

PARENT-ADOLESCENT RELATIONSHIPS AND SLEEP HEALTH

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## ABSTRACT

Close relationships are essential for feelings of security, which in turn allow humans to physiologically down regulate and fall asleep and stay asleep. Parents and adolescents likely jointly generate a sense of interpersonal security. In order to account for dependency, actor-partner modeling was used to examine how adolescents' perception and their parents' perception of the relationship simultaneously and independently relates to each other's sleep health. I examined how both parents' and adolescents' perception of parental involvement and parent-adolescent conflict associated with both their own and each other sleep duration, sleep quality, and daily rhythmicity. Twenty-eight dyads completed a relationship questionnaire and a 10-day sleep diary. Findings suggested that parents and adolescents have diverging thoughts and beliefs about the degree of closeness and conflict within their relationship, which, in turn are independently associated with sleep outcomes. More specifically, one's own perception of parental involvement appeared to benefit both parents and adolescents' sleep. Moreover, when parents reported more conflict with their adolescents, both parents and adolescents had shorter sleep durations.

## LIST OF ABBREVIATIONS AND SYMBOLS

$\alpha$	Cronbach's index of internal consistency
$\bar{m}$	Mean: the sum of a set of measurements divided by the number of measurements in the set
$p$	Probability associated with the occurrence under the null hypothesis of a value as extreme as or more extreme than the observed value
$r$	Pearson product-moment correlation
$<$	Less than
$=$	Equal to

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## INTRODUCTION

Poor sleep health, as defined by insufficient sleep, unsatisfying sleep or poor sleep quality, and irregular sleep timing, is a pervasive problem among adolescents and adults (Buysse, 2014; National Sleep Foundation, 2005). About 45% of adolescents have trouble falling asleep, staying asleep, or waking up too early, and 40% of adolescents regularly obtain less than the recommended eight to nine hours (National Sleep Foundation, 2005). Furthermore, adolescents' sleep duration has been on the decline for almost two decades (Keyes, Maslowsky, Hamilton, & Schulenberg, 2015).

A proclivity for poor sleep health arises from the new psychosocial and biological processes that youth encounter as they enter into adolescence. Young adolescents gain additional stressors and responsibilities that compete for their time in the evening (e.g., more homework, chores, sports, activities, etc.) while gaining autonomy over their bedtime (Randler, Bilger, & Diaz-Morales, 2009). Additional responsibilities and increased bedtime autonomy coalesce with biological changes that contribute to adolescents' tendency to delay bedtime resulting in insufficient sleep (Carskadon, Vieira, & Acebo, 1993).

Despite the sleep challenges that occur during adolescence, sleep health is critical to adolescent well-being. Insufficient sleep is associated with depressed mood, low self-esteem, alcohol use, and weight gain (Mitchell, Rodriguez, Schmitz, & Audrain-McGovern, 2013; Pasch, Laska, Lytle, & Moe, 2010). Adolescents who report poor sleep quality also have elevated blood pressure and report more loneliness and depression (Javaheri, Storfer-Isser, Rosen, & Redline, 2008; Raniti et

al., 2017; Zilioli et al., 2017). Thus, a better understanding of factors that influence sleep health is critical for improving health and well-being and may elucidate possible mechanisms that contribute to individual differences in health.

### Parent-Adolescent Relationship and Sleep Health

The quality of the parent-adolescent relationship is frequently implicated in adolescent sleep health because parents often provide structure for sleep timing and because parents are strong source of interpersonal support. Evolutionary models of sleep suggest strong associations between interpersonal processes (especially in close relationships) and sleep health. Sleep involves a temporary loss of consciousness thus making us vulnerable to predators (Dahl & Lewin, 2002; Worthman & Melby, 2002). Humans' best option for offsetting this vulnerability was to share a sleeping space and cultivate a close group of people who could protect them from possible danger. Anthropologists suggest that interpersonal security remains an important component of sleep health even for modern day humans (Dahl & Lewin, 2002; Worthman & Melby, 2002). Consequently, close relationships are essential for feelings of safety, which in turn allow humans to physiologically down regulate and ultimately fall asleep and stay asleep. Parents and adolescents likely jointly generate a sense of interpersonal security by cultivating a relationship characterized by structure, warmth, disclosure, and interest in each other. From an evolutionary perspective, strong interpersonal bonds such as the parent-adolescent relationship might signal to the adolescent that it is "safe" to sleep.

When parents and adolescents do not cultivate such a warm and secure environment, children may not be able to down regulate in a way that is necessary for good sleep health. Indeed, children have worse sleep health when they report greater marital conflict between their parents (El-Sheikh, Buckhalt, Mize, & Acebo, 2006). Older adolescents who reported inconsistent parenting and greater parent-adolescent conflict reported worse sleep quality (Brand, Hatzinger, Beck, & Holsboer-

Trachsler, 2009). Homes with high conflict likely heighten adolescent vigilance (i.e., arousal) which in turn maintains wakefulness and impairs sleep health (Dahl & Lewin, 2002; Palagini et al., 2018).

The interpersonal security needed for healthy sleep likely emerges from transactional processes. Both parents' and adolescents' beliefs and behaviors contribute to the quality of their relationship. Within a parent-adolescent relationship, the extent of parental involvement and conflict depends on the actions of both the parent and adolescent. Parents are more likely to be involved when their adolescents share information about themselves. Subsequently, parents feel more confident in their parenting skills and are more likely to engage their adolescents (Kapetanovic, Skoog, Bohlin, & Gerdner, 2019). When parents are more confident in their parenting abilities, adolescents are more likely to feel emotionally connected to their parents and are more likely to share information with them (Kapetanovic et al., 2019). Simply put, adolescents and parents influence each other's perception of connection and security.

The influence of one person's actions on another person, such as the influence of adolescents' self-disclosure on parents' willingness to engage with them, is referred to as interdependence (Rusbult & Van Lange, 2003). That is, adolescent sleep is likely influenced by each person's actions. Despite evidence that the quality of the parent-adolescent relationship is a transactional process, little research accounts for this interdependence in adolescent sleep health. Therefore, a more complete understanding of the role of the parent-adolescent relationship on sleep health should include both parent and adolescent's thoughts and beliefs about their relationship.

Several studies focused on the parent-adolescent relationship and adolescent sleep assess relationship characteristics through either the parent or the adolescent perspective. The single perspective research has shown that the quality of the parent-adolescent relationship can benefit adolescent sleep health. Parental involvement, the extent parents are knowledgeable about their adolescent (Cottrell et al., 2007) and the emotional closeness and warmth of the relationship (Elkins,

McGue, & Iacono, 1997), has been consistently linked with adolescent sleep. Parental involvement particularly benefits sleep quality. Older adolescents who report more praise and support from their parents report better sleep quality (Brand et al., 2009; Tsai et al., 2018). Young adolescents who report greater parental warmth and involvement also have better sleep quality (Keller & El-Sheikh, 2011). In longitudinal studies of adolescents, a higher quality relationship or bond with their parents predicts improved adolescent sleep quality (Maume, 2013; Meijer, Reitz, & Dekovic, 2016).

