies, this instrument demonstrated construct validity by correlating in anticipated directions with child routines, sleep hygiene, and sleep quality (Henderson & Jordan, 2010). Bedtime routine consistency was tested as the predictor in this study.

Bedtime Compliance

The Going to Bed Subscale of the Children's Sleep-Wake Scale (*GTB CSWS*; LeBourgeois, 2003) was used as a measure of compliance near bedtime. This also is a parent-report measure valid for children ages 2 to 8. The Going to Bed subscale is comprised of 11 questions rated on a 6-point scale ranging from 1 (*never*) to 6 (*always*). Sample items include, "Child argues with caretaker" and "Your child makes repeated requests (asks for another drink, hug, etc.) at bedtime." Of note, since this measure was initially created as an index of bedtime resistant behavior, relevant items were reverse scored such that higher scores reflect greater *compliance near bedtime*. The 11 items were then be averaged. In this sample, the GTB subscale demonstrated excellent internal consistency (α = .92). Compliance near bedtime was examined as a mediator in this study.

Anxious Distress

To the authors' knowledge, the only current measure of anxiety in the pre-sleep period for young children is a subscale within a larger questionnaire (i.e., Children's Sleep Habits Questionnaire) that consists of only 4 items (Owens et al., 2000), has some conceptual limitations (per the breadth anxiety-provoking stimuli for young children as outlined by Chorney et al. [2008]), and demonstrates poor internal consistency (i.e., Cronbach's α below 0.70; Owens et al., 2000). Therefore, a new measure of anxious distress near bedtime was generated to tap the breadth of the construct that more closely aligns with Chorney et al. (2008)'s conceptualization of commonly occurring anxieties in young children in the pre-sleep period. Parents rated the 7 items on a scale from 1 (*Rarely*) to 3 (*Usually*), with higher scores indicating greater anxious distress around bedtime. Sample items include "seeks excessive reassurance around bedtime" and "is afraid of monsters (or imaginary creatures) before going to sleep" (see Appendix C). Results from the principle components analysis and an examination of communalities, the scree plot, component loadings, and corrected-item total correlations (ranging from .67 to .81), revealed that all items should be retained with a unitary factor solution. Collectively, the factor explained 58.88% of the total variance in anxious distress near bedtime. The internal consistency for the 7-item measure of anxious distress near bedtime was excellent (α = .90). Additionally, the measure of anxious distress near bedtime demonstrated convergent validity by significantly and positively correlating with the Spence Preschool Anxiety Scale (r = .76; Spence Rapee, McDonald, & Ingram, 2001), which is a psychometrically sound measure of anxiety, broadly speaking, in children in this age group. Anxious distress around bedtime was also a mediator for this study.

Sleep Quality

The remaining subscales (e.g., falling asleep, arousing and awakening, returning to sleep, waking in the morning) of the Children's Sleep Wake Scale (CSWS; LeBourgeois, 2003) were used as a measure of sleep quality, which was the outcome variable in this study. The CSWS has been used as a measure of sleep quality across several studies (e.g., Henderson et al., 2011; Henderson & Jordan, 2010; LeBourgeois et al., 2014). The CSWS is a parent-report measure valid for children ages 2 to 8. Twenty-eight items were rated from 1 (*never*) to 6 (*always*). Sample items include, "tosses and turn in the bed," "kicks off covers," "has trouble going back to sleep," and "is difficult to get out of bed in the morning." In this study, internal consistency was excellent ($\alpha = .92$). Sleep quality was the outcome variable.

Procedure

Participants were recruited through Amazon's Mechanical Turk (Mturk) data collection website: https://www.mturk.com/mturk/welcome. Mturk is a cost-effective and efficient data collection platform on the internet making it more likely to obtain a geographically broad and diverse sample than more traditional data collection methods (Larsen & Jordan, 2019). Relevant to this study, Mturk has been used to collect parent-report data to assess questions that are clinical in nature and was determined to elicit reliable, high-quality data, have greater paternal participation, and mirror findings in the literature (Buhrmester, Kwang & Gosling, 2011; Larsen & Jordan, 2019; Schleider & Weisz, 2015). Amazon's qualification filters of "parenthood status" and "United States" were utilized to recruit for parents from the United States.

Individuals interested in participating in the study were first required to read a long consent form about the study. In accordance with standard practice for internet-based studies relying on self-report measures, quality assurance checks were included (Meade & Craig, 2011). For example, 3 directed items were randomly placed within questionnaires such as, "For this item, select always." The data of study participants who failed at least 2 of the 3 quality assurance checks were not included in analyses; however, they were offered a prorated compensation of $0.50 for their time. The quality assurance stipulation was clearly outlined in the consent form. Upon reading the consent form, individuals interested in continuing with the study selected a box at the bottom of the page indicating their consent. Participants completed a demographic questionnaire and a series of questionnaires relevant for this study and additional questionnaires for a larger data collection. The self-report measures were presented in a randomized order to mitigate any potential order effects. If a parent had more than one child between the ages of 3 and 5, they were directed to randomly choose one of their children and answer all the questionnaires about that child. The questionnaires took approximately 15 to 20 minutes and caregivers were compensated $2.00 after a good-faith effort to answer all relevant questionnaires.

CHAPTER III - RESULTS

Preliminary Analyses

The data were first downloaded and screened for invalid data (i.e., a value screening for out-of-range data). Mahalanobis (1936) distance was used to identify multivariate outliers using a chi square distribution. Meyers, Gamst, and Guarino (2017) recommend evaluating each case in the sample and advise that any case below the strict criterion of an α value below .001 should be considered a multivariate outlier and eliminated from analyses. Two participants were considered to be multivariate outliers according to this criterion and thus were eliminated from analyses. In addition, although screened as eligible for having a child in the designated age range, two participants were eliminated due to indicating that they completed the questionnaires for a child below the age criterion (i.e., 1 and 2 years old). One additional participant was screened as eligible but provided a response in Latin (i.e., “ipsum iure debitis e”) for a question pertaining to sleep behavior, suggesting that this was not likely a valid study completion. Therefore, as noted above, all analyses were completed with a total of 155 participants. A composite for each study variable was computed by first creating a sum (taking into account reverse scored items) and then obtaining an average. Higher scores indicate more of that construct (i.e., more consistent routines, more compliance around bedtime, more anxious distress, better sleep quality). Notably, on an item level, no data were missing for the main study variables.

