

FAMILY FUNCTIONING AND CHILDREN'S SLEEP  
SCHEDULE, QUALITY AND QUANTITY

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FAMILY FUNCTIONING AND CHILDREN'S SLEEP  
SCHEDULE, QUALITY AND QUANTITY

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FAMILY FUNCTIONING AND CHILDREN'S SLEEP  
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THESIS ABSTRACT

FAMILY FUNCTIONING AND CHILDREN'S SLEEP  
SCHEDULE, QUALITY, AND QUANTITY

Karen Martin  
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Although sleep problems are prevalent in U.S. children, very little is known about family variables associated with children's sleep disruptions. The objective of this study is to examine children's sleep quality and quantity in relation to family environment and functioning. The role of age, gender and puberty status in children's sleep is also examined. A total of 23 boys and 18 girls participated in the study. Data were collected from children via interview as well as by employing objective measures of children's sleep. Results indicated that family environments may play a significant role in children's sleep processes. Positive family factors were related to some sleep outcome variables. Higher levels of adaptability/cohesion predicted a later wake time in children and a trend toward less total movement. Children's perceived attachment to parents, perceptions of destructive conflict, and perceived threat regarding parental marital conflict were not

significant predictors of children's sleep. Most prevalent were findings indicating that parent-child conflict predicted multiple domains of children's sleep, with children experiencing a higher frequency of parent-child conflict obtaining lower quantity and quality sleep. Age and puberty status acted as moderators of several of these relations. These findings provide preliminary data regarding the importance of family processes in relation to several facets of sleep in children.

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## I. INTRODUCTION

Recently, research conducted world wide has begun to show a pattern of sleep difficulties among a significant number of children (Liu, et al., 2000; National Sleep Foundation, 2004; Sadeh, Raviv, and Gruber, 2000; Tikotzky & Sadeh, 2001). Among these sleep difficulties discovered are reduced overall sleep duration, increased night wakings, high levels of restless sleep, extended periods of sleep latency (i.e. time in bed before falling asleep), and overall poor quality sleep. However, not much is known about causes of sleep disruptions in otherwise typically developing children. The objective of this thesis is to examine relations between children's sleep and one potential correlate of sleep problems, namely, family functioning. First, literature illustrating the prevalence of sleep problems will be reviewed. Next the effects of poor sleep on child adjustment will be presented. Finally, the literature review will present the small body of studies documenting relations between family functioning and child sleep disruptions.

### *Prevalence of Sleep Disruptions in Children and Adolescents*

Several studies demonstrate the high prevalence of sleep difficulties in children. A study conducted by researchers in China found that among a normative sample of 2004 Chinese children from 12 different towns, 11% of the parents who completed interviews indicated some sort of sleep problem for their children (Liu, et al., 2000). Another study conducted by researchers at Tel Aviv University used objective sleep monitoring among a group of 59 physically and mentally healthy kindergarteners from middle to upper

socioeconomic backgrounds (Tikotzky & Sadeh, 2001). In this study, researchers used a strict and accepted method for analysis and classification of sleep difficulties, which included an actigraphy sleep efficiency score of less than 90% or waking for five minutes or longer three or more times on average per night. Applying this method to their actigraphic data, they found that a total of 41% of children in their sample were poor sleepers (Tikotzky & Sadeh, 2001). In a similar study, 140 children from second, fourth, and sixth grade participated. Using the same analysis and classification as the previous study, researchers found that 17.9% of the children sampled met the criteria to be considered poor sleepers (Sadeh, Raviv, & Gruber, 2000).

Similarly, in a sample of 1,125 adolescents (aged 15-18) from 4 different European countries researchers found indicators of significant sleep difficulties (Ohayon, Roberts, Zulley, Smirne, & Priest, 2000). Adolescents were interviewed via telephone and administered questions via the Sleep-Eval computer program to discover and diagnose sleep problems. Four percent of adolescents met the criteria for a Diagnostic Statistical Manual-IV diagnosis of insomnia. In addition to this finding 32.7% of adolescent workers and 35.2% of non-employed adolescents endorsed at least one symptom of insomnia.

Another study conducted in North-Central and Central Ohio sampled 1,459 5-12 year olds from both urban and rural settings (Schreck, Mulick, Rojahn, 2005). Parent reports of child sleep problems were collected using the Behavioral Evaluation of Disorders of Sleep (BEDS) questionnaire. Using this measure, researchers found that 33% of the children were at least above one SD from the mean, indicating some sort of global sleeping problem as perceived by parents.

Furthermore, in a study conducted with 150 normally developing pre-school age Icelandic children with no physical or mental delays, sleep problems were assessed using a parent report questionnaire that consisted of 47 items created based on previous interviews with parents of sleep disturbed children (Thome & Skuladottir, 2005). Findings indicated that 47% of these children demonstrated at least one sleep problem. Furthermore, when the previous two years of sleep patterns were examined (reported retrospectively by parents), it seemed that children who had experienced sleep difficulties in infancy were more likely to continue to have troubled sleep as pre-schoolers. This suggests that not only are sleep problems widespread and prevalent, but they also appear to persist over time.

To examine the prevalence of sleep disruptions in normally developing children, researchers at the University of Amsterdam in Holland conducted a study with 449 seventh and eighth graders (Meijer, Habekothé, & Van Den Wittenboer, 2000). A questionnaire was administered to children to assess sleep latency, number of night wakings, latency after each awakening, and the child's perception of his or her sleep quality. Forty-three percent of these children indicated that they had difficulty waking in the morning, 25% reported that they did not feel rested during the school day, and 15% reported experiencing poor quality sleep during the night. This study again demonstrates that child sleep problems are not confined to just one country or culture.

In a study that examined sleep problems in pre-adolescent children, 43% of the children sampled demonstrated some type of sleep difficulty (Kahn, et. al., 1989). This particular study examined the sleep habits of 972 children in third, fourth, and fifth grades from 5 public elementary schools in Brussels. Researchers assessed sleep, and

other factors that may be related to sleep, using a parent-completed questionnaire consisting of 65 items. Several questions were designed to specifically assess children's quality and quantity of sleep, including duration of night sleep, sleep environment and night time awakenings. The questionnaire also assessed family composition, parental and child sleep patterns, family socio-economic status, child behavior, school achievement, eating habits and health problems. The results of the study indicated that a high percentage (43%) of children surveyed experienced some type of sleep difficulty. Specifically 23% of the children were found to exhibit some type of parasomnia (e.g., enuresis, somnambulism [sleep-walking], somniloquy [sleep talking], and night fears), and 14% of the children were found to sleep poorly (Kahn, et. al., 1989). These findings once again demonstrate the widespread and far reaching prevalence of child sleep problems.

According to the National Sleep Foundation (2004), children aged 5 to 12 years need 10 to 11 hours of sleep each night. In general, American children are only getting an average of 9.5 hours of sleep, and half of the families polled reported that children 10 and under got an average of 6.8 hours of sleep each night (National Sleep Foundation, 2004). These reduced sleep hours can lead to a myriad of difficulties and problems for children.

Similarly, a study conducted in Israel found that children were sleeping a lot less than generally recommended for their age group (Sadeh, Raviv, and Gruber, 2000). The sampled group of normally developing children slept an average of only 8.5 hours for second graders (ages 7-8), 8.1 hours for fourth graders (aged 9-10) and 7.6 hours for sixth graders, all well below the recommended amounts of nightly sleep for children their ages. Parents of children studied in China also reported less than recommended sleep for their

children (Liu, Lui, & Wang, 2003). Children aged 7-13 in this study slept on average only 9 hours each night compared to the 10-11 hours recommended. Collectively, findings reviewed so far speak to the widespread national and international prevalence of childhood sleep disruptions, in relation to either the reduced amount of sleep or poor quality sleep, in otherwise normally developing children.

### *Effects of Poor Sleep on Child Functioning*

Understanding the prevalence and widespread nature of childhood sleep difficulties is the first step in helping children with sleep disruptions live more productive and fulfilled lives. It is also important to understand the many aspects of children's lives that poor sleep can impact. Several studies have been conducted indicating that poor quality and quantity sleep are associated with multiple childhood difficulties across several domains including internalizing and externalizing behaviors, as well several areas of cognitive functioning (El-Sheikh, Buckhalt, Cummings, & Keller, 2007).

In one of few experimental studies examining children's sleep in normally developing children, researchers asked parents to modify their child's sleep by one hour (Sadeh, Raviv & Gruber, 2003). After two nights of baseline recordings, children were randomly assigned to either have an extended sleep period (they were asked to go to bed one hour earlier) or a restricted sleep period (asked to go to bed one hour later) for three consecutive nights. Sleep was measured using an objective activity monitoring sleep watch (actigraph) as well as subjective self-reports using a Sleep Wake diary. After changes in sleep schedule, children were assessed on multiple cognitive domains, including reaction time and memory tasks. Children in the restricted sleep group experienced significant declines in cognitive performance when compared to baseline

measures. Conversely, children who extended their sleep time by one hour, on average, either improved or experienced no decline in cognitive performance (Sadeh, Raviv, & Gruber 2003). These findings highlight the importance of sleep duration for children's cognitive performance.

One other experimental study also used sleep restriction to determine the effects of reduced sleep amount on academic performance (Fallone, Acebo, Seifer, & Carskadon, 2005). Researchers asked a sample of seventy-four children aged 6 to 12 years to participate in a three-week experiment. First baseline measures were obtained for children's typical sleep patterns ( $M = 8$  hours 58 min  $SD = 35$  min). Then, children restricted their sleep opportunity period to either 8 hours for first and second graders or 6.5 hours for third to sixth graders. A third week of sleep manipulation involved requiring the children to spend no less than 10 hours (optimal time for this age group) in bed each night. Teachers, blind to the sleep manipulation that the child was currently in rated children at the end of each experimental week. Children were assessed on multiple academic domains, including: academic problems, impulsivity, hyperactivity, internalizing symptoms, aggressive behavior, and attention problems. Results indicated that, in comparison to both the baseline and extended sleep days, children in the restricted sleep opportunity days demonstrated higher levels of academic difficulty and school-related attention problems. The findings for aggressive behavior and internalizing problems were not significant.

In addition to the aforementioned experimental studies, other studies with non-experimental designs indicate relations between disruptions in children's sleep and a wide range of adjustment and academic problems. For example, sleep's effects on

adolescent school performance and general well-being was examined in a study of 3,120 normally developing high school students from four public high schools in Rhode Island (Wolfson & Carskadon, 1998). Sleep patterns and school performance were assessed using the School Sleep Habits Survey (an eight page self-report questionnaire) that students filled out independently during their homeroom classes. Results indicated that students who were struggling in school reported less overall sleep and a more irregular sleep/wake schedule than students who reported better grades. Furthermore, those who reported short school-night sleep also reported high rates of depressed mood, daytime sleepiness, problematic sleep behaviors, and more behavior problems than those who reported longer school-night sleep. The results of this study demonstrate that problems with sleep often relate to a wide range of cognitive, emotional, and behavioral difficulties.

Meijer and associates (2000) similarly investigated the effects of poor sleep on child school functioning. Using a self-report questionnaire designed and administered by the researchers, perceived quality of sleep, sleep duration, night awakenings and sleep latency after awakenings were assessed. School functioning was assessed using self-report on the School Perception Questionnaire (Van der Wolf, 1995). To assess cognitive performance, researchers administered the Bourdon-Vos test which was designed to measure concentration (Vos 1992). Researchers found that duration of sleep did not have a significant effect on cognitive performance. However, the reported quality of sleep showed significant relations with school functioning, cognitive performance and achievement motivation. Specifically, students who reported better quality sleep also reported higher rates of achievement motivation and better school functioning, such as

their ability to stay on task during class (Meijer, Habekothé, & Van Den Wittenboer, 2000).

Furthermore, another study found that children who do not get enough restful sleep are more likely to demonstrate behavior problems at school (Bates, Viken, Alexander, Beyers, Stockton, 2002). In a sample of 202 preschool children from Head Start and a university daycare center, researchers found that children with disrupted sleep patterns (e.g., irregular sleep schedules) were more likely to display fewer positive prosocial behaviors and more negative behaviors while at school. This finding was significant even after controlling for family stress and family management practices (Bates et. al., 2002).

In one of few studies employing objective measures of sleep, researchers at the University of Helsinki investigated the relationship between sleep patterns and child problem behaviors at home and at school (Aronen, Paavonen, Fjallberg, Soininen, Torronen, 2000). Specifically, a sample of 49 healthy 7 to 12 year-old children were asked to wear an ambulatory monitoring belt for 72 hours. Parents kept logs of when children went to sleep, woke up, or removed the belt. Parents were also asked to fill out the Child Behavior Checklist (CBCL; Achenbach & Edlebrock, 1983) regarding their children's behavior. In order to assess child behavior during school hours, teachers were asked to fill out the Teacher Report Form (Achenbach, 1991). Analysis of data indicated that children with high levels of Sleep Latency (time in bed before falling asleep) had parents who reported more aggressive/delinquent behavior and attention problems. Objective measures of sleep also indicated that children who slept more (as measured by

the actigraphy monitor) had lower levels of teacher-reported behavior problems than children who experienced shortened sleep periods (Aronen et al., 2000).

A group of multinational researchers conducted a longitudinal study with 980 children and their parents in New Zealand to investigate the relation between childhood sleep problems and later adult psychological disorders (Gregory, et al., 2005). After following the children through many assessments over a 20 to 25- year-period, findings indicated that consistent sleep problems early in life were predictive of adult anxiety disorder but not depression. However, this study did not clearly indicate a causal relation between poor sleep and adult anxiety, merely a correlated relation. Future studies are needed to explain more clearly if this association is causal or if both problems are the result of a separate underlying source (Gregory, et. al., 2005).

In another longitudinal study of 490 children starting at age four through age 15, researchers found that early childhood sleep disruptions predicted several long term difficulties (Gregory & O'Connor, 2002). Using parent report on the Child Behavior Checklist (Achenbach and Edlebrock, 1983), indicators of sleep difficulties as well as behavioral and emotional problems were assessed at ages four, seven, nine, ten, eleven, twelve, thirteen, fourteen, and fifteen years. Analyses showed that difficulties with sleep at age four predicted behavioral/emotional problems, attention difficulties and aggressive behavior in children eleven years later (Gregory & O'Connor, 2002).

Collectively, these findings indicate that disrupted sleep (either in quality or quantity) can have several negative effects on multiple aspects of children's lives. While these findings are indicative of the many influences disruptive sleep can have for children, many of the studies conducted so far have used subjective reports of sleep

patterns. Although it is important to examine these subjective reports because they have been consistently associated with child adjustment outcomes, objective measures of sleep are essential for a clearer understanding of the sleep—child development link.

### *Contributors to Poor Sleep in Children*

Understanding that poor sleep among children is a widespread problem, and the effects of poor sleep are numerous and far reaching in the daily lives of these children is essential and it is also imperative to try understand what may be leading to these sleep disturbances. According to one theory posited by Ronald Dahl (1996), sleep exists as part of a larger cycle of arousal regulation. Based on an evolutionary biological perspective, sleep can only occur when an individual feels safe and free from potential danger or harm. When individuals find themselves in an environment where danger is perceived, a self preserving state of high arousal is activated in order to ensure personal survival. Sleep, while a necessary part of the biological process, becomes difficult in a potentially threatening environment. Further, if one were to continue to examine the role of family structure and environment in sleep processes from an evolutionary biological perspective the importance of the family becomes more evident. Early humans lived in an environment filled with nocturnal threats including predatory carnivores. Under this threat it would be difficult to suspend a state of vigilance in order to surrender to the relaxation needed to obtain good sleep, without the protection of a family protective unit (Dahl & El-Sheikh, 2007). Given the threat of nocturnal predators, the family system would provide vital security needed in order to fall into and maintain good sleep. When taking this into account it follows that a healthy and safe bond with family members is imperative to obtaining the measure of safety needed for quality sleep.

