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Investigating Sleep Behaviors in Autistic Infants

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Investigating Sleep Behaviors in Autistic Infants

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Abstract

Autism Spectrum Disorder (ASD) is defined by social, emotional, and learning deficits. Past research suggests that ASD and sleep problems often co-occur. The goal of this research was to investigate sleeping behaviors in autistic infants in comparison to typically developing infants (TD). The data of this study has been acquired at the University of California San Diego Autism Center of Excellence. One main goal of this center is to identify early indicators of ASD in infants (1-3 years of age), which could lead to earlier treatment and better therapy techniques. The current study used a sleep questionnaire to compare parent-reported sleeping behaviors in young autistic infants and in healthy controls. The results showed that autistic infants had significantly more difficulty getting to sleep at night, woke from sleep screaming or confused more often, and had more difficulty waking up in the morning, compared to TD infants. Future research should further investigate the treatment options for sleep problems in autistic infants, and examine whether autistic infants with epilepsy have more sleeping abnormalities than autistic infants without epilepsy.

Keywords: Autism Spectrum Disorder, infants, sleep problems, sleep questionnaire

Investigating Sleep Behaviors in Autistic Infants

Sleep problems during early childhood have been shown to be comorbid with disturbances in executive functioning, along with behavioral and mood issues (Beebe & Gozal, 2002, as cited in Mindell, Kuhn, Lewin, Meltzer, & Sadeh, 2006). Sleep disturbances diminish children's quality of life, as well as the lives of their parents or caregivers (Mindell et al., 2006). Investigating these sleep issues is essential because it may lead to improvements in a child's functioning, health, and overall happiness. Past research provides insights into sleep variables that are commonly impacted in children with sleep disturbance, as well as potential behavioral and medical treatments for sleep issues (Mindell et al., 2006).

According to parent reports, children experience the most sleep problems during the time of preschool suggesting that sleep problems have a young onset (Stein, Mendelsohn, Obermeyer, Amromin, & Benca, 2013). These disturbances included parasomnias such as nightmares, snoring, insomnia, bed-wetting, noisy sleep, and tiredness during the day. The children with sleep disturbances at age two were more at risk to continue having sleep disturbances years later (Stein et al., 2013). Further, detecting sleep problems early in childhood may help to predict later emotional and behavioral problems (Gregory & O'Connor, 2002). Using a longitudinal study from age four to mid-adolescence, the researchers found that sleep problems at age four, reported by parents, predicted the development of depression/anxiety, attention problems, and aggression in mid-adolescence. Thus, sleep disturbances may put children more at risk for having psychological and behavioral problems later in development (Gregory & O'Connor, 2002). However, this association between sleep abnormalities and psychopathology needs to be further tested through sleep treatments.

There is evidence that children who have difficulty sleeping at night also suffer cognitive deficits (Konen, Dirk, & Schmiedek, 2015). To test the relationship between working memory and sleep, elementary school students practiced a numerical and spatial working memory task on smartphones. The researchers used sleep diaries and found that student performance of the task at school was correlated with sleep quality at night, bedtime, and level of tiredness during the day (Konen et al., 2015). Students with less quality sleep, a later bedtime, and more tiredness, performed worse on the working memory task. This suggests that sleep disturbances are related to impairments in cognition. The researchers also discuss how cognition in children is important because it is crucial for their social and emotional functioning (Konen et al., 2015). In fact, McQuade et al. (2013) showed a link between working memory and peer acceptance (as cited in Konen et al., 2015). These findings demonstrate that sleep problems in children have effects beyond tiredness. Research shows that sleep disturbance is related to behavioral, psychological, emotional, and cognitive problems in children.

Autism Spectrum Disorder (ASD) is defined as a range of developmental disorders that include deficits in social communication, emotionally relating to others, and in some cases repetitive or restricted behaviors (American Psychiatric Association, 2013). Earlier findings suggested that children with ASD have a more difficult time with sleep (Krakowiak, Goodlin-Jones, Hertz-Picciotto, Croen, & Hansen, 2008). Using a parent-reported questionnaire, the researchers discovered that ASD children (ages 2-5 years) had longer sleep latencies, slept for a shorter amount of time, and had more night awakenings in comparison to typically developing (TD) children of the same age. These sleep problems are also correlated with cognitive and adaptive impairments, thus, determining the causes of these sleep disturbances may lead to better behavioral and medical treatment of children with ASD (Krakowiak et al., 2008).