Primary Analyses

Descriptive data regarding the primary study variables as well as the bivariate correlations between the primary variables and demographic variables can be seen in Table 2. Skewness and kurtosis values for the main study variables were within acceptable limits. Several demographic and descriptive variables were dichotomized, including child race, marital status, child sleep disorder status, child sleep medication status, child clinical disorder status, and child medication status for attention/behavior. Variables were dichotomized (rather than dummy coded) due to the limited racial diversity of the sample, to differentiate between single parenting and coparenting, and because only a minority of children in the sample were reported to have clinical or sleep-related diagnoses or to be taking medications. Co-sleeping status (i.e., sleeping alone or with another family member) was also dichotomized. Bivariate correlations revealed that child race (dichotomized as Non-White = 0, White =1; r = .23), sleep medication status (dichotomized as Not Medicated = 0, Medicated = 1; r = -.23), child sleep disorder status (No Disorder = 0, Sleep Disorder =1; r = -.29), and co-sleeping status (Sleeping Independently =0, Co-Sleeping =1; r = -.32) were significantly correlated with the dependent variable (i.e., sleep quality); meaning, there were associations between children being White and having better parent-reported sleep quality, not taking medication for sleep and having better sleep quality, not having a sleep disorder and having better sleep quality, and sleeping independently and having better sleep quality. Child race, sleep medication status, and co-sleeping status (dichotomized) were used as covariates in the models.

Bivariate correlations were consistent with hypotheses. The consistency of bedtime routines was significantly and positively correlated with compliance near bedtime (r =.18) and sleep quality (r =.45) and inversely correlated with anxious distress around bedtime (r = -.32). The two hypothesized mediators (i.e., compliance near bedtime and anxious distress near bedtime) were negatively correlated with one another (r =-.35). In relation to the outcome variable, zero-order correlations were in expected directions: anxious distress around bedtime was negatively correlated with sleep quality (r =-.67) and compliance near bedtime was positively correlated with sleep quality (r =.61). As expected, child age was negatively correlated with nap duration (r = -.33). Disorder status (clinical or sleep) and medication status (sleep or attention/behavior) were all positively correlated with one another. Additionally, children who co-slept were reported to have more inconsistent bedtime routines (r =-.22), have less anxious distress around bedtime (r = .20), and exhibit less compliance around bedtime (r = -.25). See Table 2 for a complete correlation matrix.

Simple Mediation Models

The PROCESS macro (v. 3.5) Model 4 in the SPSS (v. 22) software package was used to examine the simple mediation models. Using ordinary least squares path analysis, 5,000 bootstrap samples were used to estimate 95% bias-corrected confidence intervals to test the significance of the direct, indirect, and total effects for each model (Hayes, 2017). Confidence intervals exclusive of zero suggest significant effects. Contrary to hypotheses, there was not a significant indirect effect of consistency of bedtime routines on sleep quality through compliance near bedtime (B = .06, SE = .05, CI [-.03 .17]) when covariates (i.e., child race, sleep medication status, and co-sleeping status) were included

in the model. Illustrated in Figure 1, parents who reported more consistent bedtime routines did not report that their child exhibited more compliance in the pre-bedtime period; however, more compliance around bedtime was related to better parent-reported sleep quality. The total effect of the consistency of bedtime routines on sleep quality (B = .36, SE = .08, p < .001) and the direct effect (B = .30, SE = .06, p < .001) were both significant. Notably, when covariates were excluded from the model, the indirect effect was significant (B = .11, SE = .06, CI [.004, .22]) and suggested that bedtime routine consistency predicted more compliance near bedtime (B = .26, SE = .11, CI [.04, .48]), which in turn predicted better sleep quality (B = .41, SE = .04, CI [.32, .50]). These results suggest that compliance near bedtime mediates the relationship between bedtime routine consistency and sleep quality until the variance accounted for by child race, sleep medication status, and co-sleeping status is considered. To further examine this unexpected finding, post hoc analyses were conducted. The coefficients for bedtime routine consistency, child race, sleep medication status, and co-sleeping status in predicting compliance around bedtime were examined (i.e., the *a* path). When all four predictors were together in the model, co-sleeping status was the only significant predictor (B = -.45, SE = .17, p = .008, CI [-.78, -.12]), with sleeping independently predicting more compliance near bedtime. Given the magnitude of the coefficient of co-sleeping status in predicting compliance near bedtime, there was likely not enough *unique* variance remaining in compliance near bedtime for consistent bedtime routines to make a statistically significant contribution. Indeed, even with no covariates, the coefficient for bedtime routines predicting compliance near bedtime was small-to-moderate (B = .26, p = .02). Additional exploratory analyses revealed that there was no

evidence that this mediation model was moderated by any of the covariates (i.e., the *Index of Moderated Mediation* was inclusive of zero when considering each covariate separately; Hayes, 2017).

The second simple mediation model examined the significance of the indirect effect of consistency of bedtime routines on sleep quality through anxious distress around bedtime. Including child race, sleep medication status, and co-sleeping status as covariates, as predicted, there was a significant indirect effect of bedtime routine consistency on sleep quality through anxious distress around bedtime (B = .14, SE = .06, CI [.02, .26]). As shown in Figure 2, parents who endorsed more consistent bedtime routines reported that their child exhibited less anxious distress around bedtime, and in turn, also reported better sleep quality. The total effect of consistency of bedtime routines on sleep quality (B = .36, SE = .08, p <.001) and the direct effect were significant (B = .22, SE = .06, p < 001).