Parental characteristics are not consistently linked to components of sleep health. Although parental involvement has been consistently linked to sleep quality, its association with adolescent sleep duration is mixed. In young adolescents, more involved parenting has been linked to greater sleep duration (Keller & El-Sheikh, 2011). However, no association between adolescent-reported parental involvement and sleep duration was found in other studies (Brand et al., 2009; Maume, 2013; Tsai et al., 2018). In contrast, one study found a positive association between parents' own perception of their warmth and how much sleep they believed their adolescent was obtaining (Adam, Snell, & Pendry, 2007). Examining sleep duration within the context of both parent and adolescents' perceptions of parental involvement will provide insight into how involvement influences sleep health.

## PARENT-ADOLESCENT RELATIONSHIP AND ADOLESCENT LIFESTYLE REGULARITY

Beyond assessments of sleep quality and sleep duration, adolescence is associated with a shift in chronotype (i.e., a biological driven preference to go to bed later) and more responsibilities. These barriers lead adolescents to delay bedtime and wake time; particularly on non-school days as there is no obligation to wake at a certain time (Carskadon et al., 1993). In turn, adolescents are at risk for greater variability in nightly sleep duration. On average, adolescents obtain 1.7 fewer hours of sleep on weeknights during the school year compared to summer weeknights (Hansen, Janssen, Schiff,

Zee, & Dubocovich, 2005). During the school year, adolescents gradually build a “sleep debt” and attempt to make up for lost sleep on the weekends (Hansen et al., 2005). Shifting between long nights on weekends and short nights on weekdays results in greater variability in sleep timing. As a result, adolescent circadian rhythms may not entrain to academic schedules, and sleep variability remains elevated throughout the school year (Dahl & Lewin, 2002).

Consistent sleep timing and consistent timing of activities that influence sleep (i.e., *daily rhythmicity*), are essential to health, sleep health, and wellbeing. Compared to more rhythmic individuals, less rhythmic individuals have shorter sleep duration, worse sleep efficiency, and more night time awakenings (Tighe, Dautovich, & McCrae, 2016). Greater rhythmicity is linked with fewer depressive symptoms (Shen et al., 2008) and individuals with lower rhythm regularity are more likely to develop bipolar disorder compared to individuals with higher rhythm regularity (Alloy, Boland, Ng, Whitehouse, & Abramson, 2015). Examining rhythmicity’s association with parent-adolescent relationship quality would provide insight into how parents influence their children’s routines and habits.

#### PARENT-ADOLESCENT RELATIONSHIP AND PARENTS’ WELLBEING

The typical developmental changes that occur in adolescence—changes that inherently lead to greater differentiation from their parents—do not occur in a vacuum. As the adolescent develops, their parents must adapt their own communication, rules, and expectations. For this reason, adolescence can also be a difficult transition for parents. During their children’s adolescence, parents’ satisfaction with their adolescent relationship decreases, this relationship dissatisfaction is linked to lower self-esteem and higher depression among parents (Nomaguchi, 2012). Adolescent differentiation contributes to parent dissatisfaction, because it forces parents to revised rules and expectations leading to increased parent-adolescent conflict. The increase in conflict limits

opportunities to maintain the warmth and closeness in the parent adolescent relationship (Dekovic, 1999).

The increase in conflict does not appear to have the same detrimental impact on parents with securely attached adolescents. When adolescents are securely attached, parents are less stressed and are more satisfied with their parenting (Watanabe, Lee, Mori, & Kawakubo, 2016). Moreover, the warmth of parent-adolescent relationship is a better predictor of (lower) parental stress than parent-adolescent conflict is (Anderson, 2008). In short, if parents have a secure relationship with their adolescent, parents are more resilient to the increase in day-to-day conflict innate to adolescence.

Thus, the reciprocal and evolving nature of the parent-adolescent relationship may be influencing parent sleep health. Among adolescent and parents, sleep duration is concordant, especially for parents and adolescents with higher quality relationships and less conflict (Fuligni, Tsai, Krull, & Gonzales, 2015). Despite the current lack of a direct link to sleep, the parent-adolescent relationship does appear to attenuate or amplify parental stress. Thus, it is plausible that interdependence in the relationship is associated with changes in sleep for both parents and adolescents. However, with the exception of a couple studies (Fuligni et al., 2015; Kouros & El-Sheikh, 2017) researchers have not examined direct links between parent and adolescent asleep.

#### CURRENT STUDY

Family sleep health is shaped by parent-adolescent relationship characteristics. However, the parent-adolescent relationship has been mostly examined in relation to adolescent sleep through a single perspective. When research has examined sleep through a dyadic perspective, parent and child reports have not always aligned (El-Sheikh et al., 2006; Gunn et al., 2019). This suggests that the influence of the parent-adolescent relationship on sleep is an interdependent process; both individuals have their own thoughts and beliefs about the degree of closeness and conflict and both

of these perspectives likely influence adolescent sleep outcomes. Studying adolescent sleep through an interdependent lens will provide us a more nuanced understanding of the family-level mechanisms contributing to adolescent sleep health.

By accounting for interdependence in analyses, we can elucidate adolescents' perception and parents' perception of their relationship simultaneously and independently as it relates to sleep health. Furthermore, by including both perspectives we can account for dependency in the data (such as shared physical space and shared routines), thus providing a more accurate assessment of the influence of the parent-adolescent relationship on sleep health (Kenny, Kashy, & Cook, 2006).

Using Actor-Partner Interdependence Modeling, I predict that higher quality relationships will be associated with better sleep health. More specifically, higher quality relationships will be associated with longer sleep duration, greater sleep quality, and greater daily rhythmicity. Research on parental involvement suggests that these constructs emerge from both member's thoughts, beliefs, and behaviors. As such, I predict that both the parent and adolescent's positive perception of the relationship will be related to better sleep health (e.g., (Maume, 2013; Meijer et al., 2016), but the degree to which each person's perception influences sleep will vary among the dimensions of the relationship (El-Sheikh et al., 2006; Gunn et al., 2019).

## METHODOLOGY

### STUDY DESIGN

Parents and adolescents, heretofore referred to as *dyads*, were recruited from the greater Pittsburgh area. Parents provided consent and adolescents provided assent. At an initial visit, dyads each completed the Parental Environment Questionnaire (PEQ). To measure sleep duration, sleep quality, and rhythmicity participants completed an electronic version of The Pittsburgh Sleep Diary for at least 10 days following the visit (Monk et al., 1994).