Given this conceptual framework, and the importance of the family in providing children a sense of security (Cummings & Davies, 2002; Dahl & El-Sheikh, 2007), it is useful to examine the findings of a number of studies that have investigated familial environmental factors that may contribute to childhood sleep problems. One such study compared a group of abused children with a group of depressed children and a group of nonabused mentally healthy children (Glod, Teicher, Hartman, & Harakal, 1997). Using activity monitoring, researchers found that abused children experienced more difficulty falling and staying asleep than both the control and depressed groups, regardless of whether the abused children met the criteria for Post Traumatic Stress Disorder. A similar study also found that physically abused children demonstrated poorer sleep efficiency and fewer motionless sleep episodes, indicative of more restlessness during the night (Sadeh et al., 1995). Using the evolutionary biological model (Dahl, 1996; Dahl & El-Sheikh, 2007), it is possible to interpret these findings as an indication that abused children were not able to reach a sufficient sense of safety and well-being necessary for a state of vigilance to be suspended and a state compatible with sleep onset and continuation to be reached.

Another familial factor that has been considered to be important in a child's sense of well-being is the child's attachment to the parents. One study hypothesized that children with a secure attachment to their mothers would sleep better than children who did not have a secure attachment (Scher, 2001). Based on this hypothesis, researchers conducted a study with 94 mother-infant dyads to investigate the attachment-sleep relationship. Contrary to their expectations, results indicated no predictive relationship between maternal attachment and child sleep problems (Scher, 2001). Scher & Asher

(2004) similarly found no significant relationship between child sleep problems and child attachment style. This study employed the use of an activity monitor to objectively measure children's sleep patterns. Attachment was assessed using the Attachment Q-set (AQS; Walters & Deane, 1985) with 57 mother-infant dyads. Results indicated that neither child security nor dependency were related to child sleep problems.

However the literature regarding the role that attachment plays in child sleep patterns has not always indicated that attachment is unimportant. In one study conducted by McNamara, Belsky, & Feron (2003) the relationship between two different types of insecure emotional attachments was investigated. The study consisted of a 342 member subset mother-infant dyads with an insecure attachment style. When compared with their insecure-avoidant (children who avoid parents upon reunion in the Strange Situation) counterparts, insecure-resistant (children who are clingy to parents in the Strange Situation, and though upset at separation from caregivers they resist comfort from them upon return) children were found to have significantly more night wakings and longer duration of wake episodes.

Maternal attachment and sleep were also examined in a study with a sample of 41 mothers and their toddler-aged children (Benoit, Zeanah, Boucher, and Minde, 1992). In this study, however, rather than assessing the child's attachment to his or her mother, researchers examined the mother's internal working model of attachment. Specifically, researchers interviewed mothers about their early relationships with their attachment figures as well as their current "state of mind" about attachment. Through structured coding, mothers were assigned to 1 of 3 categories: either dismissing (corresponding to avoidance), autonomous (secure), or preoccupied (resistant). A mother's internal working

model of attachment was found to be significantly related to sleep. Specifically, mothers with an autonomous model of attachment were significantly less likely to have a child with sleep problems (Benoit et al., 1992). This finding indicates that there may be aspects of the maternal relationship and by extension, the family environment, which can influence and even protect against childhood sleep difficulties.

Another pertinent study was conducted with a sample of Chinese families where the practice of bed-sharing between parents and children is considered a cultural norm, which is believed to help promote familial interdependence and closeness (Liu, Liu, & Wang, 2003). The sample was composed of 517 elementary aged children in the People's Republic of China. Results showed that 55.8 % of seven-year-olds in the study slept in their parent's bed, and the percentage dropped dramatically in 11 to 13-year-olds to only 7.2 %. While children who slept in the same bed as their parents did not differ significantly from children who slept alone in bed regarding sleep time, sleep duration, parasomnias and breathing problems, those children who slept with their parents had a higher rate of parental reported sleep anxiety and daytime sleepiness than children who slept alone (Liu, Liu, & Wang, 2003).

Attachment style may act as a protective or risk factor in the relationship between child security and child sleep problems. According to the framework posited by Dahl (1996), sense of security is necessary for a person to feel safe enough to lower their arousal from a state of vigilance and fall into a restful sleep. Conceptually, a secure attachment to parents would seem necessary for a small child to feel safe enough to fall into and maintain a recuperative sleep. However, the literature investigating this area of interest has been inconsistent and conducted mostly with mother-infant dyads using

mother report only. This study will extend the literature in this area by assessing perceived attachments of older children, using the child's own report of security of attachments to both parents, as well as objective and subjective sleep assessments.

While past research has focused on the negative facets of family life that may contribute to child sleep problems, based on a child security focused theory it seems equally important to discuss positive factors that may facilitate positive sleep habits for children. These positive factors have been partially examined in the above presented literature regarding child attachment. A further extension of the examination of positive factors is attempted in this thesis by looking at a family's ability to adapt and change in the face of difficult times (adaptability), and by investigating feeling of closeness among family member during difficult periods (cohesion). In past studies examining this facet of family functioning, family adaptability/cohesion have been found to act as protective factors in the relationship between parental problem drinking and child externalizing behavior (El-Sheikh & Buckhalt, 2003). Family adaptability and cohesion have also been found to play a moderating role between adolescent's perceptions of interparental conflict and the adolescent's use of aggressive tactics during parent-child conflict (Johnson, 2002).

Another study investigated the relationship between children's adjustment and self-esteem and family cohesion (Cooper, Holman, & Braithwaite, 1983). This study surveyed 467 fifth and sixth graders and their families. Results from this study indicated that children's reports of their self-esteem was significantly higher in families with higher levels of reported family cohesion compared to children in less cohesive homes, even in the face of parental divorce. Another study investigated the relationships between

children's internalizing and externalizing difficulties and family adaptability and cohesion (Kaslow, et. al., 2003). In a sample of 56 children aged 8-12 in low income homes, researchers found no significant relationship for family adaptability but did find that children's externalizing problems were directly predicted by reported levels of family cohesion; families with higher levels of reported cohesion, demonstrated higher rates of externalizing behaviors. Though these findings seem counterintuitive the evidence regarding a direct relationship between family cohesion and child adjustment, shows that investigations of family adaptability and cohesion in various areas of study related to child functioning are warranted. Given the past findings that family adaptability and cohesion may have a positive influence of other aspects of children's lives, one could make a case for extending this facet of family study into the sleep literature domain.

Another factor that may influence a child's ability to achieve good sleep is the level of family stress that is occurring in the child's environment. According to one study, children in families experiencing higher levels of marital conflict demonstrated numerous sleep disruptions including reduction in overall time spent in sleep, poorer sleep quality, more night wakings and higher reported levels of subjective sleepiness during the day (El-Sheikh, Buckhalt, Mize, & Acebo, 2007). Another study conducted with 202 preschoolers in Indiana found that children who experienced irregular sleep patterns were more likely to come from families that had higher levels of family stress than children with a regular sleep cycle (Bates, et al. 2002). In Liu et al. (2000), family stress factors were again found to correlate with child sleep problems. In this sample of 2004 Chinese children researchers found that children from stressful home environments were significantly more likely to experience dyssomnias and parasomnias. Specially, families

that demonstrated poor parental marital relations, had a crowded home environment, and used a strict disciplinary style and corporal punishment had children with higher rates of sleep disturbances. The findings of these three studies indicate that family stress may play a role in the sleep adjustment of children with disorganized sleep (Sadeh, 2001). Thus, several studies that mostly used subjective measures of sleep disruptions provide preliminary evidence for relations between various facets of family stress and children's sleep.

*Sleep and Children's Age, Gender, and Puberty Status.*

Very little is known about the role that various intrinsic biological factors and child characteristics may play in children's sleep processes. The relation between children's age, gender, and puberty and sleep patterns has not yet been clearly established. However, several studies suggest the importance of these variables as potential factors that can influence sleep. In this study, we conduct a preliminary investigation of the moderating role of age, gender, and puberty status in the connection between family and sleep functioning.

Few studies have investigated gender-related effects associated with children's sleep. El-Sheikh et al. (2006) reported that, in comparison to boys, girls slept longer and had less activity during the night. Specifically, girls slept longer (Total Sleep Minutes  $M = 7$  hours and 22 min) than boys ( $M = 6$  hours and 34 min) and 10 min). Girls also showed lower levels of activity during the night than boys. These results are consistent with the actigraph-based study of Sadeh and colleagues (2000) who found that in a sample of second, fourth and sixth graders, in comparison to boys, girls slept longer and had a lower percentage of activity during sleep. Similarly, in a Japanese sample of 13 to

14-year-old children, and based on actigraphic assessments, girls evidenced longer sleep, less wake time, and better sleep efficiency than boys (Gaina, Sekine, Hamanishi, Chen, & Kagamimori, 2005).

However, Frederickson and colleagues (2004), in a large sample of 11-14 year olds, found that boys' and girls' self-reported sleep amount declined sharply from 6th to 8th grade, with the girls showing a steeper decline. Other survey-based studies have shown girls to have shorter sleep times and poorer sleep quality (Lagerberg et al., 2001; Manni et al., 1997). The difference in findings between actigraphy and subjective based studies assessment of objective vs. subjective sleep problems may be due to the subjective nature of sleep assessment employed by these researchers. Further investigation of the gender-sleep link, using objective measures would help shed light on this topic.

Study of younger children has shown little difference in boys and girls sleep patterns. In a group of 169 typically developing children (with no physical or developmental difficulties) aged one to five years old, sleep assessed using both maternal report and objective activity monitoring found no significant relationship between gender and maternal report of sleep, or actigraphic measures of sleep (Acebo et. al, 2005). This lack of difference may be due, in part, to the generally young age of children in the study. At this young age gender differences related to pubertal maturation and children's sleep may not have yet begun to show.

Research conducted to investigate relations between puberty and sleep patterns has begun to show significant predictive relationship. A study conducted by Carskadon and colleagues (1993) supports a significant shift in sleep patterns associated with

puberty status. Specifically, as children near puberty, they experience delayed phase preference, with more biologically mature children falling asleep later at night and having more difficulty waking in the morning. This finding was revealed by survey data collected of 551 eleven to twelve year-olds who reported on their sleep habits, reasons for sleep delays, and pubertal status (Carskadon et. al., 1993). These changes during the adolescent period are also seen as the youth ages through this epoch of life, with children in the later stages of adolescence obtaining less sleep than those in the earlier stages of the teenage years mostly because of delayed bedtime and forced early awakening due to school schedules (Carskadon, 2002).

Similarly, a small study of 8 pre-pubertal and 8 mature adolescent males compared sleep stages of the two groups via electroencephalogram all night polysomnography. Mature adolescents spent significantly less time in slow wave stage 4 sleep, which is believed to be the most recuperative stage of sleep, when compared to pre-pubescent children (Jenni & Carskadon, 2004). This is consistent with studies that have shown that by the end of the second decade of life young adults spend 60% less time asleep in slow wave sleep than pre-pubescent children just starting out on that decade (Carskadon, Harvey, Duke, Anders, Litt, & Dement, 1980). These changes seem to be indicative of a change in sleep need throughout the pubertal period.

There also may be changes in sleep need and sleep patterns according to age, though data in this area is even less prevalent, especially for children in the elementary school age years. Sleep in the first year of life is spread over a the entire 24-hour period with a gradual shift toward more nocturnal sleep and less daytime sleep, culminating in an elimination of need for daytime sleep and an eventual reduction in total hours spent in

sleep (Dahl, 1996). One group of researchers compared the sleep patterns of those in the beginning of this lifetime process with a group of pre-school aged children, 12 to 60 months (Acebo et al, 2005). The sleep patterns of these 169 children in 7 different age groups (12, 18, 24, 30, 36, 48, and 60 months) were studied using both maternal report of sleep and objective activity monitoring to assess children's sleep. Age-related changes in sleep were discovered for this group of children with children in the 12, 18, and 24 month group showing the most significant reduction in total sleep, though the total sleep for children 24 months to 60 months in age were remarkably stable with no significant reduction in total sleep time (Acebo et. al. 2005). The National Sleep Foundation conducted a larger survey of American families in which children were reported to experience significantly less sleep as they aged from infancy to fifth grade, with each age range (3-12 months, 1-3 years, and 3-5 years) decreasing by approximately one hour (National Sleep Foundation, 2004). Similarly, an Italian study of 2,889 children from infancy to six years old showed that, based on maternal report during pediatric visits, children's total sleep time reduced as they aged (S. Ottaviano, Gianntti, Cortesi, Bruni, & Ottaviano, 1996).

An examination and comparison of the sleep patterns of 140 school-aged children in second, fourth and sixth grade in Israel found a significant shift in children's sleep as they aged. Children in 6<sup>th</sup> grade showed an hour later sleep onset time than children in second grade, though there was no significant change in sleep efficiency across age groups. Older children also reported an increase in daytime sleepiness that is most likely due to a later sleep onset time with no change in sleep end time due to school hours (Sadeh, Raviv, & Gruber, 2000). This change in sleep onset may have been due to

changes previously reported with the onset of puberty for the older children; however, this possibility was not assessable in this particular study, due to the absence of pubertal data. Given that few studies examining the role that age plays in school age children's sleep have been conducted, further preliminary exploration of these variables is warranted.

### *Rational, Objectives, and Hypotheses*

While sleep disruptions are common in elementary school age children and disrupted sleep is associated with a wide range of negative child outcomes, not much is known about factors that either help promote good sleep or those that contribute to sleep disruptions. In order to help promote healthy sleep patterns and environments for children, there is a recognized need to examine family variables that may have a positive impact on children's sleep patterns in addition to those that may be deleterious to obtaining and maintaining good sleep (El-Sheikh et al., 2007). In an attempt to address this important literature gap, the main objective of this study is to examine associations between children's sleep (schedule, quality and quantity) and the following positive and negative potentially influential variables: family adaptability/cohesion, children's perceived attachment to their parents, children's perceptions of parental marital conflict including associated self-blame and perceived threat, and parent-child conflict and aggression. Assessment of multiple family and parent-child functioning variables is important for a better elucidation of factors that are related to an important facet of child biological regulation, namely sleep. To our knowledge, this is the first investigation to assess family adaptability/cohesion in relation to children's sleep. In relation to

examination of the attachment-sleep link, a few studies have examined this important relationship; however, very few have done so with elementary school aged children.

Although there have been several recent assessments of relations between marital conflict and disruptions of children's sleep, these studies have not examined children's self-blame and perceived threat in the context of parental conflict. Previous research has supported the importance of children's perceptions of self-blame and perceived threat in the context of parental marital conflict for children's adjustment (Grych, Seid, Fincham, 1992) and physical health (El-Sheikh, Harger, Whitson, 2001). In this study, we extend the assessment of relations between self-blame and perceived threat and child functioning through the inclusion of sleep parameters. Similarly, many studies have shown an environment of aggression towards children by parents to be deleterious to their sleep (Glod, Teicher, Hartman, & Harakal, 1997; Sadeh et. al., 1995). This study seeks to further examine this type of family facet by examining children's reports of frequencies of parent-child conflict, including verbal and physical aggression as well as non-aggressive discipline tactics, within the context of children's sleep functioning.