Serial Mediation Model

To test the serial mediation model, the PROCESS macro (Model 6) with 5,000 bootstrap samples was used to estimate 95% bias-corrected confidence intervals. As with the simple mediation models, confidence intervals exclusive of zero suggest significant indirect effects (Hayes, 2017). Including child race, sleep medication status, and co-sleeping status as covariates, the specific indirect effect of bedtime routine consistency on sleep quality through first anxious distress near bedtime and then compliance near bedtime was significant (B = .03, SE = .01, CI [.01, .06]). This suggests that parents who are more consistent in their nightly bedtime routine reported that their child experiences less anxiety in the pre-sleep period, which in turn predicts better sleep quality through an

increase in compliance around bedtime. Paralleling the results in the simple mediation models, the specific indirect effect of bedtime routine consistency on sleep quality through anxious distress around bedtime (accounting for bedtime compliance) was significant (*B* = .11, *SE* = .05, CI [.02, .21]), but the specific indirect effect of bedtime routine consistency on sleep quality through bedtime compliance (accounting for anxious distress near bedtime) was not statistically significant (*B* = .02, *SE* = .04, CI [-.04, .11]). This suggests that anxious distress around bedtime mediates the relationship between bedtime routine consistency and sleep quality after taking into account compliance near bedtime, but compliance near bedtime does not mediate the relationship between bedtime routine consistency and sleep quality after taking into account anxious distress around bedtime. The total indirect (i.e., the sum of all three specific indirect effects) effect was significant (*B* = .16, *SE* = .07, CI [.02, .31]), as were the total (*B* = .36, *SE* = .08, $p < .001$) and direct effects (*B* = .20, *SE* = .05, $p < .001$).

The mediators in the serial mediation model were reversed (i.e., first bedtime compliance and then anxious distress near bedtime) to assess the temporal sequence of the variables given the cross-sectional design of this study. With the three covariates included, the indirect effect was not statistically significant (*B* = .01, *SE* = .01, CI [-.007, .04]), adding greater credence to the temporal order of the variables. These results suggest that a more consistent bedtime routine does not first predict greater compliance at bedtime followed by a reduction in feelings of anxious distress in the pre-sleep period, allowing for better quality sleep; conversely, these results suggest that more consistent bedtime routines is related to a reduction in anxiety in the pre-sleep period, which

directly (and indirectly through more compliance around bedtime) is linked with better parent-reported sleep quality.

Part Correlations

Part correlations were examined to determine if any facet of routine consistency (e.g., the same caregiver present during the routine, going to bed consistently at the same time), collapsed across weekday and weekend, was the best predictor of child sleep quality. Routine bedtime was the only significant part correlation (r =.21 p < .001) and routine activities (same activities comprising the routine) was trending towards significance (r =.12 p = .08; see Table 3 for part correlations). These results suggest that a consistent nightly bedtime (i.e., the same time each night) is the facet of a bedtime routine that is most related to better parent-reported sleep quality.

CHAPTER IV – DISCUSSION

Results from previous studies have repeatedly shown that the use of a consistent bedtime routine is associated with better sleep outcomes for young children when assessed cross-sectionally, longitudinally, and when using experimental designs that employ rigorous methodological standards (Henderson & Jordan, 2010; Mindell & Williamson, 2018). However, to our knowledge, only one study to date has examined why the use of a consistent bedtime routine is associated with better sleep outcomes. This study revealed that more frequent bedtime routines predicted fewer nighttime wakings, which in turn was linked with more total sleep per night (Covington et al., 2019). The current study aimed to expand the extant literature to identify *other* possible mechanisms to explain the relationship between consistent bedtime routines and better sleep outcomes in young children.

Our correlational results were in accordance with previous findings that the use of a consistent bedtime routine was positively correlated with better sleep quality (Henderson & Jordan, 2010), suggesting that children who had more consistent bedtime routines were also reported to have better parent-reported overall sleep. Not surprisingly, younger child age was positively correlated with nap duration, which is developmentally appropriate (Iglowstein, Jenni, Molinari, & Largo, 2003). Additionally, this study's findings were consistent with prior studies, which found that children who are Non-White (Henderson & Jordan, 2010) and children who co-sleep with their parents have worse sleep quality (Mao, Burnham, Goodline-Jones, Gaylor, & Anders, 2004; Teti, Shimizu, Crosby, & Kim, 2016). Also, not surprisingly, children with a diagnosed sleep disorder were rated to have worse sleep quality. In our sample, approximately 25% of the children

were reported to have sleep problems. This statistic is commensurate with other larger-scale studies that employed epidemiological approaches for assessing the frequency of sleep-problems (e.g., Mindell et al., 2006). This concordant finding lends confidence in the validity of the data collected using an online platform, as it replicates prior findings. Thus, descriptive statistics and correlations from this online sample are consistent with the extant literature.

We examined markers of internalizing and externalizing behaviors in the pre-sleep period. Children who were reported to be less compliant, or more resistant around bedtime, and/or more anxious in the pre-sleep period were also more likely to co-sleep, which is consistent with the existing literature (Blader et al., 1997; Cortesi, Giannotti, Sebastiani, Vagnoni, & Marioni, 2008). These significant correlations are likely attributable to known associations between parenting and child psychopathology. For example, the positive relationship between co-sleeping and anxious distress near bedtime may be a function of parental accommodation - that is, changes parents make in their behaviors in an effort to prevent or reduce any experiences of distress in their child (Leibowitz et al., 2013; Thompson-Hollands, Kerns, Pincus, & Comer, 2014). Indeed, co-sleeping is one of the main forms of parental accommodation (Thompson-Hollands et al., 2014). In Thompson-Hollands et al.'s (2014) sample, 31% of caregivers endorsed that they let their child co-sleep, despite mothers reporting that co-sleeping significantly interfered with family life. Although parental accommodations reduce a child's feeling of anxious distress in the short term, it is counterproductive because it contributes to anxiety maintenance in the long-term via negative reinforcement (e.g., escape and avoidance; Ginsburg, Siqueland Masia-Warner, & Hedtke, 2004). Thus, the strong correlation

between co-sleeping and anxiety around bedtime may be reflective of parental accommodation. Similarly, the relationship between co-sleeping and poor compliance may also be reflective of parental acquiescence (i.e., "giving in," known as reactive co-sleeping; Madanasky & Edelbrock 1990; McLay, France, Knight, Blampied, & Hastie, 2019; Ramos, Youngclarke, & Anderson, 2007) as well as poor limit setting and follow through, which are maladaptive parenting practices that are addressed in evidence-based treatments (e.g., Forehand & McMahon, 1981). Although the rationale for these correlations are merely speculative, later studies may wish to explore these relations longitudinally to examine the temporal nature or the possibility for bidirectional relations between these constructs. For example, perhaps co-sleeping is related to less anxious distress in the pre-sleep period, which in turn promotes co-sleeping arrangements in the long term due to the ease with which a child goes to bed (McLay et al., 2019). Thus, our correlational findings easily assimilate with current leading theories regarding parenting behaviors and how they relate to anxiety and disruptive behaviors in children, but specifically in relation to how these may manifest around bedtime.