### SAMPLE

The Institutional Review Board approved the study. Participants were recruited via fliers and through University of Pittsburgh community outreach. Because of the potential impact to sleep health, dyads were excluded if the adolescent had a history of conduct problems, pervasive developmental disorder, substance abuse or dependency, attention deficit hyperactivity disorder or attention deficit disorder, history of sleep disorder, cardiovascular disease or diabetes. Dyads were also excluded if a parent had active psychosis, substance dependency, or did not live with the adolescent. Thirty-one adolescents assented and 28 parents consented. Data from one dyad was removed because of missing scores on the relationship questionnaire. Dyads remaining were 30 adolescents between the ages of 11-14 ( $M = 12.7$  years,  $SD = 1.56$  years, 58% male) and one of their parents. Both participated in a 10-day study on the association between parenting and adolescent sleep. Participants self-identified race and were 10% Black/African American, 74% White, and 13%

biracial. See Table 1 more for demographics. Parents and adolescents were each compensated for their time. Eligible dyads participated during the school year.

Three adolescent participants were siblings whose parents participated twice; in total there were 27 parents, and 30 adolescents in the study. Dyads where the parent already participated once will be heretofore referred to as *repeated-parent dyads*. In order to balance (1) being inclusive with (2) accounting for this dependency, all analyses were completed with and without repeated parent dyads. In the first set of analyses, all dyads were included. In the second set of analyses, the repeated-parent dyads and influential cases were excluded. This approach was decided a priori.

#### INDICES OF PARENT-ADOLESCENT RELATIONSHIP QUALITY

The Parental Environment Questionnaire (PEQ) assesses the quality of the relationship between adolescent and an identified parent along several dimensions (Elkins et al., 1997). Dyads' versions of the scale had identical questions with appropriate pronouns. In analyses, I used the parental involvement subscale and the parent-adolescent conflict subscale. See Table 2 for the items on these scales.

The 12-item involvement scale assessed a parent's interest and knowledge about their adolescent, the amount of time spent together, and how close the adolescent felt to the parent. In this sample the internal consistency on the Involvement Scale was  $\alpha = .667$  for adolescents and  $\alpha = .697$  for parents. The 12-item conflict subscale measured how critical the parent is of the adolescent, how much they argued, and how much contempt the adolescent felt toward the parent. The internal consistency on the conflict subscale was adequate for adolescents and parents ( $\alpha = .822$ ;  $\alpha = .756$ , *respectively*). See Table 2 for items on each scale.

#### SLEEP MEASURES

All sleep measures were collected through an electronic form of the Pittsburgh Sleep Diary. Diaries were completed daily by each member of the dyad via smart phones, tablets, or computers.

Participants completed ten days of sleep diaries; however, only the first seven days were used. Additional days were eliminated from the data because study start day varied across dyads, which means some dyads would have more weekend nights than others. Young adolescents sleep around 100 minutes longer on weekend nights than they do on weekday nights (Collado Mateo, Diaz-Morales, Escribano Barreno, Delgado Prieto, & Randler, 2012) meaning adolescent participants who started the study on Thursdays and Fridays would have appeared to obtain more sleep than participants who started the study earlier in the week. In addition, a second set of analyses were completed using exclusively weeknights to examine if the parent-adolescent relationship had different impact on the shorter weeknight sleep.

*Sleep duration.* Sleep duration was measured by the amount of time between when participants fell asleep and woke up in the morning minus the amount of time they were awake during the night. TST was averaged over seven days for the seven days sleep variable and averaged over all the weekdays for the weekday sleep variable.

*Sleep quality.* The daily diary asks participants to rate their sleep from “Very Bad” to “Very Good.” Participants rated their sleep quality on a scale from 0-100. Sleep quality was averaged over seven days for the seven days sleep variable and averaged over all the weekdays for the weekday sleep variable.

*Social Rhythmicity.* Social Rhythm Metric (SRM) evaluated the routineness (or rhythmicity) of a participant’s activities that influence sleep and circadian rhythms (Monk, Frank, Potts, & Kupfer, 2002). The Pittsburgh Sleep Diary asks participants what time they (1) got out of bed, (2) had their first contact with another person, (3) started school, work, or volunteer activities, (4) had dinner, and (5) went to bed. For each activity, the time the participants completed the activity was averaged. Participants who completed the activity within 45 minutes of their average obtained a “hit.” Participants could score up to 5 hits a day or 35 hits across seven days. More hits reflect more

rhythmicity (Monk et al., 2002). Social Rhythmicity requires seven days of calculation and is designed, in part, to capture variability between weekdays and weekends; therefore, it is not included in weekday only analyses.

#### DATA ANALYTIC PLAN

*Data Reduction.* The data analysis was completed using SAS University Edition software Copyright © 2012-2018. Prior to analyses, data were checked for normal distribution and statistical outliers (i.e., greater than three standard deviations from the mean). One case (adolescent) was an outlier on both the involvement and conflict scales (3 *SD*'s above on the conflict scale and 3 *SD*'s below on the involvement scale). This dyad was removed from all analyses. Scatterplots were visually examined for influential cases after each statistical test. One of the adolescent's scores appeared to be influencing the association between involvement and the sleep variables. In this case, analyses were run with and without the influential case and are reported accordingly.

Outliers were also removed from additional analyses using weekday only data. This included the one adolescent whose conflict and involvement scales were 3 *SD* from the mean and another adolescent who's sleep quality score was 3 *SD* below the mean. Scatter plots were visually examined for influential cases after each statistical test. Each of the analyses had one dyad that appeared to be influential. Analyses were run with and without the influential case and are reported accordingly.

*Data interpretation.* The sample size was small and several moderate effect sizes were statistically insignificant with a p-value set at .05. Similar to previous studies, medium effect size correlations (i.e.,  $r \geq .3$ ) with a p-value smaller than .1 were interpreted as trends (Beebe et al., 2013; Capaldi, Handwerger, Richardson, & Stroud, 2005; Hasler, Kirisci, & Clark, 2016).

*Main Data Analysis.* To examine the association between the relationship variables and sleep variables, 10 Actor–Partner Interdependence Models were conducted in SAS using the Mixed Command. Because it takes into account the statistical dependency in clustered data, APIM is a

statistical model that makes it feasible to examine how adolescents' perception and their parents' perception of the relationship simultaneously and independently relates to each other's sleep health. In other words, four associations are being examined: (1) adolescents' actor effect or adolescents' perception of the relationship on their own sleep health (2) adolescents' partner effect or adolescents' perception of the relationships on their parents' sleep health (3) parent's actor effect or parents' perception of the relationship on their own sleep and (4) parents' partner effect or parents' perception of the relationship own their adolescents' sleep.