To strengthen construct measurement for sleep, we examined multiple facets of sleep including objective assessments of sleep schedule, quantity, and quality. We also examined subjective reports of sleepiness and sleep/wake problems. Consistent with the conceptual framework posited by Dahl (1996) we hypothesized that children who lived in an environment that allowed for a safe suspension of a state of self-preserving vigilance would be able to obtain and maintain a better night sleep, while those in an "unsafe" environment would experience shorter and more disturbed sleep. Specifically, we expected that higher levels of family adaptability, cohesion, and/or secure child-parent

attachments would be associated with less disruptions in sleep schedule, longer sleep durations and better sleep quality (e.g., fewer night awakenings) in children. Conversely, we expected that higher levels of marital conflict, and associated perceived threat and self-blame, as well as parent-child conflict and aggression would be related to increased sleep disruptions and reduced sleep duration.

A second study objective is to examine relations between children's sleep and their age, gender, and puberty status. Based on the few actigraphy-based studies with school age children, older and more biologically mature children were expected to evidence shorter sleep durations. Given the inconsistent evidence regarding quality of sleep in relation to gender, age, and puberty status, the assessments of the sleep quality-age or puberty status links are considered exploratory. Finally, based on the sample characteristics and preliminary analyses results, a third objective of this study is to examine gender, age, and puberty status as moderators in the relation between family functioning factors and children's sleep. A moderator is a variable that influences the direction or strength of the relationship between the predicting and outcome variables.

Due to the relatively low prevalence of studies that examine both age and puberty in sleep analysis, it is of potential importance to examine these variables separately despite the generally accepted correlation between the two variables. There may be separate mechanisms that affect relations between either age or puberty and children's sleep. Biological processes drive the changes in puberty related to children's sleep (Carskadon, 2002). However sleep expectations of the general population for children are generally based on the child's age and grade level. All analyses regarding sleep and age in this study should be considered merely as exploratory and preliminary in nature.

## Method

### *Participants*

Children were recruited from the local community through word of mouth and advertisements posted in town. Participants consisted of a group of generally healthy children who were free of chronic illness and did not have any diagnosed learning disabilities or special education needs. Participating in this study were 23 boys and 18 girls between the ages of 6 and 12 years with a mean age of 10.06 (SD = 1.74) and their mothers. Children's pubertal level was assessed using The Pubertal Development Scale (Petersen, Crockett, Richards, and Boxer, 1988). On this scale, the following numbers indicate the various pubertal stages: 1 = pre-pubertal, 2 = early pubertal, 3 = mid-pubertal, 4 = late pubertal, and 5 = post-pubertal. Mean puberty score was 1.42, SD = .56, with 59 % pre-pubertal, 34% were in the earliest stages of puberty and 7% were mid-pubertal. When further examined by gender 69.6% of the boys were pre-pubertal and 30.4% were in the earlier stages of puberty; while, 44.4% of girls were pre-pubertal, 38.9% were in the early stages of puberty, 16.7% were mid-pubertal. The majority of participating families were European-American (95%); the rest were African-American (5%). All families were rated as middle to upper class using the Hollingshead Index (Hollingshead, 1975).

### *Procedure*

This study is a part of a larger investigation and for the purposes of this thesis, only pertinent measures and procedures are presented. After agreeing to participate over the phone, families were scheduled for a 3-hour lab visit at their convenience to research facilities at a local university. Upon arriving at the research lab, each mother read and

signed informed consent forms for both her own and her child's participation. In addition, a researcher went over an assent form with the child regarding his or her participation and then answered any questions that either the child or mother had.

After consent was obtained from the parent and assent from the child, the child completed a series of questionnaires regarding sleep habits and relationships within the family including conflict between parents. During this time, mothers were also given a set of questionnaires to complete regarding their marital relationship as well as questionnaires about their child's behaviors, feelings, family relationships, and sleep habits.

To assess children's sleep patterns, after the families visit to the lab, a research assistant delivered an actigraph watch to the child's home for the child to wear each night during sleep over a period of four nights during the summer (Monday - Thursday). Parents were instructed to place the actigraph watch on the child's wrist each night before bedtime. Parents were also given a sleep diary to keep track of when the child went to bed and fell asleep each night, as well as when they woke and got up each morning. Families were asked to maintain the child's typical sleep and bedtime activity as it was on nights when their sleep was not being assessed. All procedures and questionnaires were approved by the University's Institutional Review Board for the Protection of Human Subjects.

### *Materials*

#### *Sleep*

*Subjective sleep assessment.* Children completed the Sleep Habits Survey (SHS) via interview with a research assistant (this questionnaire and all others used in this

investigation are included in the Appendix). The Sleep Habits Survey has been used previously with both adults and children and has been shown to have good reliability and validity (Carskadon, Seifer, & Acebo, 1991; El-Sheikh & Buckhalt, 2005; Wolfson et al., 2003). Two subscales of the Sleep Habits Survey were pertinent and used in analyses. The first was the Sleep/Wake Problems subscale consisting of 15 items. The Sleep/Wake Problems scale assessed a number of child-reported difficulties related to their sleep and wake behaviors including oversleeping and difficulty falling asleep at night. Children reported the frequency with which each of these problems had occurred over the previous two week period and answers were endorsed on a scale of 1-5 for each question with 1 indicating never and 5 indicating everyday/night. Good internal consistency for the Sleep/Wake scale was observed with the present sample ( $\alpha = .82$ )

The Sleepiness scale was also used in Analyses and consisted of 9 items that asked if the child had fallen asleep, struggled to stay awake, or both during specific activities over the previous two weeks. Responses indicating the child had never had difficulty during these events received a score of 1, 2 if the child struggled to stay awake, 3 if the child had just fallen asleep without trying to stay awake, and 4 if they had struggled to stay wake but fell asleep anyway. Answers reported by children in this sample indicated good internal consistency for the Sleepiness scale ( $\alpha = .83$ ). The outcome measures for subjective sleep- related problems that were used in analyses are Sleep/Wake problems and Sleepiness.

*Objective sleep assessment.* Sleep was also assessed using objective actigraphy measures obtained using a Minimitter Actiwatch-64 (Mini Mitter Co., Inc., Bend, OR). Previous studies have effectively employed this method of sleep assessment (Gaina,

Sekine, Hamanishi, Chen, & Kagamimori, 2005) and have indicated the Minimitter watch to be valid when compared with polysomnographic sleep assessment (Kushida et al., 2001). The Minimitter Actiwatch-64 works by recording movement in one minute intervals/epochs during the child's sleep period. Any activity count over 40 is scored as an "awake" epoch. If an epoch shows an activity count below 40, the preceding two epochs and subsequent two epochs are taken into account in determining if the central epoch is an "awake" interval. The central epoch is scored as "awake" if the sum total of activity counts during all five epochs is more than 40.

Sleep measures were scored by downloading Minimitter recordings onto a computer software program (Actiwatch-Score® software), which assessed several different facets of sleep, using the programmed algorithm. These measures include Sleep Onset Time and Wake Time, Actual Sleep Time, Sleep Efficiency and Total Movement during the night. Sleep Onset Time and Wake Time are sleep schedule variables that were calculated automatically by entering the parent report of bed time and wake time, the software then determined when the child went to sleep and when the child woke up. Actual Sleep Time is a measure of sleep quantity, determined by the Actiwatch software program as the total minutes between Sleep Onset and Wake Time scored as sleep. Sleep Efficiency is a measure of sleep quality, determined by dividing Actual Sleep Time by the amount of time spent in bed and then multiplying by 100. Finally, Total Movement (a measure of sleep quality) is defined as the total number of minutes during which the child demonstrated a significant amount of movement during the night.

The main actigraphy-based variables that were used in analyses are (a) Sleep Onset Time and Wake Time, (b) Actual Sleep Time, (c) Sleep Efficiency, and (d) Total

Movement. To assess the stability of actigraphic sleep variables across the four nights of data acquisition, reliability analysis was performed. All actigraphy-based variables had acceptable to high level of stability over the four nights of sleep assessments: Sleep Start Time,  $\alpha = .86$ ; Sleep End Time,  $\alpha = .90$ ; Actual Sleep Time,  $\alpha = .70$ ; Sleep Efficiency,  $\alpha = .74$ , and Total Movement,  $\alpha = .7$ .

#### *Family Relationship Factors*

The Family Adaptability and Cohesion Evaluation Scale II (FACES II) was completed by mothers. FACES II is a 30-item scale that assesses levels of a family's adaptability and cohesion. Family Cohesion is defined by Olson and McCubbin (1983) as the extent to which family members feel emotionally connected and close with one another. Family Adaptability is the extent to which a family can adapt and change in the face of challenges presented to the family and its members. The FACES II scales have been found to have good reliability and validity (Olson & McCubbin, 1983; Place, 2005). In the present investigation, the two subscales of Family Adaptability and Family Cohesion were highly correlated ( $r = .88, p < .0001$ ). Thus, to reduce the number of analyses and the probability of Type I error, the two subscales were standardized and summed to create a family adaptability/cohesion composite variable. Internal consistency for this composite variable was acceptable ( $\alpha = .61$ ).

The FACES II was originally designed to be used in conjunction with a curvilinear-based theoretical framework (Olson & McCubbin, 1983). However, research conducted by the questionnaire's developers has indicated that it may be more appropriate to treat family adaptability/cohesion as a linear construct with high scores indicating more positive levels of family cohesion and adaptability (Olson, 1991). In this

study, we examine and view the family adaptability/cohesion variable in linear terms with higher scores reflecting more positive aspects of this construct.

Children's perceptions of attachments to both mothers and fathers were measured using the Inventory of Parent and Peer Attachment (IPPA; Armsden, 1986; Armsden & Greenberg, 1987). The IPPA is composed of 25 items each for mothers and fathers and determines the degree to which children perceive their parents as sources of emotional security. Each item is rated on a 5 point Likert Scale ranging from 1 (almost never or never true) to 5 (almost always or always true). This instrument has demonstrated good reliability and validity in previous studies (Armsden, 1986, Armsden & Green Berg, 1987) and again in this study ( $\alpha = .77$ ). For data reduction purposes, and given the significant correlation between children's reports of attachments to mothers and fathers ( $r = .55; p < .01$ ), one composite measure of perceived child-parent attachments was used in analyses.

To assess negative familial factors that may affect children's sleep, the Children's Perception of Interparental Conflict Scale (CPIC; Grych, Seid, & Fincham, 1992) was administered via interview to children. The CPIC has scales, which are summarized next. The Destructive Conflict scale consists of 19 items that examine children's perceptions of marital conflict between parents in relation to the conflict's frequency, intensity, and lack of resolution. The Perceived Threat scale is composed of 12 items that assess the extent to which children feel threatened by, and are able to cope with, interparental marital conflict. Finally, the Self-blame scale includes 9 items and examines the degree to which children blame themselves for interparental marital conflict. Previous research has found the CPIC to demonstrate good psychometric properties (Grych et al., 1992) including

acceptable levels of stability over a two week period (Fincham, Grych, & Osborn, 1993). With the present sample, the three CPIC scales had acceptable to good internal consistency: Destructive Conflict  $\alpha = .85$ , Perceived Threat  $\alpha = .83$ , and Self-Blame  $\alpha = .64$ . The three CPIC scales were used in analyses.

Another family dynamic was examined using the Child report of the Revised Conflict Tactics Scale (CTS P-C; Straus, 1995). This is a 17-item questionnaire that assesses types and frequency of various discipline techniques and parent-child conflict. The questionnaire is made up of 4 subscales of parent-child conflict, which were examined in this study: Non-Violent Discipline, a 4-question subscale (e.g.: How many times did your mother/father explain why something was wrong?), Psychological Aggression, a 5-item subscale (e.g. How many times did your mother/father call you dumb, lazy or some other name like that); Physical Aggression, 4 items (How many times did your mother/father shake you); and Weekly Discipline 4 items (how many times did your mother/father shout or yell at you in the past week?). Each question was asked regarding both the mother's and father's behaviors toward the child. The child's responses were scored on a scale from 0-6 (0 = Never happened or has not happened in the past year, 1 = once in the past year, 2 = twice in past year, 3 = three to five times, 4 = six to ten times, 5 = eleven to twenty times, and 6 = more than twenty times in the past year. The CTS P-C has demonstrated good reliability in the past and continues to do so in this study ( $\alpha = .85$ ).

## II. RESULTS

### *Preliminary Analyses*

We examined associations between the child's age, gender, and puberty status in relation to the sleep and family functioning variables. Puberty status was related to age ( $r = .52, p < .001$ ), gender ( $r = .39, p < .001$ ) and Sleep Onset Time ( $r = .42, p < .01$ ). These correlations show that, in comparison to younger children, older children were more developed biologically, were more likely to be girls, and fell asleep at a later time. Child gender was also correlated with Perceived Threat due to Interparental Marital Conflict ( $r = -.32, p < .05$ ), suggesting that girls had lower levels of perceived threat. In relation to gender effects, and for an understanding of group mean differences, t-tests comparing boys and girls on puberty status and Perceived Threat were conducted. These tests showed that girls ( $M = 1.7; SD = .66$ ) had a higher level of pubertal maturation than boys ( $M = 1.30; SD = .29$ ),  $t(22.37) = -2.46, p < .05$ . Further, girls ( $M = 6.71; SD = 4.88$ ) had a lower level of Perceived Threat related to parental marital conflict than boys ( $M = 10.26; SD = 5.74$ ),  $t(38) = 2.06, p < .05$ . These relations indicate that gender and puberty status should be statistically controlled for in analyses (for more rigorous assessments, age was also covaried in primary analyses).

### *Associations Among Variables*

Table 2 presents partial correlations among the primary study variables. In relation to associations among the sleep variables, the two sleep schedule variables were

associated indicating that children who fell asleep later also woke up later. Further, earlier Sleep Start Time was associated with increased Total Movement, and later Wake time was correlated with less Sleep Efficiency. Furthermore, Actual Sleep Time was positively related to Sleep Efficiency and negatively associated with Total Movement. Finally, children's reported Sleepiness was positively related to their reported Sleep/Wake problems. No significant associations between the objective and subjective sleep measures were found.

In relation to associations among the family functioning variables, no significant association was found between positive family environmental factors (Family Adaptability/Cohesion and child Perceived Attachment). A modest correlation was found between children's Perceived Attachment to parents and children's reports of Self-blame related to parental marital conflict with those who have a more secure parental attachment reporting lower levels of Self-blame. Modest correlations were also found between children's perception of marital conflict and child reports of parent-child conflict interactions, with higher levels of marital conflict predicting higher child reports of parent-child conflict.

#### *Family Environment and Children's Sleep*

Partial correlations between family environmental factors and children's sleep that controlled for age, gender, and puberty status are presented in Table 2. As shown in the Table, parent-child conflict was associated with some objectively examined and subjectively reported sleep variables. Specifically, children's reports of more frequent Non-Aggressive Discipline were associated with lower levels of both Actual Sleep Time and Sleep Efficiency. Further, as children's reports of weekly discipline increased so did

children's reports of Sleep/Wake Problems. In addition, higher levels of parent-child verbal aggression were associated with decreased Actual Sleep Time.

Associations between family functioning and sleep parameters were also found. Specifically, Family Adaptability/Cohesion was related such that increased adaptability/cohesion was related to later Wake Time and lower Sleep Efficiency. No significant associations were found between children's sleep and their perceived attachment to parents, children's perception of destructive interparental marital conflict, Perceived Threat or Self-blame regarding the interparental conflict.