Extending the literature base, we identified anxious distress as a mechanism through which bedtime routine consistency is related to sleep quality. Meaning, children who have more consistent bedtime routines were reported to experience less anxious distress around bedtime, which in turn was related to better parent-reported sleep quality, even after controlling for three covariates - child race, child sleep medication status, and co-sleeping status. This significant indirect effect lends empirical support to the theoretical argument made by Bridley and Jordan (2012) regarding why consistent routines may be related to lower rates of internalizing tendencies in young children.

Specifically, a consistent bedtime routine may foster fewer internalizing behaviors such as anxiety because routines provide children with a sense of predictability, consistency, and security, which may attenuate anxious distress (Bridley & Jordan, 2012). Moreover, given the empirical evidence for the construct of "intolerance of uncertainty" as an important contributor to symptoms of childhood anxiety (Comer et al., 2009), a consistent bedtime routine may eliminate or reduce elements of uncertainty in the pre-sleep period. For instance, a consistent bedtime routine may allow a child to know the order of activities, where they are occurring, with whom they are completing activities, and at what time the routine starts, which may reduce uncertainty and alleviate anxious distress. A bedtime routine operating in this manner supports Dahl's (1996) supposition that feeling safe and secure is paramount to successfully transition between wake and sleep states. Thus, we theorize that a consistent bedtime routine may alleviate anxiety around bedtime either through increasing predictability and/or mitigating uncertainty around bedtime.

Contrary to our predictions, parent-reported child compliance near bedtime did not mediate the relationship between bedtime routine consistency and sleep quality when covariates (i.e., child race, sleep medication status, co-sleeping status) were included in the model. However, there was evidence that compliance near bedtime was a mediator when the covariates were excluded. In combination, these results suggest that the use of a consistent bedtime routine is predictive of more compliance near bedtime, providing empirical support for Sytsma and colleagues' (2001) argument that a consistent routine promotes compliance in young children. However, in the present study, this relationship was weak, and one that deteriorated once the impact of co-sleeping was considered.

Indeed, when considering all three covariates and bedtime routine consistency, sleeping independently was the only significant predictor of compliance at bedtime. Thus, although bedtime routine consistency promotes compliance at bedtime, sleeping independently is a more important construct in explaining compliance in the period preceding bedtime. This may be because independent sleep is a byproduct of a learning history that contains minimal parental accommodations or acquiescence in light of repeated protests or demands from a child. Another important consideration is that the indirect effect of bedtime routines on sleep quality through compliance at bedtime was still trending towards significance when the covariates were included. Thus, it may also be the case that our sample was underpowered to find a significant indirect effect. Most importantly, in the models with and without the covariates, more compliance near bedtime was predictive of better sleep quality, suggesting that greater child compliance around bedtime is important for high quality sleep. If this is the case, it stands to reason that evidence-based behavior management strategies known to promote compliance in young children such as differential attention, contingent rewards, behaviorally specific praise, token economies, and effective instruction delivery (Handen & Gilchrist, 2006) may be useful for achieving better quality sleep. However, empirical studies are needed to directly test this assumption. In summary, results of this study suggest that bedtime routine consistency may play a small role in promoting compliance in the pre-sleep period; however, parents having compliance from their child around bedtime, whether that be through a history of sleeping independently or other mechanisms, is crucial for a good night sleep.

Notably, the data also supported a significant serial mediation model whereby children with more consistent bedtime routines were reported to experience less anxious distress near bedtime, which in turn predicted more compliance in the pre-sleep period, followed by better sleep quality. This serial pathway held true even after taking into account the variance that child race, sleep medication, and co-sleeping status explain in sleep quality. Despite the cross-sectional design, analyses support the temporal sequence of the variables given that when the mediators were reversed (i.e., compliance at bedtime followed by anxious distress near bedtime), the serial model was not supported. These results suggest that there is a unique sequence such that a consistent bedtime routine is associated with children feeling lower levels of anxiety in the pre-sleep period, which in turn is predictive of more compliance at bedtime, which then allows for higher quality sleep. This expands the literature on bedtime routines by identifying another possible mechanism and pathways through which bedtime routines relate to better sleep. Specifically, this pathway likely highlights the "externalizing internalizer" clinical presentation in the context of bedtime. Clinically, this may manifest as children experiencing nighttime fears (e.g., fearful themes such as separation from caregivers, fear of the dark, intruders/burglars), which in turn elicit resistant behaviors (e.g., argument with parents, demands for the parent to stay by the child's bedside, stalling at bedtime; Clementi, 2018). However, results suggest that if parents can employ strategies to alleviate and manage their child's anxiety before bedtime through consistent routines, compliance around bedtime and a good night sleep will likely follow.

Exploratory analyses also were conducted to determine if certain facets of consistency within a routine are differentially predictive of children's sleep quality. The

part correlation of the largest magnitude was routine time. Meaning, after taking into account other facets of consistency, having the same bedtime each night contributed the most unique variance in predicting parent-reported sleep quality. This provides additional empirical data to the oft-stated parental recommendation about the importance of putting to children to bed at the same time each night to maintain social rhythms. Indeed, prior studies reveal that an irregular bedtime adversely impacts sleep quality (Kang & Chen, 2009). These results suggest that if parents are to implement any facet of a routine, putting their child to bed at the same time each night is most important for promoting high quality sleep, at least for preschool-age children.