In this model, sleep health was the dependent variable and the predictors were the two relationship variables: the actor relationship variable and the partner relationship variable. Two dummy variables, *parents* and *adolescents*, were created and the value assigned signaled whether the participant belonged or did not belong to this *role* in the relationship. These two dummy variables were entered in the model as two intercepts allowing us to ascertain the intercepts for both participants in the role of parents and participants in the role of adolescents. To determine the actor and partner effects the interaction terms of predictors and roles were entered as fixed effects (e.g., RelationshipVariable\*Adolescent, RelationshipVariable\*Parent, partnershipRelationVariable\*Adolescent, and partnerRelationshipVariable\*Parent). The Maximum Likelihood method was used. In order to account for the sample being heterogenous (e.g., parents and adolescents), heterogenous compound symmetry was specified. In order to handle the nonindependence, the participants role affiliation was enter in the repeated statement (Kenny et al., 2006). Standardized beta effect sizes were reported. In order to be consistent with the interpretation of the bivariate correlations, p-values less than .1 were interpreted as trends.

## RESULTS

### DEMOGRAPHICS

Participant demographics are shown in Table 2. To briefly summarize, adolescents slept 8.78 hours and parents slept 7.95 hours each night. Overall, our sample reported high quality relationships and they were similar to other non-clinical parent-adolescent relationship samples (McGue, Elkins, Walden, & Iacono, 2005; Walkner & Rueter, 2014). Adolescents displayed less social rhythmicity than their parents (19.0 hits vs. 24.1 hits).

Bivariate actor correlations (Table 3) showed adolescents' ratings of the relationship was associated with their own sleep health. Adolescents slept longer when they reported that their parents were more involved. Adolescents' ratings of their relationship with their parents was unrelated to their sleep quality and social rhythmicity. Parents slept longer when they reported less conflict with their adolescents and a trend was detected indicating that parents who reported more involvement slept longer. Like their adolescents, parents' ratings of the relationship were unrelated to their own sleep quality and social rhythmicity. Dyads' sleep health was associated with each other's perception of their relationship. Parents who reported less conflict had adolescents who slept longer. Two trends emerged for parents who reported greater involvement. Their adolescents reported longer sleep, but had worse sleep quality. Parents' rating was not associated with their adolescent's social rhythmicity. Parents' sleep health was unrelated to their adolescents' ratings of the relationship.

## ACTOR-PARTNER MODEL RESULTS

*Adolescent Relationship Ratings and Adolescent Sleep Health.* As shown in Table 4, adolescents who reported more parental involvement were more likely to sleep longer. This finding persisted after removing repeated-parent dyads ( $p = .004$ ), but after additionally removing the influential case the finding was in the same direction but in the trend range ( $p = 0.088$ ). Adolescent ratings of involvement were not associated with sleep quality or social rhythmicity. Moreover, adolescents' perception of conflict was unrelated to their own sleep duration, sleep quality, and social rhythmicity.

Additional analyses on exclusively weekday sleep duration and sleep quality revealed a trend between involvement and sleep duration was detected but was no longer significant after an influential case was removed ( $p = .208$ ; Table 5).

*Adolescent Relationship Rating and Parent Sleep Health.* Adolescents' ratings of involvement and conflict was not associated with their parent's sleep (all  $p$ 's  $> .10$ ) However, in weekday only analyses, there was a strong association between greater adolescent rated conflict and longer parent sleep duration. The association remained significant even after removing repeated parent dyads and influential cases.

*Parent Relationship Ratings and Parent Sleep Health.* As shown in Table 4, there was a trend towards a negative association between parents' rating of conflict and their own sleep duration. The trend remained after excluding the repeated-parent dyads ( $p = .056$ ). A trend between parents' perception of their involvement and their duration was also detected. The trend remained after removing the repeated-parent dyads ( $p = .081$ ). It was no longer a trend after removing an influential case ( $p = .302$ ). Parents' perception of their relationships with their adolescent was not associated with their own sleep quality or social rhythmicity.

Weekday-only analysis showed that parents who reported more involvement slept longer. This finding remained significant after removing influential cases and repeated parent dyads were removed. There was a trend for parents who reported more conflict to have a shorter sleep duration and worse sleep quality; however, p values were greater than .10 after removing the repeated parent dyads.

*Parent Relationship Ratings and Adolescent Sleep Health.* After accounting for adolescent sleep, parents' rating of their relationship with their adolescents was associated with adolescent sleep health. Greater parent rated conflict was associated with shorter adolescent sleep. This remained significant after removing influential cases and repeated parent dyads. Parent perceived conflict was not associated with adolescent sleep quality or social rhythmicity. There was a negative association between parent's rating of their involvement and adolescent sleep quality. This finding was in the same direction, but at the trend level after the repeated-parent dyads were removed ( $p = .086$ ) and after the influential case was removed ( $p = .054$ ). There was no association between parents' rating of their involvement and their adolescents' sleep duration or social rhythmicity.

Weekday analyses indicated a trend between parent rated conflict and worse sleep quality; however, this trend did not persist after removing repeated parent dyads from the analysis ( $p = .78$ ).

## DISCUSSION

Family sleep health is shaped by parent-adolescent relationship characteristics (Brand et al., 2009; Fuligni et al., 2015). This study adds to the current research on adolescent sleep health by capturing the interdependent influence of the parent-adolescent relationship. In addition, by including parent and adolescent perspectives, we can see that they can have diverging thoughts and beliefs about the degree of closeness and conflict within their relationship, which, in turn are independently associated with sleep outcomes. As predicted, greater parental involvement appeared to benefit both parents' and adolescents' sleep. Involvement, as characterized by parent's interest and knowledge about their adolescent and how close the adolescent felt to the parent (Elkins et al., 1997), was associated with longer sleep for parents and adolescent. When parents rated themselves as more involved, they were more likely to sleep longer and when adolescents rated their parent as more involved, adolescents were also more likely to sleep longer.

Likewise, those in more quarrelsome homes were more likely to have worse sleep health. When parents reported more conflict with their adolescents, both parents and adolescents had shorter sleep durations. This is congruent with other sleep literature on arousal and conflict (Brand et al., 2009). It is likely that parents and adolescents who have more conflict are more vigilant of each other's behaviors, which in turn, maintains arousal which is counterproductive for sleep (Dahl & Lewin, 2002; Palagini et al., 2018).

Though the direction on the findings were consistent with prior research, the novel approach of simultaneously examining both parent and adolescent perspectives yielded some unexpected findings. While both parents and adolescent appeared to benefit from their own perception of parental involvement, parents and adolescents did not agree on the extent of parental involvement and parents believed that they were more involved than their adolescents. Moreover, one's own perception of involvement was associated with one's own sleep (i.e., actor effects), but not associated with other's sleep (partner effect). Involvement in this study is characterized by warmth, disclosing behaviors, and structure. Thus, these findings suggest that individual positive feelings about the relationship is important for one's own sleep. On the other hand, only parent's perception of conflict was associated with the dyad's sleep health. Adolescents own perception of conflict was unrelated to both their own sleep and their parents' sleep. It is unclear why the parent's perspective on conflict was associated with sleep, particularly since there was agreement on the amount of conflict in the relationship. It may be that parents are more attuned to the overall emotional tone of the relationship while their adolescents are focused on disagreements (McLaren, 2014).