#### *Family Functioning as a Predictor of Sleep and Moderators of this Association*

Hierarchical multiple regressions were run to determine (a) the amount of variance accounted for by the various family functioning variables in the prediction of sleep quality and quantity, and (b) whether age, gender or pubertal status interacted with family variables in predicting children's sleep (Aiken & West, 1991). In the first step of each regression equation, to conduct stringent examinations of relations between family functioning and sleep, we controlled for children's age (Sadeh, et al. 2000), puberty status (Carskadon, Viera, & Acebo, 1993), and gender (Sadeh et al, 2000). In the second step, a family functioning variable was added. Finally, the two-way interactions between the family functioning variable and the three potential moderators were entered in the third step. Because of the small sample size, and related power considerations, the family functioning variables had to be examined separately in several regression equations. In each equation, all predictors and moderators were centered. Significant interactions were graphed by computing predicted values of sleep at high (+ 1 SD) and low (-1 SD) values for the moderator and sleep measure. Slopes in the graphs were examined to determine

whether they were significantly different from zero. All analyses conducted to investigate moderating roles followed the recommendations of Aiken and West (1991). Only significant findings are reported. The following results section is organized by the following family functioning variables in this order: Family Adaptability/Cohesion, Children's Perceptions of Interparental Marital Conflict, and Parent-Child Conflict. Further, these sections are divided by Sleep outcome variable in the following order: Sleep Onset Time, Wake Time, Actual Sleep Time, Sleep Efficiency and Movement.

*Family Adaptability/Cohesion as a Predictor of Children's Sleep*

The Family Adaptability/Cohesion variable was examined as a predictor of children's sleep. Regression analyses (Table 3) showed that, after controlling for child characteristics, Family Adaptability/Cohesion predicted 14% of unique variance in children's Wake Time, and showed a trend towards predicting 9% of the variance in Total Movement (Table 3). These findings indicate that children from homes characterized by a higher sense of adaptability/cohesion sleep later and have less movement during the night than children from less adaptable and cohesive homes. No interaction effects were found between either age, gender, or puberty and Family Adaptability/Cohesion in the prediction of children's sleep.

*Interparental Marital Conflict as a predictor of Children's sleep and Moderation effects*

*Sleep Onset Time.* Children's perceptions of parental marital conflict were examined as predictors of their sleep. As shown in Table 4, child characteristics interacted with children's perception of self-blame related to the marital conflict to predict children's Sleep Onset, accounting for 22% of the unique variance in this sleep variable (see Table 4 for all regression analyses involving Self-blame). In figure 1, it can

be seen that at lower levels of Self-blame, younger children had an earlier Sleep Onset time than older children. However, at higher levels of Self-blame, both older and younger children had a similar Sleep Onset Time. Examination of the slopes indicated that the slope representing the relations between Self-blame and Sleep Onset was significantly different from zero for younger children but not for older children. This indicates that as younger children's level of Self-blame increased their Sleep Onset Time was later in the evening.

Puberty also acted as a moderator in the association between Self-blame and Sleep Onset Time. As can be seen in the Figure (2), when perceived Self-blame is low, children demonstrated similar Sleep Onset time regardless of pubertal status. Conversely, when Self-blame levels were high, the more pubertally advanced children evidenced a later Sleep Onset time than their less physically mature counterparts. An examination of the slopes associated with the Self-blame Sleep Onset relation showed that the slope was significantly different from zero for pubertally mature children but not for the less physically mature children. These findings show that as Self-blame levels increased for pubertal children, they demonstrated a markedly later Sleep Onset Time.

*Wake Time.* Similarly, Self-blame regarding parental marital conflict directly predicted 10% of the unique variance in children's Wake Time. The betas shown in Table 4 indicate that children who felt more at fault for the conflict had a later Wake Time than those who felt less responsible. No interactions between either age, gender, or puberty and Self-blame were found in the prediction of children's sleep.

*Actual Sleep Time.* Children's Perceived Threat in relation to marital conflict showed a trend toward predicting 9% of unique variance in children's Actual Sleep Time,

with children who perceived higher levels of threat associated with their parents' conflict showing a reduced level of Actual Sleep during the night. No moderation effects were found.

*Parent-Child Conflict as a Predictor of Children's Sleep and Moderation effects*

*Sleep Onset Time.* After controlling for age, gender, puberty, and main effects, child demographic characteristics interacted with parent-child verbal aggression to predict Sleep Onset Time, and this step of the regression equation accounted for 24% of unique variance in this sleep schedule variable (see Table 5 for all Parent-Child Conflict-objective sleep measure regression results). As the betas associated with this step indicate, puberty and parent-child verbal aggression interacted significantly; interactions involving age and gender were not significant. As shown in Figure 3, at lower levels of parent-child verbal aggression, Sleep Onset Time was very similar for children regardless of their puberty status. However, at higher levels of verbal aggression, more biologically mature children evidenced a more delayed Sleep Onset Time than their less biologically mature counterparts. Furthermore, examinations of the slopes indicated that whereas the slope representing the association between verbal aggression and Sleep Onset Time was significantly different from zero for pubertally advanced children, it only approached conventional levels of significance for less biologically mature children.

Similarly, child characteristics acted as a moderator in the relation between parent-child Physical Aggression and Sleep Onset Time (see Table 5). As the betas in the Table indicate, the interactions between physical aggression and either age or puberty status was significant. Graphing of these interactions indicated that at higher levels of physical aggression, Sleep Onset time was similar for all children regardless of their age

(see Figure 4). However, at lower levels of physical aggression, older children had a later Sleep Onset Time than younger ones; neither slope was significantly different from zero.

Furthermore, the moderation effect involving puberty illustrated that, at lower levels of physical aggression, children had similar Sleep Onset Times regardless of their puberty status (see Figure 5). However, at higher levels of physical aggression, more biologically mature children are evidencing a later Sleep Onset Time than their less biologically mature counterparts. Another way of interpreting the graph is that, the slope representing the relation between physical aggression and Sleep Onset Time was not significantly different from zero for less mature children. The slope representing that relation for more biologically mature children was statistically different from zero illustrating that these children are more likely to have later Sleep Onset at higher levels of Physical Aggression.

*Wake Time.* Age acted as a moderator in the relation between Parent-Child Verbal Aggression and children's Wake Time. As seen in Figure 6, at low levels of Verbal Aggression children younger children and older children woke at similar times, but at higher levels of Verbal Aggression, younger children begin to wake significantly later than older children. Examination of the slopes indicates that the slope is significantly different from zero for younger children but not for older children.

Graphs (see Fig. 7) representing the age interaction illustrated that at lower levels of Verbal Aggression, less pubertally advanced children woke up later than their more pubertally mature counterparts. However, group differences were more pronounced when there was a higher rate of parent-child Verbal Aggression. Specifically, more pubertally advanced children had a later Wake Time than those less biologically mature.

Examination of the slopes indicated that the relationship between parent-child Verbal Aggression and Wake Time approached conventional levels of significance for more physically mature children, but no such trend was found for children who were less pubertally advanced.

Similarly, regression Analyses showed that parent-child physical aggression explained 15% of the unique variance in children's Wake Time, indicating that a higher level of physical aggression toward children was related to children sleeping later in the morning. No interaction effects were found for age, gender, or puberty in the relation between Parent-Child Physical Aggression and children's Wake Time.

*Actual Sleep Time.* Parent-Child conflict variables were also examined as predictors of children's Actual Sleep Time. Regressions, shown in Table 5, indicated that Non-aggressive Discipline accounted for 18% of the unique variance in children's Actual Sleep Time. This finding illustrates that children who experienced more frequent Non-Aggressive Discipline obtained less Actual Sleep during the night. Similarly, Parent-Child Verbal Aggression approached significance in predicting 10% of the variance in Actual Sleep Time. These results indicate that children who have higher levels of parent-child verbal aggression in their home show a lower level of Actual Sleep at night. No interaction effects were found for age, gender or puberty in the Non-aggressive discipline and Actual Sleep relation.

*Sleep Efficiency.* Non-Aggressive Discipline was also examined as a predictor of sleep. As shown in Table 5, Non-Aggressive Discipline accounted for 13% of the unique variance in children's Sleep Efficiency. Specifically, children who experienced higher levels of Non-Aggressive Discipline showed lower levels of Sleep Efficiency. There were

no interactions between age, gender, or puberty in the relationship between Non-Aggressive Discipline and Sleep Efficiency.

*Total Movement.* Parent-Child Conflict variables were also examined as predictors of children's Total Movement during the sleep period. Regressions revealed that Weekly Discipline predicted 15% of the variance in Total Movement. Children who report more Weekly Discipline have higher levels of Total Movement during their sleep.

Furthermore, child characteristics interacted with Parent-Child Verbal Aggression to predict Total Movement, and this third step of the regression equation predicted 24% of the unique variance in this Sleep Quality Variable. As betas shown in Table 5 indicate, puberty interacted significantly with Verbal Aggression when predicting children's total movement; age and gender did not show similar interaction effects. The graph of the interaction between puberty and verbal aggression is depicted in Figure 8. The Figure, illustrates that the slope representing the association between Verbal Aggression and Total Movement was significantly different from zero for less pubertally mature children but not for more pubertally mature children. Thus, increasing levels of Parent-Child Verbal Aggression were associated with increased Total Movement during the night only for less pubertally advanced children.

Similarly, child demographic characteristics interacted with Parent-Child Physical Aggression in predicting Total Movement, accounting for 43% of the variance in this sleep variable. Betas indicate that both age and puberty interacted with Parent-Child Physical Aggression to predict Total Movement; gender did not show a significant interaction. Graphing of these interactions (Fig. 9) indicated that both older and younger children show similar levels of Total Movement to one another when Physical

Aggression is low. However, more age-related effects are apparent at higher levels of Physical aggression, with older children having more movement than their younger counterparts. Note that neither slope was significantly different from zero.

In comparison to age, puberty showed a stronger interaction with Parent-Child Physical Aggression in predicting Total Movement. As Physical Aggression increased, the less physically mature children had increasing levels of Total Movement, and the slope representing this association was significantly different from zero (see Fig 10). The similar slope for more biologically developed children approached conventional levels of statistical significance ( $p = .09$ ).

#### *Parent-Child Conflict and Subjective Sleep Measures and Moderators*

Lastly, Parent-Child Conflict variables were explored as possible predictors of children's subjective sleep measures. After controlling for age, gender, puberty and main effects, child characteristics interacted with Non-Aggressive Discipline to account for 26% of the variance in Sleepiness (see Table 6). As the betas found in this step indicate, puberty interacted significantly with Non-Aggressive Discipline in predicting children's reported Sleepiness. Figure 11 shows that at lower levels of Non-Aggressive Discipline, more pubertally advanced children report higher levels of daytime sleepiness than less pubertally advanced children. Further investigation of the slopes shows that neither the pubertally mature nor the less pubertally mature children have a slope that is significantly different than zero; both slopes approached conventional levels of significance ( $ps = .06$ ).

### III. DISCUSSION

Although sleep problems are very prevalent in otherwise typically developing children, not much is known about how the family environment and the child-parent relationship are related to sleep in children. We examined several aspects of family process in relation to subjective and objective measures of sleep in elementary school age children. Consistent with expectations, several dimensions of family conflict in either the marital or the parent-child context were associated with sleep schedules, amount, and quality in children. Further, child puberty status interacted with parent-child conflict in the prediction of various sleep parameters. These findings provide preliminary evidence for the importance of relationships within the family in relation to sleep.

Most profoundly, parent-child conflict was correlated with multiple sleep domains, indicating that this kind of conflict between parents and children seems to be extremely influential on children's well-being. Our results show that children who experienced more frequent conflict with their parents demonstrated consistent sleep difficulties including less actual sleep during the night, lower sleep efficiency, more total movement during the night, and higher levels of reported sleepiness. These findings are consistent with, and build on, results from the few studies that examined abused vs. non-abused children's sleep patterns (Glod, Teicher, Hartman, & Harakal, 1997; Sadeh et.al., 1995). Our results also suggest that it is not just abuse per se, but that even less violent discipline practices such as non-aggressive conflict, when they occur frequently, can be

related to disruptions children's sleep. In addition to the direct relations between parent-child conflict and sleep parameters, conflict interacted with both age and puberty status (results more robust for the latter) to predict changes in sleep onset and wake time, (measures of sleep schedule) and total movement (a measure of sleep quality). Future studies are needed to replicate and tease out the mechanisms at work in these moderating relationships. Also it would seem that the findings regarding total movement and sleep onset are contradictory. However, it is important to keep in mind that sleep onset and total movement are different aspects of children's sleep. Sleep onset is a measure of children's sleep schedule and total movement is a measure of sleep quality. The different findings for total movement and sleep onset may tap fundamentally different aspects of children's sleep.

Regarding other possible negative family factors relating to children's sleep, we expected to find that higher levels of marital conflict, and associated perceived threat and self-blame would also be related to a decreased sleep quality and quantity. Higher levels of self-blame for interparental marital conflict were associated with a later wake time, and interacted with age and puberty in the prediction of sleep onset time. It is not clear why self-blame would be associated with later wake time. However, given the association between self-blame and depression symptoms (Grych and Fincham, 1993), it is plausible that this is an escape-avoidance form of coping, though clearly this explanation is tentative. Self-blame interacted with children's age and puberty status to predict sleep onset time. The pattern of effects illustrates a later sleep onset for older children regardless of self-blame. However, for younger children, a positive association between self-blame and sleep onset time was evident. Self-blame is likely associated with

increased anxiety in children, and past findings have shown self-blame to be an important mediator in the connection between exposure to parental marital conflict and children's internalizing, externalizing (Grych and Fincham, 1993), and physical health problems (El-Sheikh et al., 2001). The present findings, although modest, present initial evidence for the potential impact of self-blame in the context of marital conflict on another dimension of children's well-being, namely sleep. However, this finding was only evident for the chronologically younger children. For older children, and possibly because of reduced parental monitoring of sleep schedules for these older children, sleep onset time was later and not impacted by self-blame for this age group. Puberty status also showed an interaction in the relation and self-blame and children's sleep. Again it would be important in future research to have a wide range of puberty and age differences while evaluating the relations between self-blame due to parental marital conflict and children's sleep.

Relations between family conflict and sleep disruptions are consistent with Dahl's proposition (1996; Dahl & El-Sheikh, 2007), that sleep and vigilance constitute opponent processes and that family stress is likely to be disruptive of sleep. It is likely that the evolution of sleep in humans was tied to the protection provided by family members in an environment with nocturnal hunting carnivores and few physically safe environments (Dahl & El-Sheikh, 2007). This biological-evolutionary perspective provides a context for understanding the role of sleep disruptions in threatening environments. Following this same line of reasoning we expected that positive family factors would be related to better sleep in children. However, this proposition did not receive as much empirical support in our study.

We expected that higher levels of family adaptability/cohesion, or secure child-parent attachments would be associated with better quantity and quality in children's sleep as well as less disruptions in children's sleep schedule. We actually found no relationship between parent attachment and children's sleep patterns. Although theoretically this seems unlikely it is actually consistent with previous studies (Scher, 2001; Scher & Asher, 2004). However it may be possible that attachment while not conferring any additional direct benefits to children's sleep, may act as a protective factor in the relation between negative family environmental factors and children's sleep. A recent study conducted by El-Sheikh and colleagues (El-Sheikh, Keller, & Buckhalt, under review) found that attachment acted as a protective factor in the relation between parental marital conflict and children's sleep. Future studies examining the possible protective role of attachment in the parent-child conflict-sleep relation would be an intriguing avenue to pursue.

Similarly, few relations between family adaptability/cohesion and children's sleep were found. Specifically, higher family adaptability/cohesion was associated with a later wake time, a trend toward lower total movement and very unexpectedly associated significantly with lower levels of sleep efficiency. As this was one of the first studies to examine family adaptability/cohesion in relation to children's sleep, pending further investigation we will refrain from interpreting these unexpected findings. It is curious that most of the "positive" family functioning dynamics were not related consistently to sleep. Although one does not want to accept the null hypotheses, especially given the small sample size in this study and associated power limitations, some speculations are pertinent.