Future Research

Future researchers may wish to employ more sophisticated data collection methodologies to obtain precise recordings of physiological changes in the pre-sleep period and child sleep behaviors. As Mindell et al. (2015) proposed, one possible mechanism through which bedtime routines exact their influence on sleep outcomes is through physiological changes that arise from activities that comprise a bedtime routine (e.g., baths). Indeed, we speculate that the reduction in anxious distress in the pre-sleep period occurs in tandem with a reduction in cognitive or and/or physiological arousal, which allows children to initiate sleep more readily. Thus, employing physiological measures to concretely evaluate possible changes in physiological indicators of stress would provide data to support the notion that physiological changes do occur in the context of a bedtime routine. In addition, future studies may wish to employ actigraphs, which are non-invasive forms of technology used to monitor sleep-wake cycles in a way that is more precise than parent report on a questionnaire (Mindell et al., 2010). Indeed,

the validity of parent-report data in this age group is less accurate than parent-report sleep data for infants and toddlers (Mindell et al., 2010). In sum, using actigraphs and physiological measures would provide objective, rather than subjective data, of sleep quality in young children.

In addition, although our results supported anxious distress as an independent mediator and anxious distress and compliance near bedtime as serial mediators of the relationship between bedtime routines and sleep quality, significant direct effects suggest that there are likely other mediators of the relationship between bedtime routine consistency and sleep quality at play. Based on the current state of the literature, other possible mediators may include sleep ecology factors (e.g., sleeping with the lights off; a cool room), sleep hygiene factors (e.g., caffeine consumption; naps), parenting practices, or positive parent-child relationships. Mindell and Williamson (2018) stated that a consistent routine may be an indicator of positive parent-child relationships and that the secure attachment may allow children to feel safer and sleep more soundly throughout the night, rather than necessarily the consistency of a routine setting the stage for improved sleep quality. Furthermore, as discussed by Mindell and Williamson (2018), future research should continue to expand and investigate how the use of consistent bedtime routines are related to other crucial outcomes beyond sleep (e.g., daytime functioning). These possibilities warrant future investigation of additional constructs to add to our understanding of how the use of consistent routines relate to better sleep and child functioning.

Furthermore, this study employed a new measure of anxious distress in the pre-sleep period. This measure was derived from facets of sleep anxiety described by

Chorney et al. (2008) and a measure of preschool anxiety developed by Spence and colleagues (2001). Although a psychometric evaluation was not the main focus of this study, the developed measure had sound psychometric properties such as excellent internal consistency, strong corrected item-total correlations, and it maintained a unitary solution in the exploratory factor analysis, as well as demonstrated construct validity by correlating with a psychometrically sound measure of anxiety in preschoolers (Spence et al., 2001). A logical area for future research is a comprehensive psychometric evaluation of the measure including test-retest reliability, more extensive evidence of convergent validity and divergent validity, and possibly determining if this measure can discriminate between anxious and nonanxious youth. Given the prevalence of sleep problems in young children (Mindell et al., 2006), having a psychometrically sound assessment measure of anxiety in the pre-sleep period may give pediatricians and practitioners alike an appropriate tool to monitor anxiety around bedtime over time or determine if it warrants clinical intervention.

Additionally, our sample had a large portion of fathers and to our knowledge, this is one of the first studies that had paternal participation when assessing bedtime routines specifically (also see Ragni, De Stasio, Barni, Gentile & Giampaolo, 2019). Indeed, fathers are an understudied population when it comes to examining parenting and child functioning (Phares, Fields, Kamboukos, & Lopez, 2005). Because approximately 70% of parents in the United States report working between the hours of 8:00AM and 5:00PM (Brown, Boser, & Baffour, 2016), both mothers and fathers may have a more accurate or nuanced insight regarding their child's functioning at night and routines around bedtime, as opposed to routines of their child across the entire day, given that they are more likely

to be at home at night. Thus, father involvement in bedtime routines may be a ripe area for further study both due to the historical reliance on maternal report (e.g., Mindell et al., 2015a) and the initial evidence that low paternal involvement at bedtime is predictive of bedtime difficulties (Ragni et al., 2019). Moreover, given the prevalence of divorce in the United States, it would be interesting to examine sleep patterns and routines across households - particularly how disrupted and inconsistent routines interfere with a child's sleep quality.

Overall, these results add additional empirical support to the small, but growing body of literature supporting the notion of studying bedtime routines as an intervention to promote good sleep outcomes for children. A bedtime routine in the age group of this study (i.e., 3 to 5 years old) may be particularly important given that nighttime fears such as a fear of the dark, although developmentally normative, commonly emerge in the preschool and early elementary years (Muris et al., 2001). It may also be informative to attempt to replicate these findings in an older age group (e.g., 6 to 8) to assess the robustness of the theoretical models.

Limitations

This study has some limitations that should be acknowledged. First, all data were self-report questionnaires from a single caregiver. Multiple indicators of study variables and employing objective measures (e.g., actigraphy) of sleep behaviors would be a more robust way to assess these associations. However, this study design and methodology was consistent with the majority of the extant literature on routines and sleep outcomes (e.g., Henderson & Jordan, 2010; Mindell & Williamson, 2018) and is appropriate for an initial investigation. Second, this study was a cross-sectional design assessing the predictor,

mediators, and outcome variable at a single time point. A longitudinal design would be better apt to confirm the temporal sequence of the variables. However, reversing the order of the mediators in the serial model (i.e., using bedtime compliance as mediator 1 and anxious distress near bedtime as mediator 2) and failing to find a significant indirect effect provides greater credence to the temporal order of the model. And last, although MTurk does allow for a greater geographic and diverse sample to be recruited than in-person studies (Larsen & Jordan, 2019), there was some evidence of invalid data despite employing best-practices for quality assurance checks (Meade & Craig, 2011), suggesting that perhaps shorter (e.g., less involved and time-consuming studies) or more stringent criteria should be used when employing this platform for data collection.