By examining the parent's perspective and parent's own sleep, we have expanded the current literature on whether parent-adolescent relationships are associated with parental sleep. Prior research has consistently found that adolescents who have more involved parents obtain more sleep (Brand et al., 2009; Keller & El-Sheikh, 2011; Meijer et al., 2016). To our knowledge, this was the first study to demonstrate that parents who are involved in their adolescent's life also have better sleep. Findings on parent mood and parent-adolescent relationship quality are consistent with this finding. Our findings suggest that parents sleep may also benefit from parent-adolescent relationships that are less contentious. Parents who reported less conflict with their adolescents were more likely to have longer sleep duration.

Previous studies examining adolescent's perception of conflict have shown that familial conflict is associated with poor adolescent sleep quality (Brand et al., 2009; McHale, 2011). However, the association between conflict and adolescent sleep duration has been weak (Brand et al., 2009; El-Sheikh et al., 2006). In line with previous literature, this study found that adolescents' ratings of conflict were not associated with their own sleep duration. In contrast, *parent's* ratings of conflict were negatively associated with both their adolescent's sleep duration and their own sleep duration. This suggests that parent perceptions of conflict have greater impact on family sleep health and highlights the importance of examining both perspectives.

Current findings also yielded unexpected partner effects (i.e., associations between one member's rating of the relationship and the other member's sleep health). Greater parent reported involvement was associated with worse adolescent sleep *quality*. Moreover, when adolescents reported more conflict, their parents slept longer on weekdays, but not on weekends. The degree of agreement between the parent and the adolescent on the quality of their relationship may provide some insight into counterintuitive findings. The parents and adolescents tended to agree on the amount of conflict within the relationship; however, ratings of parental involvement were not significantly correlated. Parents and adolescents have distinct developmental concerns, and this may map onto changes in sleep. As part of normative development, young adolescents are concerned with differentiating from their parents and becoming more autonomous. Meanwhile, their parents increasingly see the relationship they have with their adolescents as an extension of their legacy (Bengtson & Kuypers, 1971; Kim & Stokes, 2019). These concerns lead to specific biases. Being an extension of their legacy, parents tend to have more positive emotions toward their relationship with their adolescent (Noller, Seth-Smith, Bouma, & Schweitzer, 1992; Sillars, Smith, & Koerner, 2010) and adolescents often interpret parental involvement as attempts to undermine their competence and autonomy (McLaren & Sillars, 2014). This may explain why the parental perception of their

involvement was 1) greater than their adolescents' perception of involvement, 2) unrelated to the adolescents' perception of involvement, and 3) detrimental to adolescent sleep quality. The second counterintuitive finding is also consistent with this theory. The behaviors that adolescents are perceiving as conflict appear to be associated with longer parent's sleep. The behaviors that give rise to adolescents' perception of conflict appear to not bother the parents, suggesting that parents show a more positive bias toward their own behaviors in the relationship.

The combination of the actor and partner effects illustrate the complex interpersonal processes that influence sleep health. Both members' own positive feelings toward the relationship benefits their own sleep confirming previous studies that healthy family dynamics benefits sleep (Fuligni, 2015). The current novel approach allowed for a more nuanced, albeit complex, examination into relationship perceptions and sleep health. Consistent with other findings, parents and adolescents do perceive the same relationship differently (Noller et al., 1992; Sillars et al., 2010). Our findings showed that differential perceptions contribute to unexpected findings between typically positively valenced relationship variables and worse sleep health.

#### LIMITATIONS TO THE ANALYSIS/ALTERNATIVES HYPOTHESES

Surprisingly, social rhythmicity, a measure of lifestyle regularity, was not associated with any of the parent adolescent relationship variables. This is a surprising finding because parental monitoring has been linked to sleep regularity (Gunn, 2019). While lifestyle regularity and sleep regularity are close constructs, the timing of non-sleep behaviors captured in the SRM such as the school start time and supper time are generally not controlled by the adolescent; therefore, it is possible that the participants in this study simply did not have enough liberty to determine the time they performed these activities. Without control of the timing of activities, relationship factors may have had limited ability to change or impact lifestyle regularity.

The current study had 29 dyads and was likely underpowered to detect small to medium effects. In addition, the data in the sample is cross-sectional and correlational; therefore, directionality cannot be determined. In a prior longitudinal study, greater child sleep problems were associated with a decrease in parental closeness, but in the same study greater parental closeness was associated with a decrease in sleep problems (Bell, 2008). This indicates that sleep health may benefit family well-being.

Additionally, this analysis does not consider how other relationships outside the home or technology may be influencing adolescent sleep. Adolescents who reported decreases in positive peer relationships also reported a decrease in sleep duration and greater sleep disturbance (Maume, 2013). Parents, however, share a sleep environment with adolescents and inherently have more social interactions near the adolescent's bedtime and waketime. Moreover, the parent-adolescent relationship typically precedes and outlasts peer relationships. From an interpersonal perspective, parent relations are most relevant because they have the most influence over the felt security of the adolescent's sleep environment and peer relationships (Gorrese & Ruggieri, 2012). Furthermore, parents have a direct influence and shape adolescent experiences with technology and peer relationships, making parent adolescent relationship all the more important to study within the context of sleep health (Mesch, 2009). Nevertheless, there could be external influences affecting both parent and adolescent sleep, and future studies will want to consider these influences on family sleep health.

Limitations notwithstanding, measuring both parent and adolescent perspectives, we were able to capture the interdependent influence of the parent-adolescent relationship on sleep health. We found evidence that both parents and adolescents have their own understanding about the quality of their relationship, and both of these perspectives are independently associated with sleep outcomes. Adolescents' sleep appears to benefit from parental involvement and low familial conflict.

Moreover, this study showed that parents' sleep may also benefit when parents rate their relationship with their adolescent positively. Our findings illustrate that measuring relationships from multiple perspectives increase our understanding of how relationships influence sleep health. By measuring both perspectives, we demonstrated how family relationships influence sleep health and provide a greater understanding of mechanisms for improving sleep health.