It is important to target sleep problems early in children. Previous studies investigated sleep problems in regressed and non-regressed autistic children as well as in TD children (Giannotti, Cortesi, Cerquiglini, Miraglia, Vagnoni, Sebastiani, & Bernabei, 2008). Regression refers to the loss of previously learned skills, including communicative and social skills (Giannotti et a., 2008). Both regressed and non-regressed autistic children had significantly more sleep problems before age 2 than TD children. In agreement with Krakowiak et al. (2008), Giannotti et al. (2008) found that children with autism had significantly longer sleep latencies and more night awakenings, in addition to having more sleep anxiety and daytime tiredness. In comparing regressed and non-regressed children, the researchers found that regressed autistic children showed more sleep disturbances. This suggests that sleep problems are exasperated in autistic children who experience a loss of language, social interest, and other communication skills. Other research has confirmed that the higher the severity of autism, the greater the sleep problems (Mayes & Calhoun, 2009). Further, using parent-reports, they suggested that sleep disturbances in autistic children were correlated with maladaptive behaviors, aggression, attention deficit, hyperactivity, anxiety, and depression (Mayes & Calhoun, 2009).

Anxiety, a symptom of ASD, may be related to sensory overload. This interaction may be a contributor to sleep problems in ASD children (Mazurek & Petroski, 2015). Using a large sample of autistic children, Mazurek & Petroski (2015) discovered that anxiety and sensory over-responsivity were significantly correlated for young and old autistic children. In addition, anxiety and sensory over-responsivity were each significantly correlated to sleep problems. From ages two to five specifically, more anxiety was correlated with resisting bedtime, shorter sleep length, and more night awakenings. While increases in sensory over-responsivity were also correlated with shorter sleep length and more night awakenings, they were also related to prolonged sleep

onset. This evidence suggested that treatments for anxiety or hyperarousal might be useful in treating sleep problems in autistic children (Mazurek & Petroski, 2015).

To measure wake and sleep activities more directly, actigraphy studies in ASD children use a wristwatch to monitor motor activity. Wiggs and Stores (2004) showed that over a five day period, ASD children had sleep problems including long sleep latencies and more frequent awakenings during the night, even when these behaviors were not parent-reported (as cited in Glickman, 2009). These sleep disturbance patterns propose that ASD children may have circadian sleep disorders (Glickman, 2009). Although there is no consensus from these researchers on the cause of sleep problems, it was suggested that abnormal neuronal activity may account for the inability to develop normal sleeping patterns (Cortesi, Giannotti, Ivanenko, & Johnson, 2009).

In a review of sleep literature, the most commonly found sleep problems in children with autism were difficulty falling asleep and sleep restlessness (Mayes & Calhoun, 2009). More recently, a meta-analysis was performed to compare the findings of past research on sleep difficulties in children with ASD in comparison to TD children (Elrod & Hood, 2015). The researchers found that children with ASD on average slept 32.8 minutes less per day, took 10.9 minutes longer to fall asleep, and had 1.9% less sleep efficiency than TD children, suggesting that children with ASD have consistently shown more difficulty falling asleep and staying asleep through the night (Elrod & Hood, 2015).

Sleep disturbance may impact the overall quality of life of ASD children. There is new evidence that sleep problems in autistic children are negatively correlated with scores on the Health-Related Quality of Life, an assessment measuring an individual's overall well-being in addition to physical, psychological, and social functioning (Delahaye, Kovacs, Sikora, Hall,

Orlich, Clemons, van der Weerd, Glick, & Kuhlthau, 2014). Therefore, investigating and treating sleep problems in autistic children may lead to them developing a better quality of life (Delahaye et al., 2014).

While past research demonstrated that children with ASD have sleep problems, most of these studies included older children. Therefore, the current study uses a younger sample population, including infants from the age of 12 to 36 months. Since sleep patterns begin developing at an earlier age, the results of this study could lead to earlier identification of abnormal sleep behaviors and lead to earlier treatment for autistic children.