Conclusion

The importance of sleep for young children is undisputed in the academic literature and popular parenting books alike and is crucial for children's overall development. This study continues to expand the small, but growing body of literature revealing that the use of a consistent bedtime routine promotes better sleep quality in young children. Importantly, this study identified a serial model and an independent mediator, that may explain, in part, the relationship between the consistency of a bedtime routine and better quality sleep among preschool-age children. Specifically, bedtime routines are associated with better sleep quality through reducing anxious distress (and indirectly through compliance near bedtime) in the pre-sleep period. Given that experts in the field posit that routines are an easy, cost-effective intervention (Harris et al., 2014), results of this study may provide struggling parents a concrete first step for alleviating poor sleep quality, which is paramount given that child sleep is associated with both

parent (e.g., Mindell et al., 2011a) and child functioning (e.g., Mindell & Williamson, 2018).

APPENDIX A – TABLES AND FIGURES

Table A1.

Descriptive characteristics of target child and caregiver

Child Characteristics	**N**	**%**	**Caregiver Characteristics**	**N**	**%**
Child Sex			**Respondent Relation to Target Child**		
Male	87	56.1	Biological parent	141	91
Female	68	43.9	Step-parent	5	3.2
Child Age			Adoptive parent	4	2.6
3	59	38.1	Grandparent	4	2.6
4	53	34.2	Legal Guardian (e.g., foster parent)	1	0.6
5	43	27.7	**Respondent Gender**		
Child Race			Female	91	58.7
White	120	77.4	Male	64	41.3
Black or African American	14	9	**Household Highest Education Level**		
Asian	2	1.3	*Female Caregiver Education*		
White Hispanic	8	5.2	Some high school (10th, 11th grade)	2	1.3
Non-White Hispanic	2	1.3	High school graduate	16	10.3

Table 1 Continued.

American Indian/Alaska Native	1	0.6	Some College/ Specialized Training	37	23.9
Multiracial	8	5.2	Standard College or University Graduate	73	47.1
Sleep Disorders			Graduate Professional Degree	24	15.5
Night Terrors/ Sleep Terrors	16	10.3	No Response	3	1.9
Sleep Walking	7	4.5	*Male Caregiver Education*		
Nightmares	17	11	Junior high school (7th, 8th, 9th grade)	1	0.6
Behavioral Insomnia of Childhood (sleep-onset association type)	6	3.9	Some high school (10th, 11th grade)	2	1.3
Behavioral Insomnia of Childhood (limit-setting type)	5	3.2	High school graduate	22	14.2
Confusion Arousals	3	1.9	Some College/ Specialized Training	35	22.6
Restless Leg Syndrome	4	2.6	Standard College or University Graduate	45	29.0
Sleep Medication			Graduate Professional Degree	25	16.1
Melatonin	14	9	No Response	25	16.1
Ambien (Zolpidem)	2	1.3	**Marital Status**		
Clonazepram (Klonipin)	1	0.6	Single (never married)	13	8.4
Estazolam (ProSom)	1	0.6	Currently married	118	76.1
Desyrel (Trazodone)	1	0.6	Currently living together (not married)	12	7.7

Table 1 Continued.

Sominex	1	0.6	Separated	7	4.5
Sonata (Zaleplon)	1	0.6	Divorced	5	3.2
Antihistamines (e.g., Benadryl)	1	0.6	**Household Employment**		
Other	2	1.3	*Female Caregiver Employment*		
Child Clinical Disorder			None, Unemployed	51	32.9
ADHD	16	10.3	None, Disabled	3	1.9
Oppositional Defiant Disorder (ODD)	2	1.3	Yes, Part-Time	35	22.6
Autism Spectrum Disorder	17	11	Yes, Full Time	63	40.6
Global Developmental Delay	3	1.9	No Response	3	1.9
Speech/Language Impairment	16	10.3	*Male Caregiver Employment*		
Separation Anxiety Disorder	10	6.5	None, Unemployed	3	1.9
Medication for Attention/Behavior			None, Disabled	1	0.6
Psychostimulants/ADHD Medication	10	6.5	Yes, Part-Time	3	1.9
Nonstimulant ADHD Medication	4	2.6	Yes, Full Time	123	79.4
Allergy/Asthma Medication	2	1.3	No Response	25	16.1
Antidepressants/Antianxiety Medication	4	2.6	**Family Income**		
Nap Duration			Earns Less Than $10,000	1	0.6

Table 1 Continued.

Does not nap	40	25.8	$10,000-$19,999	5	3.2
1-30 minutes	16	10.3	$20,000-29,999	9	5.8
31 minutes to 1 hour	37	23.9	$30,000- $ 39,999	12	7.7
1 hour to 1.5 hours	42	27.1	$40,000- $49,999	15	9.7
1.5 to 2 hours	16	10.3	$50,000- $74,999	42	27.1
2 hours to 2.5 hours	2	1.3	$75,000- $99,999	35	22.6
More than 2.5 hours	2	1.3	$100,000- 124,999	10	6.5
Sleeping Arrangement			$125,000- $149,999	12	7.7
Sleep in own bed in own room	84	54.2	$150,000- $ 199,999	7	4.5
Sleep in own bed in a shared room (e.g., with sibling)	26	16.8	More than $200,000	7	4.5
Share a bed with a sibling	5	3.2			
Share a bed with a parent	21	13.5			
Sleep on couch/futon	1	0.6			
Sleep on couch/futon with a parent or sibling	2	1.3			
Start the night sleeping in own bed, but transition to parents' bed	13	8.4			
Other	3	1.9			

Table A2.

Bivariate correlations and descriptive statistics for study variables and demographic variables

Variables	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1. Bedtime Routines Consistency	--													
2. Anxious Distress Near Bedtime	-.32**	--												
3. Compliance Near Bedtime	0.18*	-.35**	--											
4. Sleep Quality	0.45**	-.67**	.61**	--										
5. Child Age	-.01	.12	-.04	-.10	--									
6. Family Income	-.01	.02	-.07	-.06	-.14	--								
7. Child Nap Duration	-.09	.10	.07	-.10	-.33**	.05	--							
8. Child Race[a]	.20*	-.27**	.13	.23**	-.01	-.11	-.03	--						
9. Child Gender[b]	-.03	.03	-.13	-.07	.02	.02	.09	-.14	--					
10. Child Sleep Disorder Status[c]	-.14	.48**	-.10	-.29**	.002	.15	-.04	-.14	-.08	--				
11. Child Sleep Medication Status[d]	-.17*	.15	-.03	-.23**	.14	-.04	.04	-.001	-.10	.27**	--			
12. Child Clinical Disorder Status[e]	-.19*	.26**	.03	-.16	.08	-.03	-.02	-.02	-.26**	.36**	.34**	--		
13. Child Medication Status[f]	-.20*	.24**	.05	-.14	.05	.01	.05	-.05	-.16*	.43**	.49**	.51**	--	

Table 2 Continued.