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**Table 1**  
***Parent and adolescent demographics***

Parent		
Race (%)	Black/African American	12.9
	White	80.6
	Biracial	3.2
	Other	3.2
Age (Mean, SD)		43.8
		(6.26)
Sex (%)	Female	87.1%
Adolescent		
Race (%)	Black/African American	9.7
	White	74.2
	Biracial	12.9
	Other	3.2
Age (Mean, SD)		12.26
		(1.51)
Sex (%)	Female	41.9%
	Male	58.1%

**Table 2**  
**Items on Parent Environment Questionnaire**

Scale	Item
<b>Conflict</b>	I often criticize this child.
	I often interrupt this child before he/she can finish saying anything.
	I often irritate this child.
	Often there are misunderstandings between this child and me.
	This child treats others with more respect than he/she treats me.
	I often hurt this child's feelings.
	I do not trust this child to make his/her own decisions.
	This child and I often get into arguments.
	This child often angers or annoys me.
	I often lose my temper with this child.
	I sometimes hit this child in anger.
	Once in a while this child has been really scared of me.
	<b>Involvement</b>
I praise this child when he/she does something well.	
I don't know about this child's hobbies.	
This child doesn't want his/her friends to meet me.	
I comfort this child when he/she is discouraged or has a disappointment.	
This child and I don't have much to talk about when we are together.	
I try to keep up with how well this child does in school or on the job.	
This child prefers not to talk about his/her personal problems with me.	
I don't seem to know much about how this child is doing in school.	
This child and I do not do a lot of things together.	
This child doesn't seem to feel very close to me.	
I don't know much about how this child spends his/her spare time.	

**Table 3*****Summary of Intercorrelations, Means, and Standard Deviations for Relationship Characteristics and Sleep Health Variables***

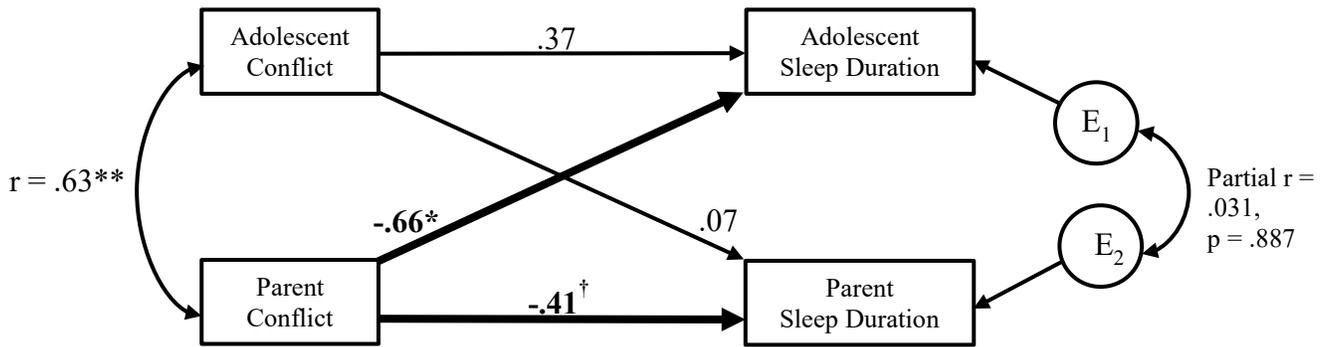
Measure	1	2	3	4	5	6	7	8	9	M	SD
1. Adolescent Conflict										18.8	4.1
2. Parent Conflict	0.63**									20.9	4.5
3. Adolescent Involvement	-0.40*	-0.50*								41.3	4.1
4. Parent Involvement	0.16	-0.32†	0.14							44.7	3.1
5. Adolescent Duration	-0.11	-0.46*	0.56**	0.32†						526.5	50.38
6. Parent Duration	-0.19	-0.37*	0.31	0.35†	0.21					477.2	36.2
7. Adolescent Sleep Quality	-0.05	0.16	0.03	-0.35†	0.17	0.11				76.64	12.3
8. Parent Sleep Quality	-0.14	0.03	0.18	-0.24	0.04	0.09	0.31			75.4	12.8
9. Adolescent SRM	0.26	0.19	-0.03	0.03	-0.08	-0.28	-0.08	-0.06		19.0	6.7
10. Parent SRM	0.05	-0.09	-0.05	-0.21	0.15	-0.14	0.20	0.29	0.26	24.1	4.8

*Note.* Intercorrelations for participants ( $n = 29$  parents,  $n = 29$  adolescents) are presented above. Means and standard deviations are displayed on the right side of the table. For all scales, higher scores are indicative of more extreme responding. Duration refers to length

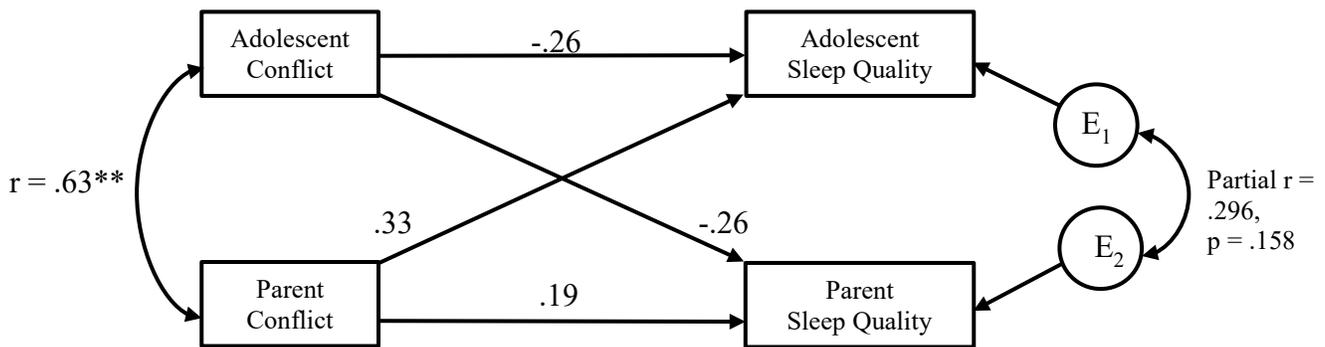
†  $p < .1$ , one-tailed; \*  $p < .05$ , one-tailed, \*\*  $p < .01$ , one-tailed

**Figure 1**  
**Conflict and Sleep Health over Seven Days**

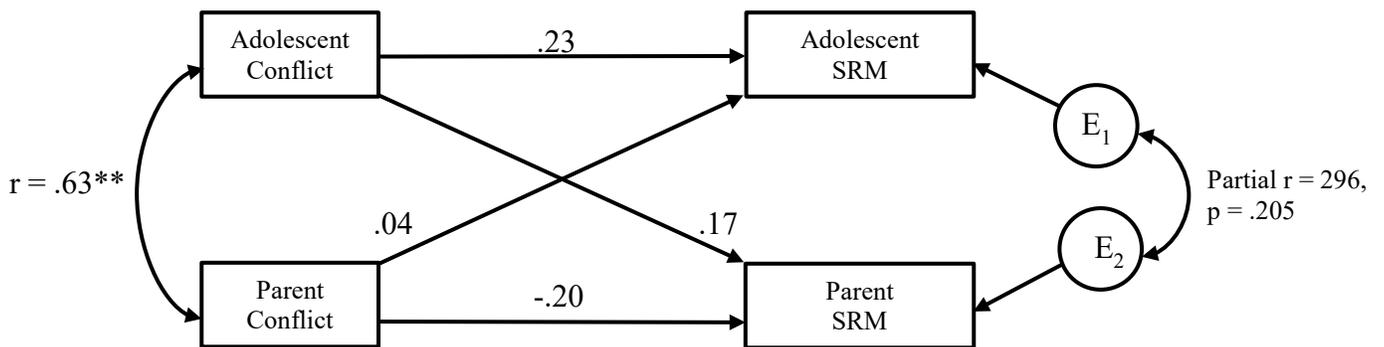
*Conflict and Sleep Duration (Seven Day Average)*