The very different patterns of effects involving the “positive” family variables, on the one hand, and conflict in especially the parent-child or marital system, on the other hand, and sleep, respectively, have implications for family-wide models of how different family systems may affect sleep. Although a few positive family functioning variables were correlated significantly with either marital or parent-child conflict, by and large these variables were not associated with each other. This raises the possibility of qualitatively different pathways of effects on children’s sleep outcomes associated with children’s experience in these two family contexts. One interpretation is that conflict in the family has pervasive effects on children’s regulatory processes, including sleep.

Conversely, positive features of the family environment, in the absence of a threatening environment, may not confer additional benefits to the regulation of a biologically influenced system such as sleep. Thus, it may be that these “positive” and conflictual family variables pose different forms and or levels of risk for the sleep system. Given some researchers findings that attachment acts as a protective factor for children’s sleep in the face of family stress (El-Sheikh, Keller, & Buckhalt, under review), examining family adaptability/cohesion in this context may also be warranted.

Surprisingly few relations were found between family environmental factors and children’s actual sleep time. One plausible explanation for the surprisingly few relations between family factors and children’s actual sleep is that the sleep data collected for this study were compiled during the summer when children were on vacation from school and did not have to artificially curtail their sleep for school start times. Future studies should concentrate on assessments during the school year when a more robust relationship between actual sleep and family variables may become apparent.

Sleep quantity and quality were assessed through both subjective, self-report measures and with actigraphy, a more objective measure. We should note that the objective and subjective measures were not related, which though initially counterintuitive, upon further examination can be better understood. While both measures are useful for many purposes, subjective and objective sleep measures represent different aspects of human sleep. It is important to assess children's perceptions of the quality of their sleep, as beliefs may guide emotions and behaviors, as well as to make objective assessments of sleep quality and relate those assessments to patterns of behavior.

Within each domain of measures, however, the correspondence is in the expected direction at expected levels. For example, self-reported sleepiness was positively correlated with self-reported sleep-wake problems similar to what others have reported (Carskadon, 2002). Further, most of the actigraphy variables were related to one another in expected directions and degrees (Sadeh, Raviv, & Gruber, 2000). Sleep onset time and wake time were found to be highly correlated, though intuitively this finding is in the expected direction, the relation is incongruent with results and theory of previous studies (Carskadon 2002), which find little correlation between the two due to a societal pressure for early waking to attend school. Because this study was conducted during the summer, when children did not have to get up early for school, there was less societal pressure for an early waking. Similarly due to the same conditions, a later sleep onset time was not related to a reduced amount of actual sleep time as may have been found if children had been required, by the demands of school, to artificially curtail their natural sleep cycle. As findings indicate that children in more stressed families fell asleep later, if the study had been conducted during the school year children who lived in more stressed family

environments may have shown curtailed sleep cycles, due to the community demand of an earlier wake time for school regardless of when a child falls asleep at night.

Marital conflict variables destructive conflict and self-blame regarding parental marital conflict were positively associated with parent-child conflict as would be expected based on previous study findings (Erel and Burman, 1995). Also in an expected direction, better perceived attachment as reported by the child was associated with lower levels of child self-blame resulting from marital conflict.

Data collected here are consistent with similar sleep and family functioning data collected in previous studies. Children's objective sleep measures including Sleep Onset, Wake Time, and Actual Sleep coincide with like measures taken in other actigraphic sleep studies (Sadeh, Raviv, and Gruber, 2000; Tikotzky and Sadeh, 2001). Sleep Efficiency was also consistent with Sleep Efficiency scores in previous studies (El-Sheikh and Buckhalt, 2005). Similarly, children's responses on the subjective sleep measures were also consistent with scores of previous studies using the School Sleep Habits Survey (Carskadon, Seifer, & Acebo, 1991).

Family adaptability/cohesion were comparable to scores in previous studies as were the results for attachment (Armsden, 1986), marital conflict variables (Grych, Seid, & Fincham, 1992) and parent-child conflict variables (Straus, 1995). All measures for this study have been validated in other studies and continue to show appropriate levels of stability and reliability in this study.

The findings of this study are an intriguing preliminary look into the relationships between family environmental factors and children's sleep and the possible moderating role that puberty and age play in this relationship. However there are limitations existing

in this study that need to be taken into account when interpreting the findings and planning for future studies. The small sample size although comparable to many sleep studies in the pediatric literature that utilize objective assessments of sleep, did not allow for adequate explication of all research questions and limited the power of analysis. However, supportive of the representativeness of our sample in relation to the population at large, many of the study findings are similar to those reported in the literature. Specifically, this study was relatively small in nature with only 41 total participants of mostly upper SES European-American families. Larger and more demographically diverse populations in future studies may be able to further explicate findings in the areas of positive family environmental factors as well as those relating to destructive marital conflict and perceived threat from that conflict.

A further limitation of this study is the relatively small variability in pubertal status of the participants, with most children at the pre- to early pubertal stages of development. Given this low range of variability, it is important to keep in mind that the interaction results involving puberty should be viewed only as preliminary and exploratory data. Though investigating age and puberty separately in future studies seems an important avenue for research, given the different pattern of effects for puberty status and age, future research would benefit from including a wide variability of pubertal statuses as well as children at different pubertal statuses in each age group.

Another limitation of the present study was related to the form of objective sleep measures assessed. Though actigraphic sleep watch assessment is currently the best way to measure children's sleep in their homes, measures are taken using movement to evaluate the children's sleep. Actigraphy does not allow for the assessment of stages of

sleep, which may be impacted by family functioning. It would be intriguing to evaluate children's responses to family environment factors by examining how much children actually spent in different stages of sleep at different levels of stressors and positive family environments.

Given the many indications found in the present study that parent-child conflict predicts multiple sleep difficulties for children, it would seem that the safety found within the parent-child relationship is extremely important in children's ability to sleep well. With even a higher frequency of non-aggressive discipline predicting children sleep problems, it is of utmost importance that parents work to protect and nurture their relationship with their child and reduce overall frequency of conflict with their child, instead focusing on and encouraging positive, non-punitive interactions with their child, so that their child may feel more secure and sleep better, thus promoting a better overall level of child and family adjustment and well-being.

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*Table 1 Means and Standard Deviations of Study Variables*

	Mean	SD
Age (years)	10.06	1.74
Puberty	1.47	.50
Family Adaptability/Cohesion	113.73	12.21
Perceived Attachment to parents	104.78	10.48
Child Perceived Destructive Marital Conflict	8.00	6.55
Child Perceived Threat from Marital Conflict	8.75	5.61
Child report of Self-Blame for Marital Conflict	2.25	2.11
Non-Aggressive discipline	19.83	11.18
Parent-Child Verbal Aggression	8.53	7.76
Physical aggression to child (child report)	3.47	4.19
Weekly discipline (child report)	2.38	4.96
Sleep Onset Time (Actigraphy)	21:24	46 min
Wake time (Actigraphy)	6:49	43 min
Actual Sleep Time (min; Actigraphy)	8hr 34	15.26
Sleep Efficiency (Actigraphy)	83.8	4.08
Total Movement (Actigraphy)	14.81	2.95
Sleep/Wake Problems (child report)	17.59	9.87
Sleepiness (child report)	14.85	7.02

Table 2 Correlations between Study Variables

	1	2	3	4	5	6	7	8
1. Family Adaptability/Cohesion								
2. Perceived Attachment to parents	-.26							
3. Child Perceived destructive marital conflict	-.10	-.24						
4. Child Perceived Threat from Marital Conflict	-.07	-.23	.55**					
5. Child report of self-blame for Marital Conflict	.05	-.56**	.44*	.41 <sup>+</sup>				
6. Non-Aggressive discipline	.26	-.01	.37 <sup>+</sup>	.15	.07			
7. Parent-Child Verbal Aggression	-.04	.06	.30	.08	-.19	.65**		
8. Physical aggression to child (child report)	-.09	-.1	.70***	.34	.55**	.35	.21	
9. Weekly discipline (child report)	-.01	-.16	.57**	.14	.09	.31	.45*	.32
10. Sleep Onset Time (Actigraphy)	.37	-.01	.15	.20	.07	-.16	.06	.17
11. Wake time (Actigraphy)	.58**	-.12	-.20	.35	.24	.12	-.10	.24
12. Actual Sleep Time (Actigraphy)	.16	-.19	-.32	-.32	.09	-.48*	-.42*	-.17
13. Sleep Efficiency (Actigraphy)	-.52**	-.05	-.11	-.08	.15	-.44*	-.07	.08
14. Total Movement (Actigraphy)	-.33	.22	.09	.23	.11	.13	-.01	.25
15. Sleep/Wake Problems (child report)	-.06	-.09	.32	-.04	.14	.12	-.17	.21
16. Sleepiness (child report)	-.04	.08	.04	-.01	-.09	-.11	-.26	.04

Table2 (continued)

	9	10	11	12	13	14	15
1. Family Adaptability/Cohesion							
2. Perceived Attachments to parents							
3. Child Perceived destructive marital conflict							
4. Child Perceived Threat from Marital Conflict							
5. Child report of self-blame for Marital Conflict							
6. Non-violent discipline							
7. Parent-child verbal aggression							
8. Parent-child physical aggression							
9. Weekly discipline							
10. Sleep onset time (Actigraphy)	.18						
11. Wake time (Actigraphy)	-.26	.60**					
12. Actual sleep time (Actigraphy)	-.12	.12	-.01				
13. Sleep efficiency (Actigraphy)	.17	-.21	-.56**	.43*			
14. Total Movement (Actigraphy)	-.2	-.45*	-.15	-.46*	-.10		
15. Sleep/wake problems (child report)	.36 <sup>+</sup>	-.14	-.05	.13	.14	.09	
16. Daytime sleepiness (child report)	.05	.01	.05	.15	.06	.17	.66**

Table 3

*Family Adaptability/Cohesion as a predictor of Children's Sleep*

Step and Variables	$\beta$	$R^2$	$\Delta R^2$	$\Delta F$
<b>Wake time</b>				
Step 1:		.14	.14	1.81 (3, 34)
Age	-.34			
Gender	.02			
Puberty	.4			
Step 2: Family Adaptability/Cohesion	.39	.27	.14	6.15 (1, 33)*
<b>Total Movement</b>				
Step 1:		.01	.01	.05 (3, 34)
Age	.03			
Gender	-.03			
Puberty	.05			
Step 2: Family Adaptability/Cohesion	-.32	.09	.09	3.25 (1, 33) <sup>†</sup>

Table 4

*Children's Perceptions of Marital Conflict as a predictor of Sleep Disruptions and*

*Moderation effects*

Step and Variables	$\beta$	$R^2$	$\Delta R^2$	$\Delta F$
<b>Sleep Onset</b>				
Step 1:		.22	.22	3.25 <sub>(3, 34)</sub> *
Age	.09			
Gender	-.1			
Puberty	.46			
Step 2:		.26	.03	1.43 <sub>(1, 33)</sub>
Child perceived self-blame related to Marital Conflict (child report)	.18			
Step 3:		.47	.22	4.08 <sub>(3, 30)</sub> *
Age x Child perceived self-blame	-.38 <sup>†</sup>			
Gender x Child perceived self-blame	.03			
Puberty x Child perceived self-blame	.58**			
<b>Wake Time</b>				
Step 1:		.14	.14	1.78 <sub>(3, 34)</sub>
Age	-.36			
Gender	-.03			
Puberty	.42			
Step 2: Perceived self-blame for parental marital conflict	.32	.24	.10	4.27 <sub>(1, 33)</sub> *
<b>Actual Sleep</b>				
Step 1:		.03	.03	.37 <sub>(3, 34)</sub>
Age	-.04			
Gender	.13			
Puberty	.08			
Step 2: Perceived threat from parental marital conflict	-.32	.12	.09	3.26 <sub>(1, 33)</sub> †

Table 5

*Parent-Child Conflict as a Predictor of Children's Sleep and Moderation effects*

Step and Variables	$\beta$	$R^2$	$\Delta R^2$	$\Delta F$
<b>Sleep Onset</b>				
Step 1:		.21	.21	2.72 (3, 30) <sup>†</sup>
Age	.12			
Gender	.06			
Puberty	.36			
Step 2:		.22	.002	.09 (1, 29)
Verbal aggression toward child (child report)	.05			
Step 3:		.46	.24	3.81 (3, 26)*
Age x Verbal aggression toward child	-.35			
Gender x Verbal aggression toward child	.06			
Puberty x Verbal aggression toward child	.60*			
<b>Sleep Onset</b>				
Step 1:		.21	.21	2.72 (3, 30)
Age	.06			
Gender	.12			
Puberty	.36			
Step 2:		.26	.04	1.63 (1, 29)
Physical aggression toward child (child report)	.23			
Step 3:		.46	.2	3.17 (3, 26)*
Age x Physical aggression toward child	-.55*			
Gender x Physical aggression toward child	-.86			
Puberty x Physical aggression toward child	.66**			
<b>Wake Time</b>				
Step 1:		.13	.13	1.54 (3, 30)
Age	-.32			
Gender	.03			
Puberty	.39			
Step 2: Parent-Child Verbal Aggression	.05	.14	.003	.09(1, 29)
Step 3:		.52	.38	6.81(3, 26)**
Age x Verbal aggression toward child	-.64**			
Gender x Verbal aggression toward child	.33			
Puberty x Verbal aggression toward child	.58*			

Table 5 (continued)

Step and Variables	$\beta$	$R^2$	$\Delta R^2$	$\Delta F$
<b>Wake Time</b>				
Step 1:		.13	.13	1.54 <sub>(3, 30)</sub>
Age	-.32			
Gender	.03			
Puberty	.39			
Step 2: Parent-child physical aggression	.42	.28	.15	5.82 <sub>(1, 29)</sub> *
<b>Actual Sleep Time</b>				
Step 1:		.06	.06	.62 <sub>(3,30)</sub>
Age	-.19			
Gender	.18			
Puberty	.10			
Step 2: Non aggressive discipline	-.46	.24	.18	6.7 <sub>(1,29)</sub> *
<b>Actual Sleep Time</b>				
Step 1:		.06	.06	.62 <sub>(1, 29)</sub>
Age	-.11			
Gender	.18			
Puberty	.10			
Step 2: Parent-child verbal aggression	-.34	.16	.10	3.60 <sub>(1, 29)</sub> †
<b>Sleep Efficiency</b>				
Step 1:		.07	.07	.69 <sub>(3, 30)</sub>
Age	-.09			
Gender	.22			
Puberty	.06			
Step 2: Non Aggressive discipline	-.39	.19	.13	4.52 <sub>(1, 29)</sub> *
<b>Movement</b>				
Step 1:		.04	.04	.38 <sub>(3, 30)</sub>
Age	.02			
Gender	-.19			
Puberty	.02			
Step 2: Parent-child Verbal Aggression	.07	.04	.004	.13 <sub>(1, 29)</sub>
Step 3:		.28	.24	2.83 <sub>(3, 26)</sub> †
Age x Parent-child Verbal Aggression	-.10			
Gender x Parent-child Verbal Aggression	.07			
Puberty x Parent-child Verbal Aggression	.50 †			

Table 5 (continued)

Step and Variable	$\beta$	$R^2$	$\Delta R^2$	$\Delta F$
<b>Movement</b>				
Step 1:		.04	.04	.38 (3, 30)
Age	.02			
Gender	-.19			
Puberty	.02			
Step 2:		.09	.05	1.62 (1, 29)
Physical aggression toward child (child report)	.25			
Step 3:		.51	.43	7.57 (3, 26)**
Age x Physical aggression toward child	.63*			
Gender x Physical aggression toward child	1.05			
Puberty x Physical aggression toward child	-.96***			
<b>Total Movement</b>				
Step 1:		.02	.02	.17(3, 33)
Age	.07			
Gender	-.11			
Puberty	.04			
Step 2: Weekly discipline	-.40	.16	.15	5.65(1, 32)*