14. Parental Marital Status[g]	-.02	-.02	.02	.05	-.05	-.03	.12	.17*	-.12	-.10	-.05	.01	-.01	--
15. Co-Sleep Status[h]	-.22**	.20*	-.25**	-.32**	.12	-.23**	.08	-.10	.04	.01	.03	-.04	-.14	.07
Mean	4.10	1.31	3.72	4.35	3.90	6.41	--	--	--	--	--	--	--	--
SD	0.68	0.46	0.95	0.72	0.81	2.12	--	--	--	--	--	--	--	--
Skewness	-0.70	1.47	-0.22	-0.47	0.19	0.07	--	--	--	--	--	--	--	--
Kurtosis	0.29	0.96	-0.50	0.37	-1.44	0.04	--	--	--	--	--	--	--	--
Minimum	1.90	1.00	1.45	1.79	3.00	1.00	--	--	--	--	--	--	--	--
Maximum	5.00	2.71	5.91	5.79	5.00	11.00	--	--	--	--	--	--	--	--
Actual Range	3.10	1.71	4.45	4.00	2.00	10.00	--	--	--	--	--	--	--	--
Potential Range	1-5	1-3	1-6	1-6	3-5	0-11	--	--	--	--	--	--	--	--

Note: [a]Race was dichotomized as Non-White = 0 and White = 1. [b]Child gender was coded Male = 1, and Female = 2. [c]Child Sleep Disorder Status was dichotomized as No Disorder = 0 and Disorder = 1. [d]Child Sleep Medication Status was dichotomized as Not medicated = 0 and Medicated = 1. [e]Child Clinical Disorder Status was dichotomized as No Disorder = 0 and Disorder = 1. [f]Child Medication Status for Attention/Behavior was dichotomized as Not medicated = 0 and Medicated = 1. [g]Marital Status was coded as Not Married or Living as Married =0 and Married or Living as Married = 1. [h]Co-Sleep Status was coded as Sleep Alone (in own room or own bed in shared room) = 0 and Co-Sleep =1. * $p < .05$ ** $p < .01$ *** $p < .001$.

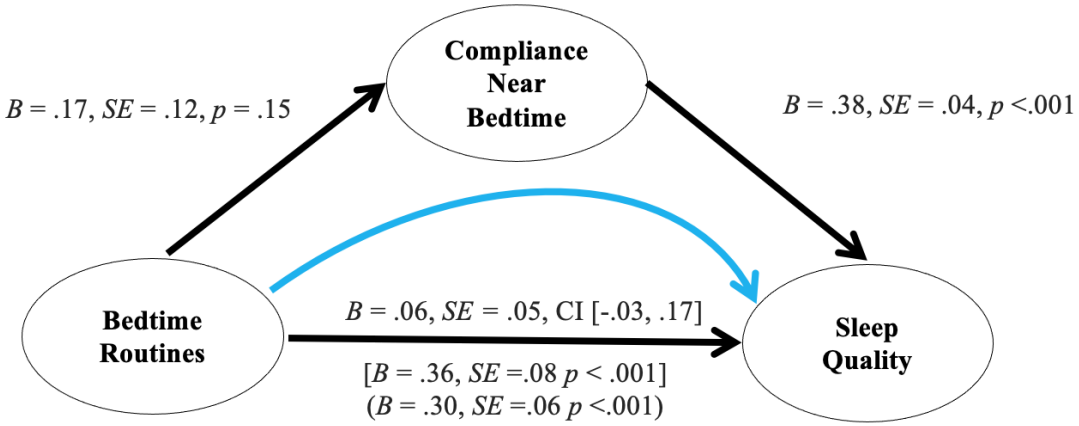
Table A3.

Part correlations between facets of a consistent bedtime routine and sleep quality

Variables	Sleep Quality
1. Activities	.12+
2. Order	-.03
3. Place	.08
4. Time	.21***
5. Person	-.003

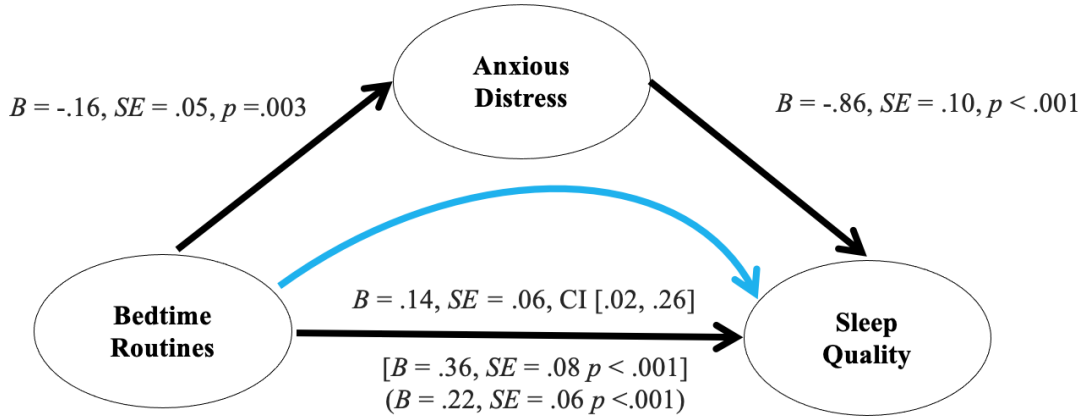
Note: + p <.10, * p < .05, **p < .01, *** p < .001.

Figure 1. Simple mediation model of bedtime routines on sleep quality through compliance near bedtime while controlling for child race, co-sleeping status, and sleep medication status.