*Conflict and Sleep Quality (Seven Day Average)*



*Conflict and Social Rhythmicity (Seven Day Average)*



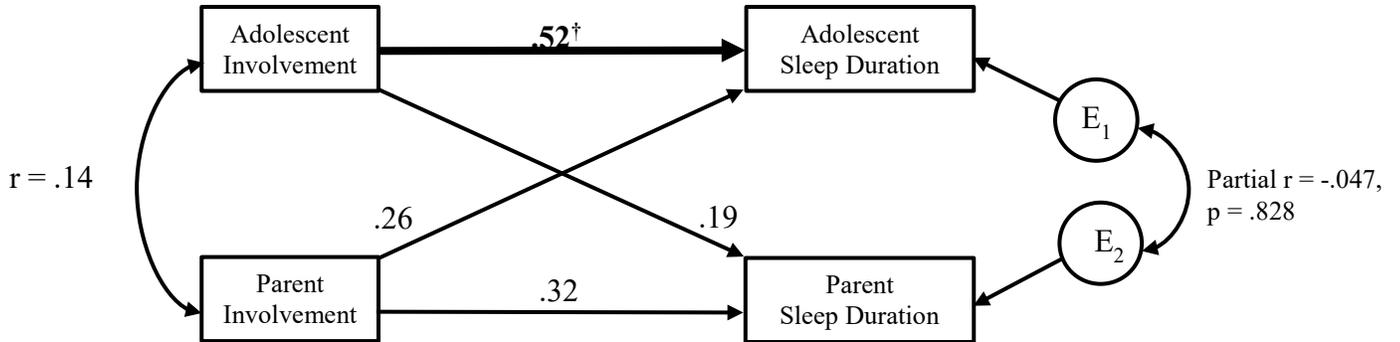
*Note.* For all scales, higher scores are indicative of more extreme responding. Duration refers to length of sleep in minutes. SRM = Social Rhythmicity Metric. The significant and trending findings are bolded.

\* = Finding remains significant after removing influential cases and repeated parent dyads

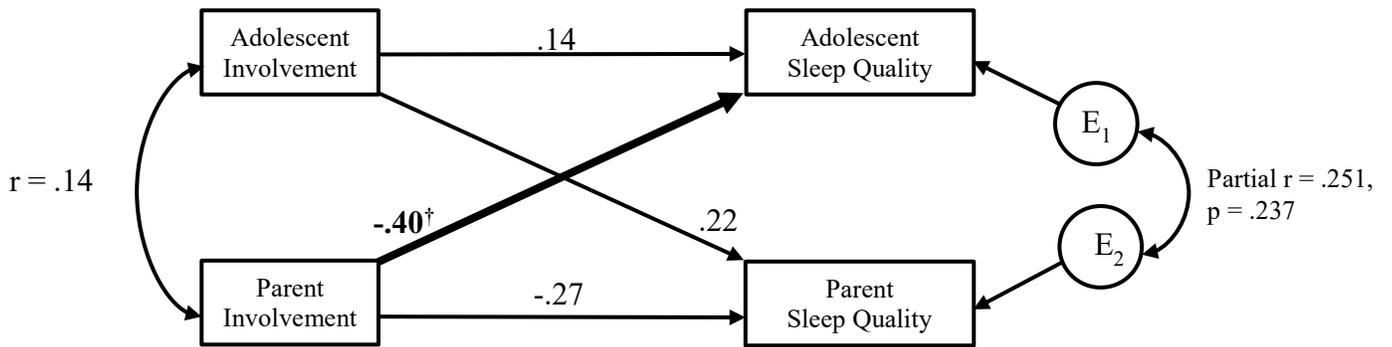
† = Finding becomes or remains trend after removing influential cases and repeated parent dyads

**Figure 2**  
**Involvement and Sleep Health over Seven Days**

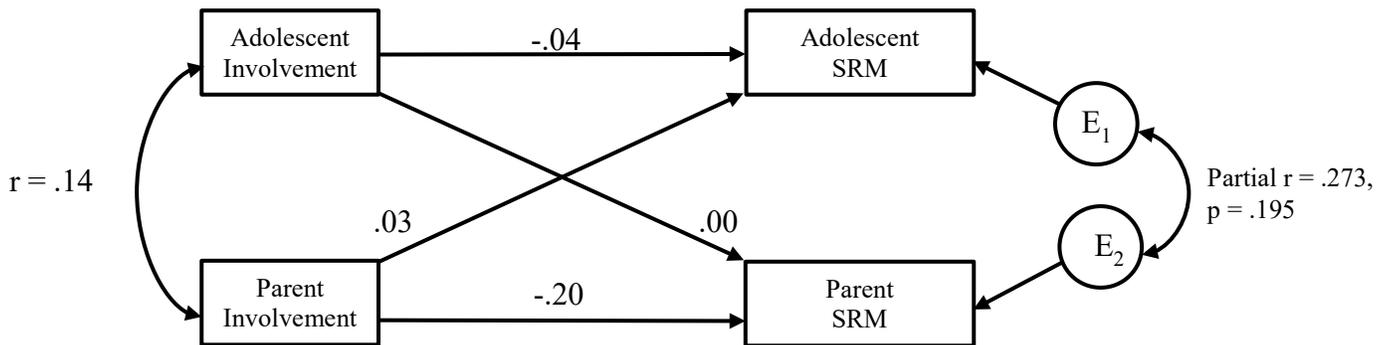
*Involvement and Sleep Duration (Seven Day Average)*



*Involvement and Sleep Quality (Seven Day Average)*



*Involvement and Social Rhythmicity (Seven Day Average)*



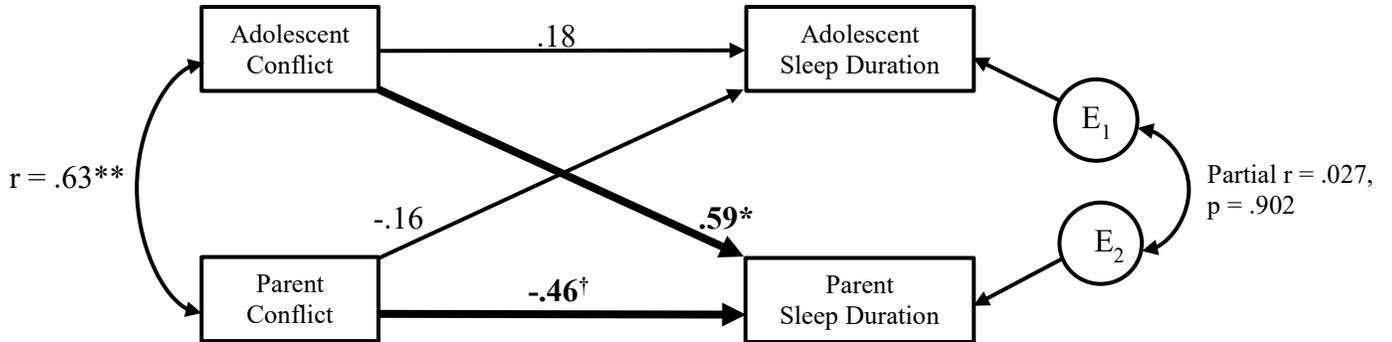
*Note.* For all scales, higher scores are indicative of more extreme responding. Duration refers to length of sleep in minutes. SRM = Social Rhythmicity Metric. The significant and trending findings are bolded.