Table 6

*Parent-child Conflict as Predictors of Subjective Sleep and Moderation effects*

Step and Variables	$\beta$	$R^2$	$\Delta R^2$	$\Delta F$
<b>Sleepiness</b>				
Step 1:		.02	.02	.14 (3, 24)
Age	.15			
Gender	.03			
Puberty	-.09			
Step 2: Non-Aggressive Discipline		.02	.002	.05 (1, 23) †
Step 3:		.28	.26	2.42 (3, 20) †
Age x Child report of Sleepiness	.02			
Gender x Child report of Sleepiness	.65			
Puberty x Child report of Sleepiness	-.67*			

Figure Caption

*Figure 1. Age as a Moderator in the Relation between Perceived Self-blame and Sleep*

Onset Time

Figure 1

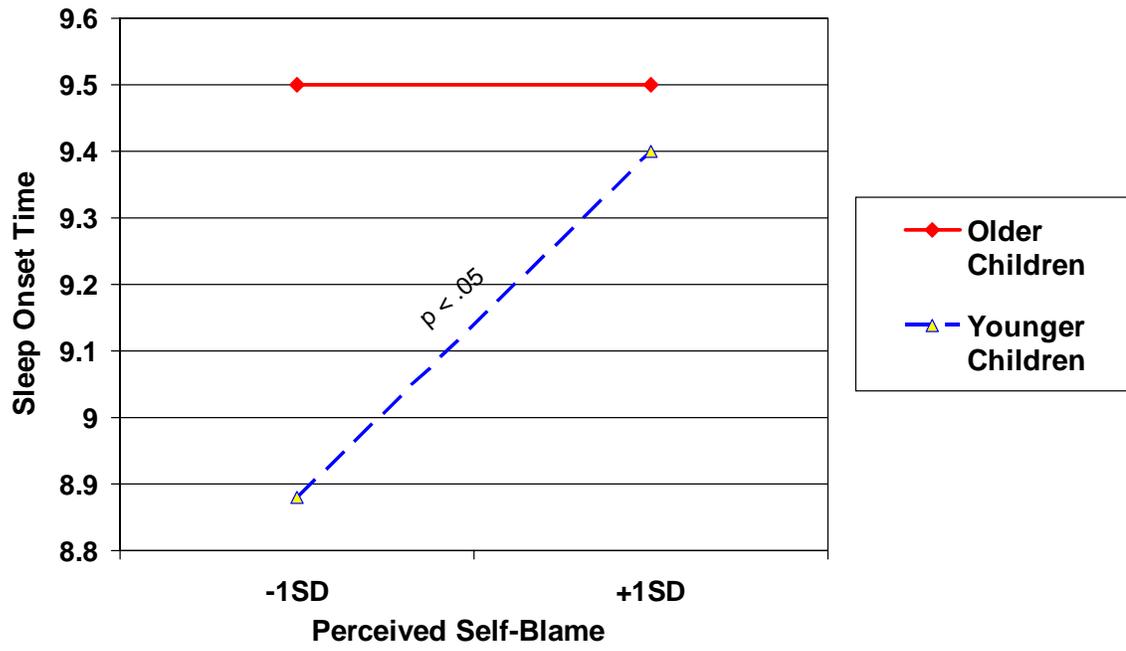


Figure Caption

*Figure 2.* Puberty as a Moderator in the Relation between Perceived Self-blame and  
Sleep Onset Time

Figure 2

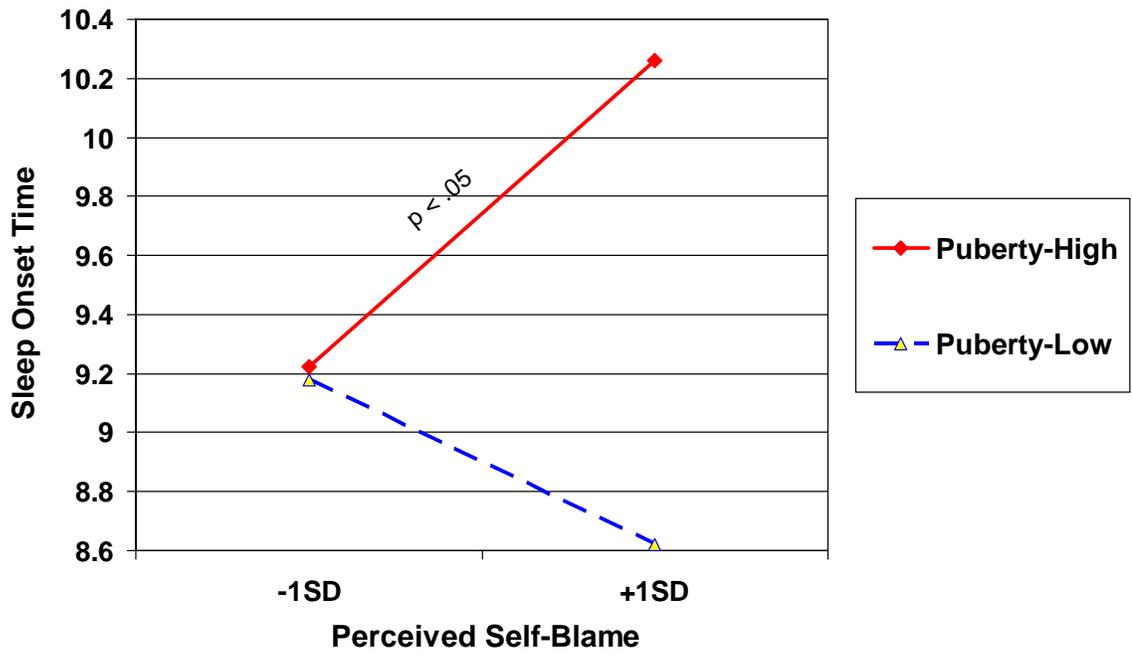


Figure Caption

*Figure 3.* Puberty as a Moderator in the Relation between Parent-Child Verbal Aggression and Sleep Onset

Figure 3

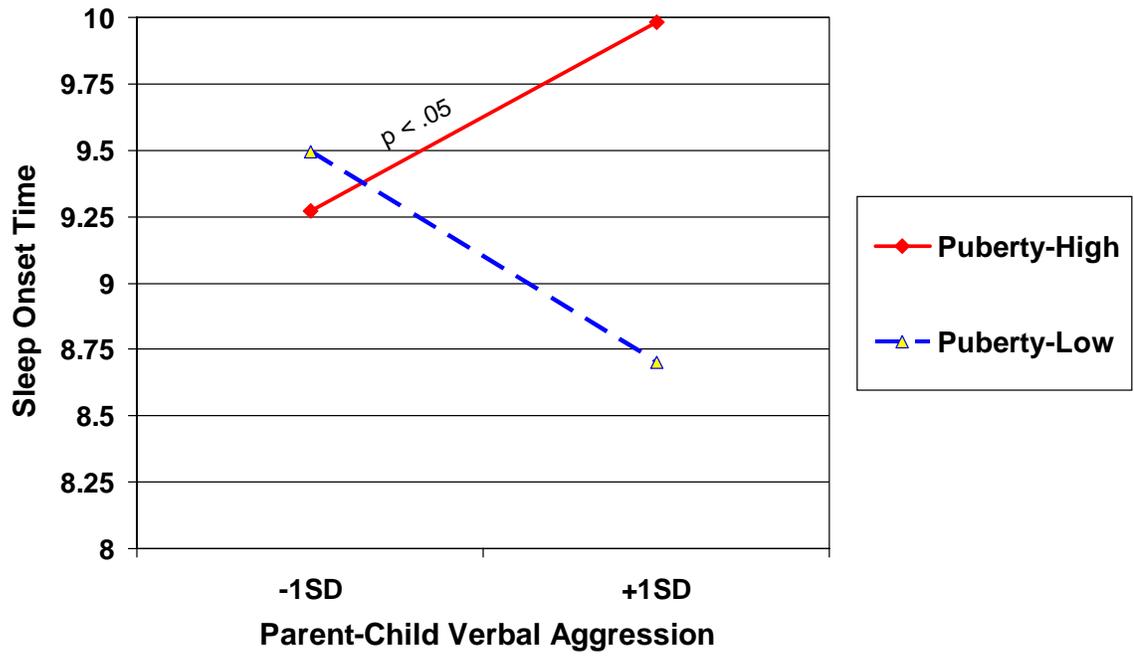


Figure Caption

*Figure 4.* Age as a Moderator in the Relation between Parent-Child Physical Aggression and Sleep Onset.

Figure 4

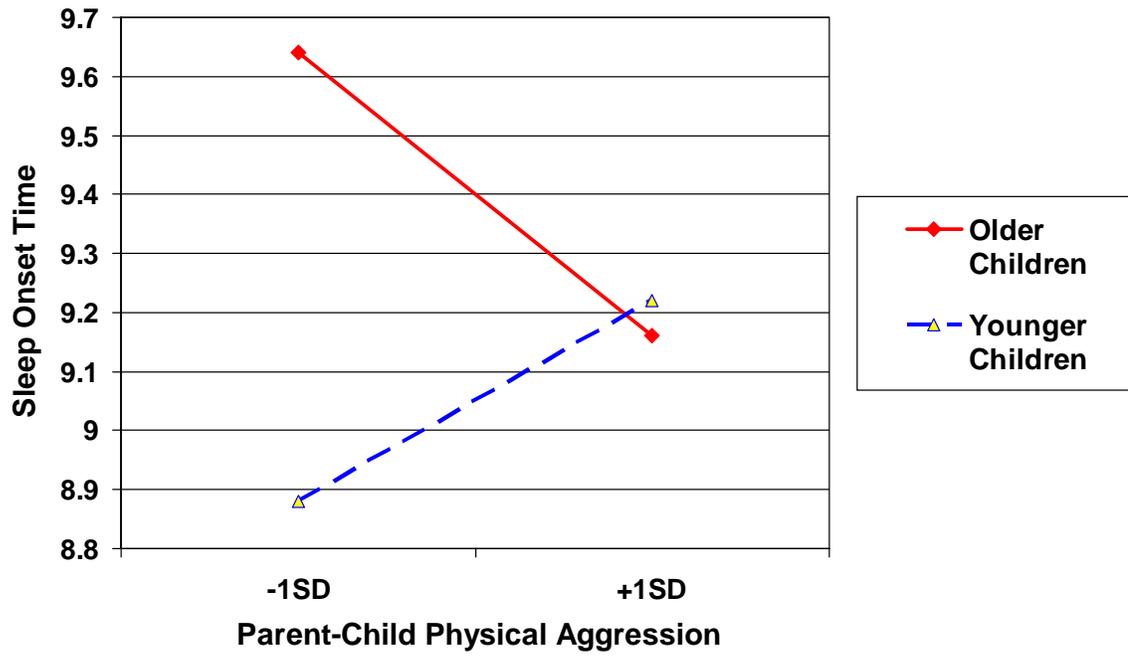


Figure Caption

*Figure 5.* Puberty as a Moderator in the Relation between Parent-Child Physical Aggression and Sleep Onset

Figure 5

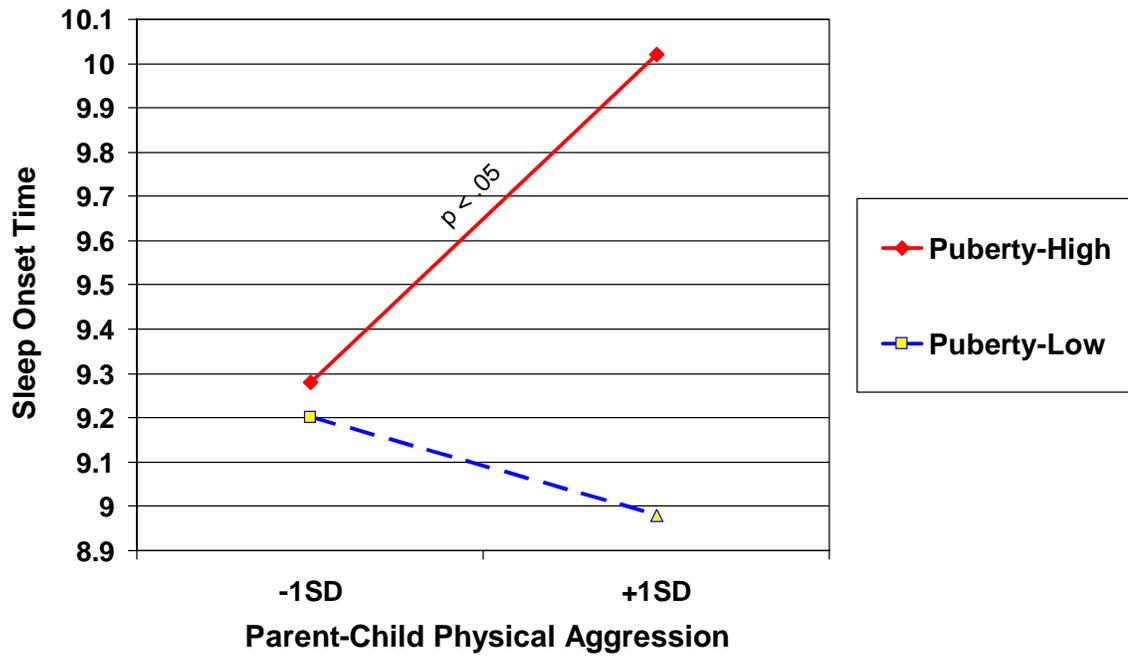


Figure Caption

*Figure 6.* Age as a Moderator in the Relation between Parent-Child Verbal Aggression  
and Wake Time

Figure 6

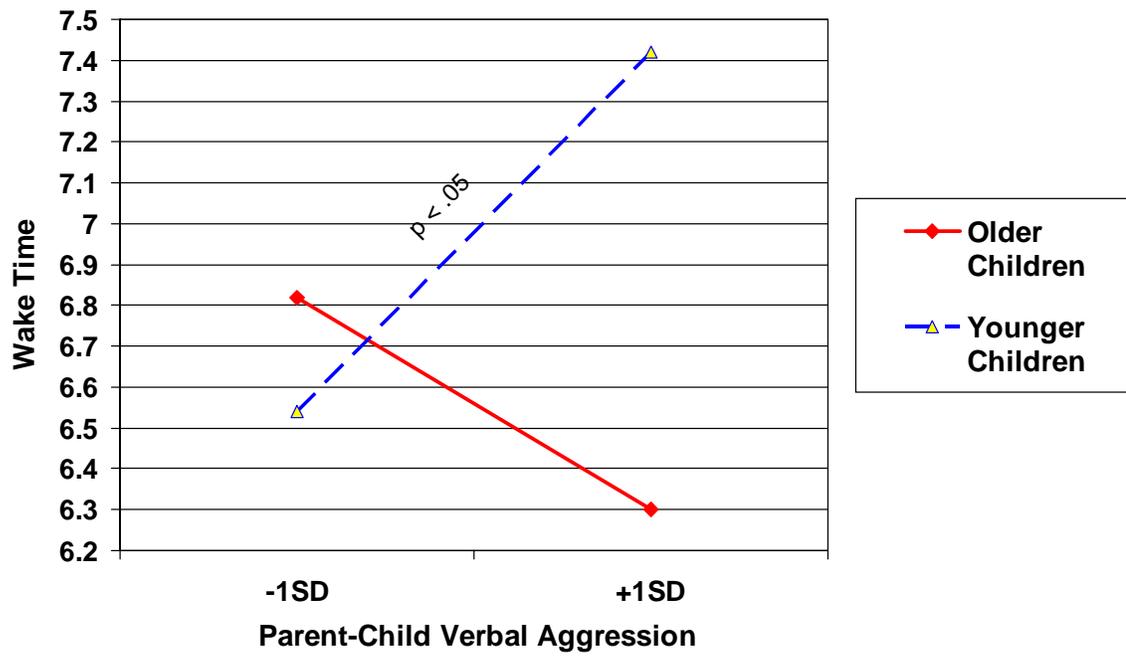


Figure Caption

*Figure 7.* Puberty as a Moderator in the Relation between Parent-Child Verbal Aggression and Wake Time