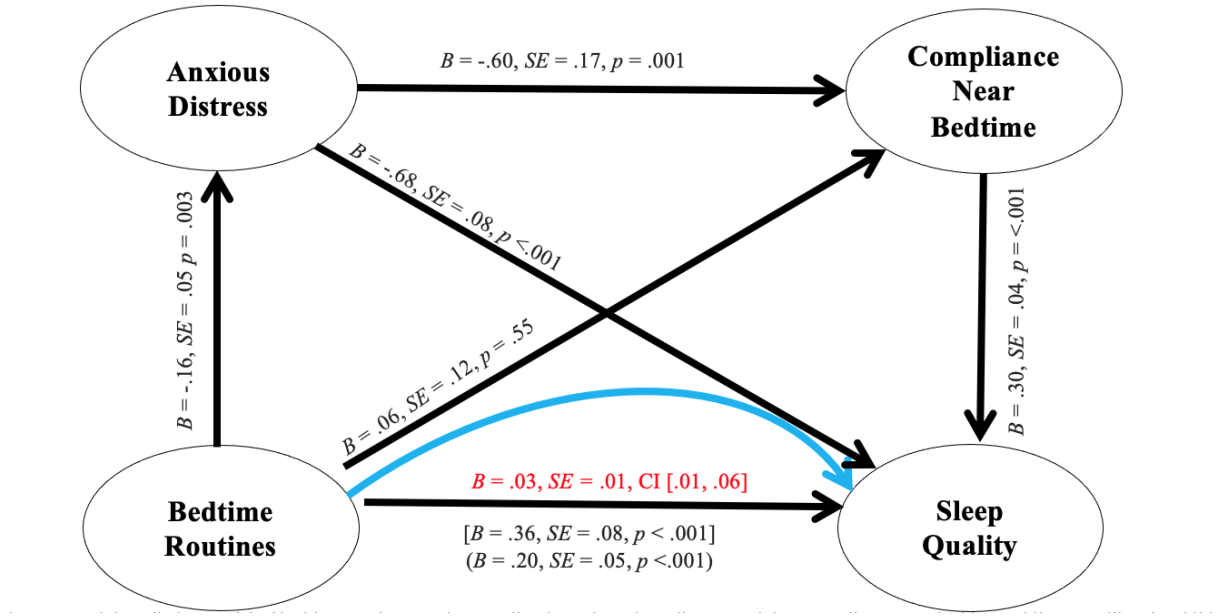
Note: Unstandardized regression coefficients are reported. The statistics in brackets show the total effect of bedtime routines on sleep quality. The statistics in parenthesis show the direct effect of bedtime routines on sleep quality, after controlling for the indirect effect of compliance near bedtime. The indirect effect (depicted in blue below the curved arrow) was significant based on an asymmetric 95% confidence interval with 5,000 resamples with replacement (Hayes, 2017).

Figure 2. Simple mediation model of bedtime routines on sleep quality through anxious distress while controlling for child race, co-sleeping status, and sleep medication status.



Note: Unstandardized regression coefficients are reported. The statistics in brackets show the total effect of bedtime routines on sleep quality. The statistics in parenthesis show the direct effect of bedtime routines on sleep quality, after controlling for the indirect effect of anxious distress. The indirect effect (depicted in blue below the curved arrow) was significant based on an asymmetric 95% confidence interval with 5,000 resamples with replacement (Hayes, 2017).

Figure 3. Serial mediation model of bedtime routines on sleep quality through anxious distress and then compliance near bedtime, while controlling for child race, co-sleeping status, and sleep medication status.



Note: Unstandardized regression coefficients are reported. The statistics in brackets show the total effect of bedtime routines on sleep quality. The statistics in parenthesis show the direct effect of bedtime routines on sleep quality, after controlling for the indirect effects. The indirect effect (depicted in blue below the curved arrow) was significant based on an asymmetric 95% confidence interval with 5,000 resamples with replacement (Hayes, 2017).

APPENDIX B –IRB Approval Letter

Office of Research Integrity

THE UNIVERSITY OF SOUTHERN MISSISSIPPI

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NOTICE OF INSTITUTIONAL REVIEW BOARD ACTION

The project below has been reviewed by The University of Southern Mississippi Institutional Review Board in accordance with Federal Drug Administration regulations (21 CFR 26, 111), Department of Health and Human Services regulations (45 CFR Part 46), and University Policy to ensure:

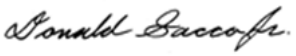
- The risks to subjects are minimized and reasonable in relation to the anticipated benefits.
- The selection of subjects is equitable.
- Informed consent is adequate and appropriately documented.
- Where appropriate, the research plan makes adequate provisions for monitoring the data collected to ensure the safety of the subjects.
- Where appropriate, there are adequate provisions to protect the privacy of subjects and to maintain the confidentiality of all data.
- Appropriate additional safeguards have been included to protect vulnerable subjects.
- Any unanticipated, serious, or continuing problems encountered involving risks to subjects must be reported immediately. Problems should be reported to ORI via the Incident template on Cayuse IRB.
- The period of approval is twelve months. An application for renewal must be submitted for projects exceeding twelve months.

PROTOCOL NUMBER: IRB-19-509
PROJECT TITLE: Frequency of Bedtime Routines and Sleep Outcomes
SCHOOL/PROGRAM: School of Psychology, Psychology
RESEARCHER(S): Kristy Larsen, Sara Jordan, Lauren Short, Justin Hughes

IRB COMMITTEE ACTION: Approved
CATEGORY: Expedited

7. Research on individual or group characteristics or behavior (including, but not limited to, research on perception, cognition, motivation, identity, language, communication, cultural beliefs or practices, and social behavior) or research employing survey, interview, oral history, focus group, program evaluation, human factors evaluation, or quality assurance methodologies.

PERIOD OF APPROVAL: March 17, 2020



Donald Sacco, Ph.D.
Institutional Review Board Chairperson

APPENDIX C – Anxious Distress Items

-has trouble sleeping due to worry
-seeks excessive reassurance around bedtime
-before going to sleep, worries that something bad will happen
-is afraid of monsters (or imaginary creatures) before going to sleep
-is scared something bad might happen when sleeping
-is afraid of having bad dreams (nightmares) during sleep
-feels shaky or nervous at bedtime

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