\* = Finding remains significant after removing influential cases and repeated parent dyads

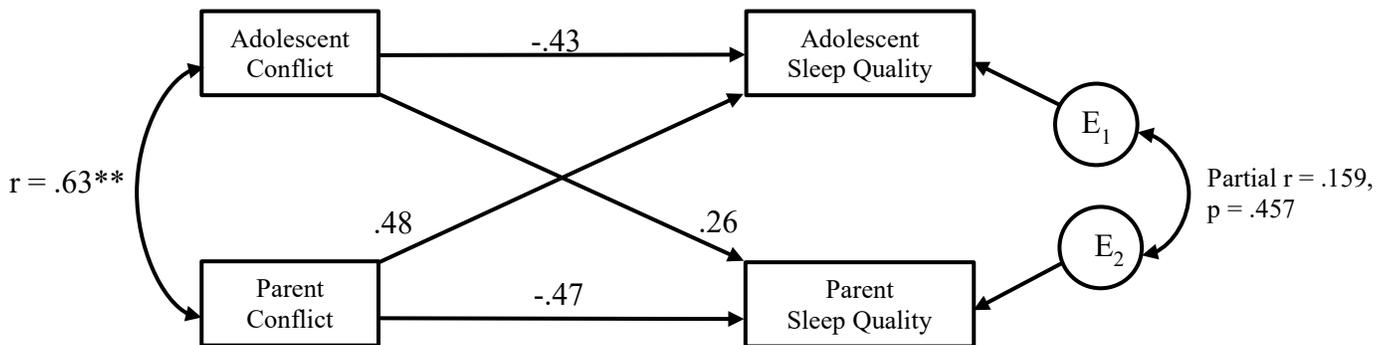
† = Finding becomes or remains trend after removing influential cases and repeated parent dyads

**Figure 3**  
**Conflict and Sleep Health (Weekdays only)**

*Conflict and Sleep Duration (Weekdays only)*



*Conflict and Sleep Quality (Weekdays only)*



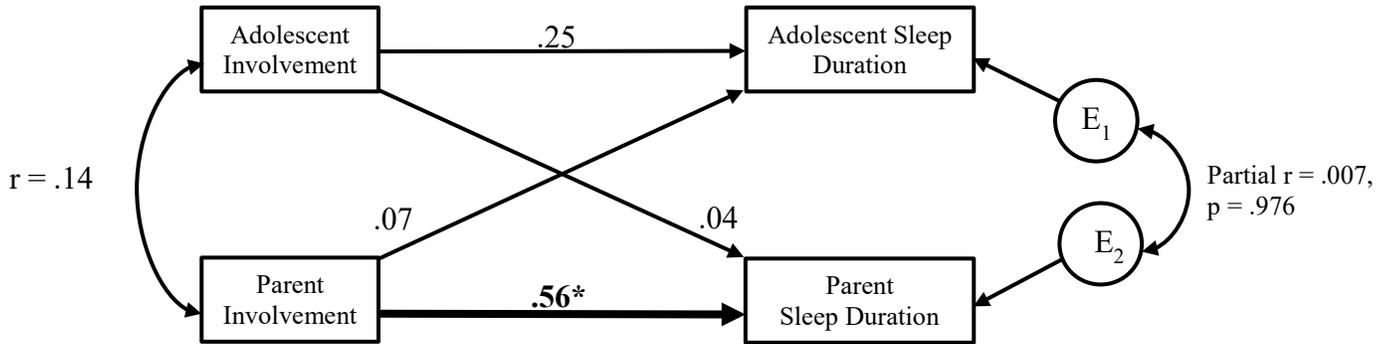
*Note.* For all scales, higher scores are indicative of more extreme responding. Duration refers to length of sleep in minutes. The significant and trending findings are bolded.

\* = Finding remains significant after removing influential cases and repeated parent dyads

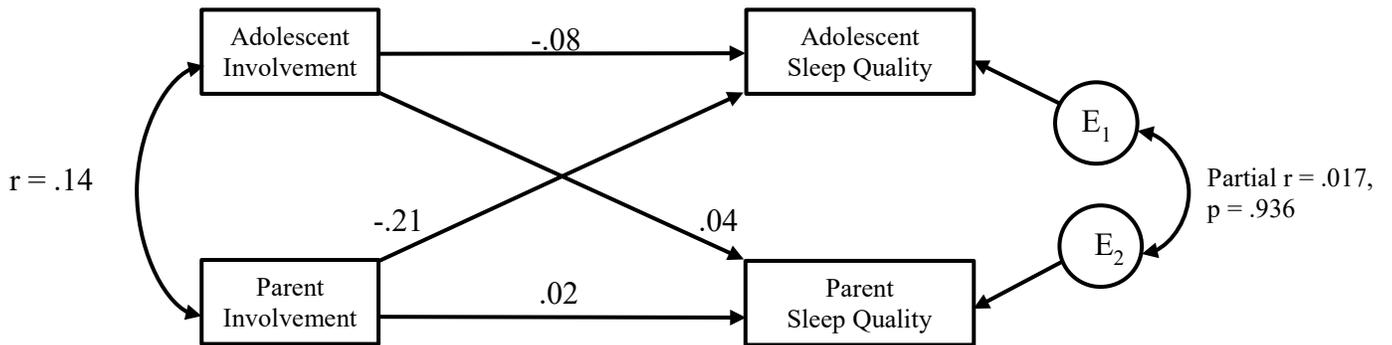
† = Finding becomes or remains trend after removing influential cases and repeated parent dyads

**Figure 4**  
**Involvement and Sleep Health (Weekdays only)**

*Involvement and Sleep Duration (Weekdays only)*



*Involvement and Sleep Quality (Weekdays only)*



*Note.* For all scales, higher scores are indicative of more extreme responding. Duration refers to length of sleep in minutes.

\* = Finding remains significant after removing influential cases and repeated parent dyads

† = Finding becomes or remains trend after removing influential cases and repeated parent dyads