Figure 7

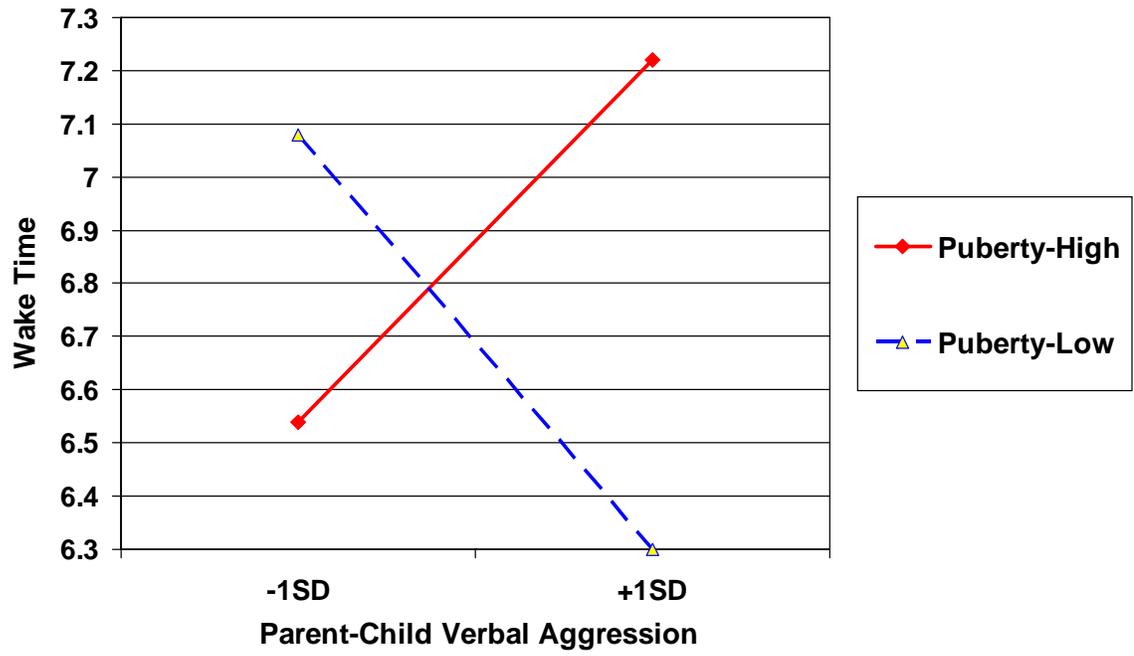


Figure Caption

*Figure 8.* Puberty as a Moderator in the Relation between Verbal Aggression and Total Movement

Figure 8

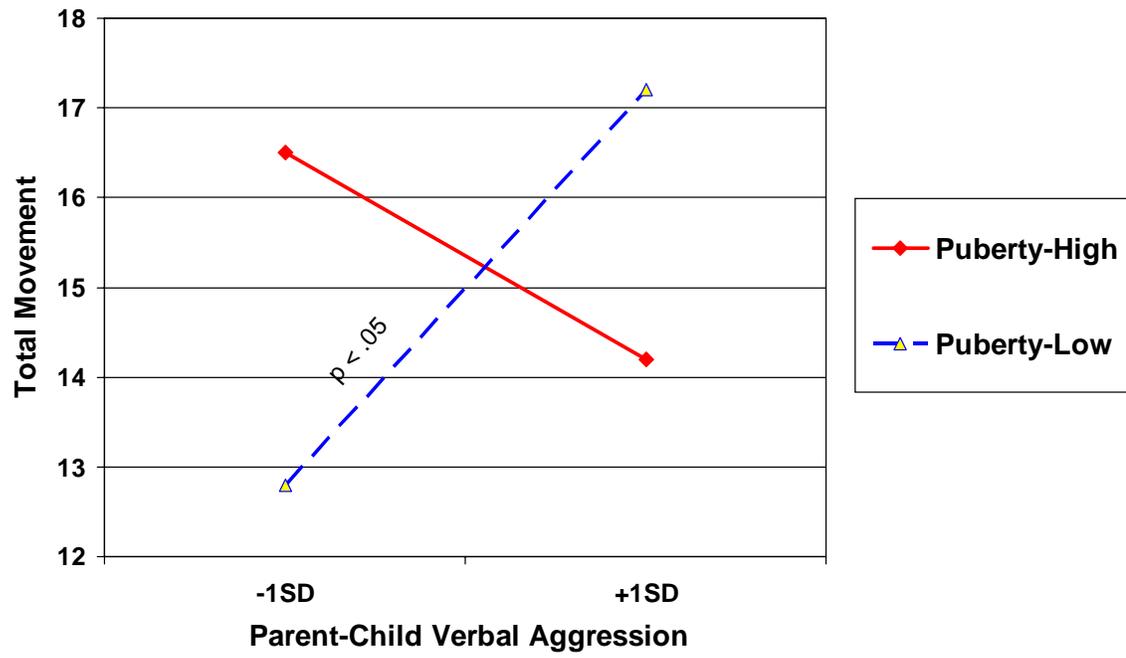


Figure Caption

*Figure 9. Age as a Moderator in the Relation between Parent-Child Physical Aggression and Total Movement*

Figure 9

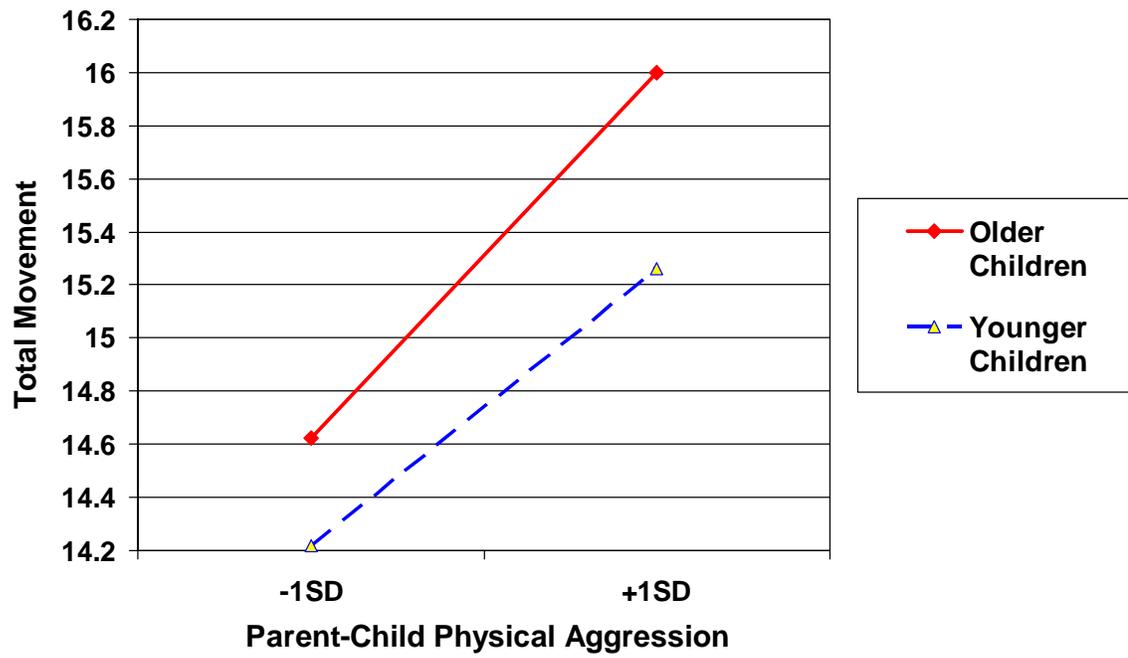


Figure Caption

*Figure 10.* Puberty as a Moderator in the Relation between Physical Aggression and  
Total Movement

Figure 10

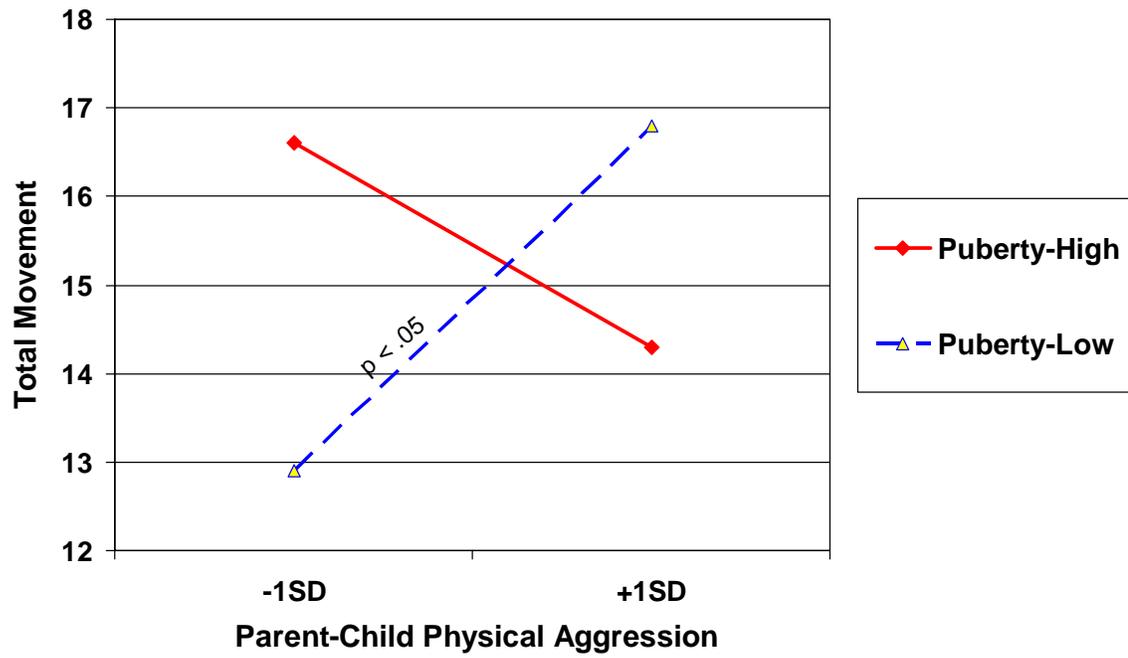
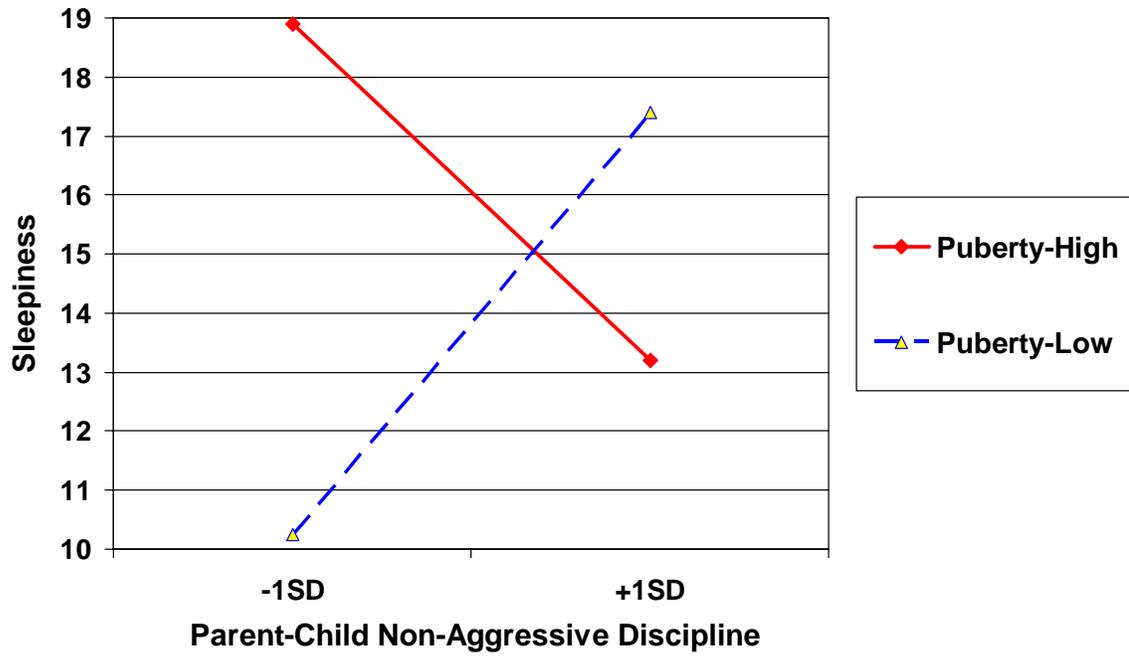


Figure Caption

*Figure 11.* Puberty as a Moderator in the Relation between Non-Aggressive Discipline  
and Sleepiness

Figure 11



## APPENDIX

1. Puberty Scale (Petersen, Crockett, Richards, and Boxer, 1988)
  - A. Puberty Scale for girls
  - B. Puberty Scale for boys
2. School Sleep Habit Survey (Carskadon, Seifer, & Acebo, 1991)
  - A. Sleepiness Scale
  - B. Sleep/Wake Problems Scale
3. FACES II: Family Adaptability and Cohesion Scale (Olsen & McCubbin, 1983)
4. IPPA: Inventory of Parent and Peer Attachment (Armsden, 1986)
5. CPIC: Children's Perception of Interparental Conflict Scale  
(Grych, Seid, & Fincham, 1992)
6. CTS2 P-C: Conflict Tactics Scale 2 Parent-Child (Straus, 1995)

## Puberty Scale (Girls)

Please circle the number in front of the answer that best describes your daughter's current physical growth. Please choose only one answer for each question.

1. Would you say your daughter's growth in height:
  - 1-Has not yet begun to spurt
  - 2-Has barely started
  - 3-Is definitely underway
  - 4-Seems completed
  
2. Regarding your daughter's growth of body hair, would you say that your daughter's body hair has:
  - 1-Not yet started growing
  - 2-Has barely started growing
  - 3-Is definitely underway
  - 4-Seems completed
  
3. Have you noticed that your daughter has any skin changes, especially pimples?
  - 1-Not yet started showing changes
  - 2-Have barely started showing changes
  - 3-Skin changes are defiantly underway
  - 4-Skin changes seem completed
  
4. Have your daughter's breasts begun to grow?
  - 1-Not yet started
  - 2-Have barely started growing
  - 3-Breast growth is definitely underway
  - 4-Breast growth seems completed
  
5. Has your daughter begun to menstruate?
  - 1-Yes
  - 2-No

## Puberty Scale (Boys)

Please circle the number in front of the answer that best describes your daughter's current physical growth. Please choose only one answer for each question.

1. Would you say your son's growth in height:  
1-Has not yet begun to spurt                      3-Is definitely underway  
2-Has barely started                                      4-Seems completed
2. Regarding your son's growth of body hair, would you say that your daughter's body hair has:  
1-Not yet started growing                      3-Is definitely underway  
2-Has barely started growing                      4-Seems completed
3. Have you noticed that your son has any skin changes, especially pimples?  
1-Not yet started showing changes                      3-Skin changes are defiantly underway  
2-Have barely started showing changes                      4-Skin changes seem completed
4. Have you noticed a deepening of your son's voice?  
1-Not yet started changing                      3-Voice change is definitely underway  
2-Has barely started changing                      4-Voice change seems complete
5. Has your son begun to grow hair on his face?  
1-Not yet started growing hair                      3-Facial hair growth is definitely underway  
2-Has barely started growing hair                      4-Facial hair growth seems completed

## School Sleep Habits Survey

### Sleepiness Scale:

During the last two weeks, have you struggled to stay awake (fought sleep) or fallen asleep in the following situations? Please mark only one answer for every item.

a. In a face to face conversation with another person?

- No
- Struggled to stay awake
- Fallen asleep
- Both struggled to stay awake and fallen asleep

b. Traveling in a bus, train, plain, or car?

- No
- Struggled to stay awake
- Fallen asleep
- Both struggled to stay awake and fallen asleep

c. While attending a performance (movie, concert, play)?

- No
- Struggled to stay awake
- Fallen asleep
- Both struggled to stay awake and fallen asleep

d. While watching television or listening to the radio or stereo?

- No
- Struggled to stay awake
- Fallen asleep
- Both struggled to stay awake and fallen asleep

e. While reading, studying or doing homework?

- No
- Struggled to stay awake
- Fallen asleep
- Both struggled to stay awake and fallen asleep

f. During a test?

- No
- Struggled to stay awake
- Fallen asleep
- Both struggled to stay awake and fallen asleep

g. In a class at school?

- No
- Struggled to stay awake
- Fallen asleep
- Both struggled to stay awake and fallen asleep

h. While doing work on a computer?

- No
- Struggled to stay awake
- Fallen asleep
- Both struggled to stay awake and fallen asleep

i. While playing video games?

- No
- Struggled to stay awake
- Fallen asleep
- Both struggled to stay awake and fallen asleep

Sleep/Wake Problems:

In the last two weeks how often have you:

a. Felt satisfied with your sleep?

- Everyday/night
- Several times
- Twice
- Once
- Never

b. Arrived late to class because you overslept?

- Everyday/night
- Several times
- Twice
- Once
- Never

c. Fallen asleep in a morning class?

- Everyday/night
- Several times
- Twice
- Once
- Never

d. Fallen asleep in an afternoon class?

- Everyday/night
- Several times
- Twice
- Once
- Never

e. Awakened too early in the morning and couldn't get back to sleep?

- Everyday/night
- Several times
- Twice
- Once
- Never

f. Stayed up until at least 3 a.m.?

- Everyday/night    Several times    Twice    Once    Never

g. Stayed up all night?

- Everyday/night    Several times    Twice    Once    Never

h. Slept in past noon?

- Everyday/night    Several times    Twice    Once    Never

i. Felt tired, dragged out, or sleepy during the day?

- Everyday/night    Several times    Twice    Once    Never

j. Needed more than one reminder to get up in the morning?

- Everyday/night    Several times    Twice    Once    Never

k. Had an extremely hard time falling asleep?

- Everyday/night    Several times    Twice    Once    Never

l. Had nightmares or bad dreams during the night?

- Everyday/night    Several times    Twice    Once    Never

m. Gone to bed because you just could not get out of bed in the morning?

- Everyday/night    Several times    Twice    Once    Never

n. Done dangerous things without thinking?

- Everyday/night    Several times    Twice    Once    Never

o. Had a good night's sleep?

- Everyday/night    Several times    Twice    Once    Never

## FACES II: Family Version

Please describe how often each statement describes your family using the scale below.

1-Almost Never 2-Once in Awhile 3-Sometimes 4-Frequently 5-Almost Always

- \_\_\_ 1. Family members are supportive of each other during difficult times.
- \_\_\_ 2. In our family, it is easy for everyone to express his/her opinion.
- \_\_\_ 3. It is easier to discuss problems with people outside the family than with other family members.
- \_\_\_ 4. Each family member has input regarding major family decisions.
- \_\_\_ 5. Our family gathers together in the same room.
- \_\_\_ 6. Children have a say in their discipline.
- \_\_\_ 7. Our family does things together.
- \_\_\_ 8. Family members discuss problems and feel good about the solutions.
- \_\_\_ 9. In our family, everyone goes his/her own way.
- \_\_\_ 10. We shift household responsibilities from person to person.
- \_\_\_ 11. Family members know each other's close friends.
- \_\_\_ 12. It is hard to know what the rules are in our family.
- \_\_\_ 13. Family members consult other family members on personal decisions.
- \_\_\_ 14. Family members say what they want.
- \_\_\_ 15. We have difficulty thinking of things to do as a family.
- \_\_\_ 16. In solving problems, the children's suggestions are followed.
- \_\_\_ 17. Family members feel very close to each other.
- \_\_\_ 18. Discipline is fair in our family.

Please describe how often each statement describes your family using the scale below.

1-Almost Never 2-Once in Awhile 3-Sometimes 4-Frequently 5-Almost Always

\_\_\_ 19. Family members feel closer to people outside the family than to other family members.

\_\_\_ 20. Our family tries new ways of dealing with problems.

\_\_\_ 21. Family members go along with what the family decides to do.

\_\_\_ 22. In our family, everyone shares responsibilities.

\_\_\_ 23. Family members like to spend their free time with each other.

\_\_\_ 24. It is difficult to get a rule changed in our family.

\_\_\_ 25. Family members avoid each other at home.

\_\_\_ 26. When problems arise, we compromise.

\_\_\_ 27. We approve of each other's friends.

\_\_\_ 28. Family members are afraid to say what is on their minds.

\_\_\_ 29. Family members pair up rather than do things as a total family.

\_\_\_ 30. Family members share interests and hobbies with each other.

## IPPA

These questions are about your relationships with your parents.

Part 1: Each of the following statements asks about your feelings about your mother, or the woman who has acted as your mother. Please indicate how much each statement is true for you using the following scale:

1-Almost never or never true

2-Not very often true

3-Sometimes true

4-Often true

5-Almost always or always true

1. My mother respects my feelings.

1      2      3      4      5

2. I feel my mother does a good job as my mother.

1      2      3      4      5

3. I wish I had a different mother.

1      2      3      4      5

4. My mother accepts me as I am.

1      2      3      4      5

5. I like to get my mother's point of view on things I'm concerned about.

1      2      3      4      5

6. I feel it's no use letting my feelings show around my mother.

1      2      3      4      5

7. My mother can tell when I'm upset about something.

1      2      3      4      5

8. Talking over my problems with my mother makes me feel ashamed or foolish.

1      2      3      4      5

9. My mother expects too much from me.

1      2      3      4      5

10. I get upset easily around my mother.

1      2      3      4      5

11. I get upset a lot more than my mother knows about.

1      2      3      4      5

12. When we discuss things, my mother cares about my point of view.

1      2      3      4      5

13. My mother trusts my judgment.

1      2      3      4      5

14. My mother has her own problems, so I don't bother her with mine.

1      2      3      4      5

15. My mother helps me understand myself better.

1      2      3      4      5

16. I tell my mother about my problems and troubles.

1      2      3      4      5

17. I feel angry with my mother.

1      2      3      4      5

18. I don't get much attention from my mother.

1      2      3      4      5

19. My mother helps me to talk about my difficulties.

1      2      3      4      5

20. My mother understands me.

1      2      3      4      5

21. When I am angry about something my mother tries to be understanding.

1      2      3      4      5

22. I trust my mother.

1      2      3      4      5

23. My mother doesn't understand what I'm going through these days.

1      2      3      4      5

24. I can count on my mother when I need to get something off my chest.

1      2      3      4      5

25. If my mother knows something is bothering me, she asks me about it.

1      2      3      4      5

Part 2: Each of the following statements asks about your feelings about your father, or the man who has acted as your father. Please indicate how much each statement is true for you using the following scale:

1-Almost never or never true

2-Not very often true

3-Sometimes true

4-Often true

5-Almost always or always true

1. My father respects my feelings.

1      2      3      4      5

2. I feel my father does a good job as my father.

1      2      3      4      5

3. I wish I had a different father.

1      2      3      4      5

4. My father accepts me as I am.

1      2      3      4      5

5. I like to get my father's point of view on things I'm concerned about.

1      2      3      4      5

6. I feel it's no use letting my feelings show around my father.

1      2      3      4      5

7. My father can tell when I'm upset about something.

1      2      3      4      5

8. Talking over my problems with my father makes me feel ashamed or foolish.

1      2      3      4      5

9. My father expects too much from me.

1      2      3      4      5

10. I get upset easily around my father.

1      2      3      4      5

11. I get upset a lot more than my father knows about.

1      2      3      4      5

12. When we discuss things, my father cares about my point of view.

1      2      3      4      5

13. My father trusts my judgment.

1      2      3      4      5

14. My father has his own problems, so I don't bother him with mine.

1      2      3      4      5

15. My father helps me understand myself better.

1      2      3      4      5

16. I tell my father about my problems and troubles.

1      2      3      4      5

17. I feel angry with my father.

1      2      3      4      5

18. I don't get much attention from my father.

1      2      3      4      5

19. My father helps me to talk about my difficulties.

1      2      3      4      5

20. My father understands me.

1      2      3      4      5

21. When I am angry about something my father tries to be understanding.

1      2      3      4      5

22. I trust my father.

1      2      3      4      5

23. My father doesn't understand what I'm going through these days.

1      2      3      4      5

24. I can count on my father when I need to get something off my chest.

1      2      3      4      5

25. If my father knows something is bothering me, he asks me about it.

1      2      3      4      5

## CPIC

In every family there are times when parents don't get along. Below are some things that kids sometimes think or feel when their parents have arguments. We would like you to tell us what you think or feel when your parents argue or disagree by answering each of the questions below using the following responses.

T = True   ST = Sort of True   F = False

1. T ST F    I never see my parents arguing or disagreeing.
2. T ST F    When my parents have an argument they usually work it out.
3. T ST F    My parents often get into arguments about things I do at school.
4. T ST F    When my parents argue it's because one of the just had a bad day.
5. T ST F    My parents get really mad when they argue.
6. T ST F    When my parents argue I can do something to make myself feel better.
7. T ST F    I get scared when my parents argue.
8. T ST F    I feel caught in the middle when my parents argue.
9. T ST F    I'm not to blame when my parents have arguments.
10. T ST F    They may not think I know it, but my parents argue or disagree a lot.
11. T ST F    Even after my parents stop arguing they stay mad at each other.
12. T ST F    When my parents argue usually it has to do with their own problems.
13. T ST F    My parents have arguments because they are not happy together.
14. T ST F    When my parents have a disagreement the discuss it quietly.
15. T ST F    I don't know what to do when my parents have disagreements.
16. T ST F    My parents are mean to each other, even when I'm around.
17. T ST F    When my parents argue, I worry about what will happen to me.

T = True ST = Sort of True F = False

18. T ST F I don't feel like I have to take sides when my parents argue.
19. T ST F It's usually my fault when my parents argue.
20. T ST F I often see or hear my parents arguing.
21. T ST F When my parents disagree about something, they usually come up with a solution.
22. T ST F My parents' arguments are usually about me.
23. T ST F The reasons my parents argue never change.
24. T ST F When my parents have an argument they say mean things to each other.
25. T ST F When my parent argue or disagree I can usually help make things better.
26. T ST F When my parents argue I'm afraid that something bad will happen.
27. T ST F My mom wants me to be on her side when she and my dad argue.
28. T ST F Even if they don't say it, I know I'm to blame when my parents argue.
29. T ST F My parents hardly ever argue.
30. T ST F When my parents argue they usually make up right away.
31. T ST F My parents usually argue or disagree about things that I do.
32. T ST F My parents argue because they don't really love each other.
33. T ST F When my parents have an argument they yell at each other.
34. T ST F When my parents argue there's nothing I can do to stop them.
35. T ST F When my parents argue I worry that one of them will get hurt.
36. T ST F I feel like I have to take side when my parents argue.
37. T ST F My parents often nag and complain about each other around the house.
38. T ST F My parents hardly ever yell when they have a disagreement.

T = True ST = Sort of True F = False

39. T ST F My parents often get into arguments when I do something wrong.
40. T ST F My parents have broken or thrown things during an argument.
41. T ST F After my parents stop arguing, they are friendly towards each other.
42. T ST F When my parents argue I'm afraid that they will yell at me too.
43. T ST F My parents blame me when they have arguments.
44. T ST F My dad wants me to be on his side when he and my mom argue.
45. T ST F My parents have pushed or shoved each other during an argument.
46. T ST F When my parents argue or disagree there's nothing I can do to make myself  
feel better.
47. T ST F When my parents argue I worry that they might get divorced.
48. T ST F My parents still act mean after they have had an argument.
49. T ST F My parents have arguments because they don't know how to get along.
50. T ST F Usually it's not my fault when my parents have arguments.
51. T ST F When my parents argue they don't listen to anything I say.

Parent-Child Behaviors

CTS P-C

Children sometimes do things that are wrong, disobey, or make their parents angry. We would like to know what your mother and father have done when you did something wrong or made them upset or angry.

This is a list of things your mother and father may or may not have done in the past year and I would like to know whether they have done these things once in the past year (indicate by circling 1), twice in the past year (circle 2) 3-5 times in the past year (circle 3), 6-10 times in the past year (circle 4), 11-20 times (circle 5), or more than 20 times in the past year (circle 6). If they have done this before but not in the past year, I would like to know this as well (circle 7). If it has never happened circle 0.

1. Explained why something was wrong:

Mother

Father

1 2 3 4 5 6 7 0

1 2 3 4 5 6 7 0

2. Put you in time out:

Mother

Father

1 2 3 4 5 6 7 0

1 2 3 4 5 6 7 0

3. Shook you:

Mother

Father

1 2 3 4 5 6 7 0

1 2 3 4 5 6 7 0

4. Gave you something else to do instead of what you were doing:

Mother

Father

1 2 3 4 5 6 7 0

1 2 3 4 5 6 7 0

5. Shouted, yelled, or screamed at you:

Mother

Father

1 2 3 4 5 6 7 0

1 2 3 4 5 6 7 0

6. Spanked you on the bottom with a bare hand:

Mother

Father

1 2 3 4 5 6 7 0

1 2 3 4 5 6 7 0

7. Swore or cursed at you:

Mother

Father

1 2 3 4 5 6 7 0

1 2 3 4 5 6 7 0

8. Said they would send you away or kick you out of the house:

Mother

Father

1 2 3 4 5 6 7 0

1 2 3 4 5 6 7 0

9. Threatened to spank or hit you but did not actually do it:

Mother

Father

1 2 3 4 5 6 7 0

1 2 3 4 5 6 7 0

10. Slapped you on the hand, arm, or leg:

Mother

Father

1 2 3 4 5 6 7 0

1 2 3 4 5 6 7 0

11. Took away privileges or grounded you:

Mother

Father

1 2 3 4 5 6 7 0

1 2 3 4 5 6 7 0

12. Pinched you:

Mother

Father

1 2 3 4 5 6 7 0

1 2 3 4 5 6 7 0

13. Called you dumb, lazy, or some other name like that:

Mother

Father

1 2 3 4 5 6 7 0

1 2 3 4 5 6 7 0

Weekly Discipline

Sometimes it's hard to remember what happened over a whole year, so I'd like to ask you a few questions again, just about the last week. For each of these questions tell me how many times they happened in the past week.

Once in the past year (indicate by circling 1), twice in the past year (circle 2) 3-5 times in the past year (circle 3), 6-10 times in the past year (circle 4), 11-20 times (circle 5), or more than 20 times in the past year (circle 6). If it has not happened in the past week circle 0.

1. Put you in "time out" or sent you to your room:

Mother

Father

1 2 3 4 5 6 7 0

1 2 3 4 5 6 7 0

2. Shouted yelled or screamed at you:

Mother

Father

1 2 3 4 5 6 7 0

1 2 3 4 5 6 7 0

3. Spanked you on the bottom with a bare hand:

Mother

Father

1 2 3 4 5 6 7 0

1 2 3 4 5 6 7 0

4. Slapped you on the hand, arm, or leg:

Mother

Father

1 2 3 4 5 6 7 0

1 2 3 4 5 6 7