The purpose of this study was to investigate sleep behaviors in ASD and typically developing (TD) infants using a parent-reported questionnaire of sleep behaviors as well as a review of past and recent literature. As most past research shows evidence for longer sleep latencies and night awakenings in ASD children, this study tests these sleep variables and explores others. It was hypothesized that autistic infants would show abnormal sleeping behaviors in comparison to TD infants because autistic infants have abnormal brain activity that challenges their ability to develop normal sleeping patterns.

Method

Participants

Participants included in this study were 219 provisionally ASD (mean = 23.1 months, SD = 6.42, range = 23.9, 183 boys) and 152 TD (mean = 20.2 months, SD = 6.75, range = 23.9, 88 boys) infants in the San Diego area whose parents or guardians gave informed consent for participation in the Autism Center of Excellence's research program approved by the University of California San Diego and the Institutional Review Board of Rady's Children's Hospital (see Table 1). The parents or guardians were compensated for their time and participation. Parents of

provisionally autistic infants were recruited by presenters at autism support groups, clinicians, and letters handed out at agencies. Parents of typically developing infants were recruited from preschools, advertisements, and referrals from other participants.

All participants were administered the Mullen Scales of Early Learning (Mullen, 1995), a standardized psychological assessment, to measure their cognitive performances in comparison to those of the same age group. The criteria for a provisional diagnosis of ASD was based on the Autism Diagnostic Observation Schedule (ADOS; Lord, Risi, Lambrecht, Cook, Leventhal, DiLavore, Pickles, & Rutter, 2000), the Autism Diagnostic Interview-R (ADI-R; Lord, Rutter, & Le Couteur, 1994), and the Diagnostic and Statistical Manual of Mental Disorders-IV (DSM-IV; American Psychiatric Association, 2000). The ADOS is a psychological assessment that measures whether a participant is on the autism spectrum by testing the categories of social communication and interaction while monitoring restricted or repetitive behaviors in play (Lord et al., 2000). The ADI-R is a parent interview designed to confirm or deny the provisional diagnosis of Autism Spectrum Disorder based on the DSM-IV criteria (Lord et al., 1994).

If the infants performed in the average range or higher for their same-aged peers on the Mullen Scales of Early Learning, and did not have features of autism, then they were classified as Normal Control, or Type I Error if they had previously failed the Communication and Symbolic Behavior Scales Developmental Profile (CSBS DP) Infant-Toddler questionnaire (Wetherby & Prizant, 2002). The CSBS DP is an evaluation tool completed by pediatricians and caregivers to assess communication and language skills in infants ages six to 24 months (Wetherby & Prizant, 2002). For the purposes of this study, the Normal Control and Type I Error groups were classified as Typically Developing (TD). Infants who did not show autistic features, but also did not perform at least average on the Mullen Scales of Early Learning (Mullen, 1995),

were not included in this study. If participants showed features of autism, they were provisionally diagnosed as Autistic Disorder or Pervasive Developmental Disorder not otherwise specified (PDD-NOS). Since the Diagnostic and Statistical Manual of Mental Disorders-V (DSM-V) was published, infants diagnosed as Autistic Disorder and PDD-NOS are now classified as Autism Spectrum Disorder (ASD) (American Psychiatric Association, 2013). Therefore, for this study, the participants were considered either Typically Developing (TD) or provisionally Autistic (ASD).

Material

The Sleeping Questionnaire was adapted from Bruni, Ottaviano, Guidetti, Romoli, Innocenzi, Cortesi, & Giannotti (1996), Owens (2011), Sadeh (2004), and McGreavey, Donnan, Pagliari, & Sullivan (2005). The questionnaire asked parents to report their name, role, as well as the child's name, date of birth, sex, and birth order (see Sleep Questionnaire in supplementary information). The questionnaire includes both quantitative and qualitative data. This study focused on the quantitative data, Questions 12-28, in which the participants were asked to indicate their child's sleeping behaviors on a Likert scale. Intervals ranged from one (never), to two (occasionally), to three (sometimes), to four (often), to five (always).

Procedure

The sleep questionnaire was administered in the welcome packet mailed out before the research session. The parents and guardians filled out the sleep questionnaire and other medical questionnaires before or during the research session. At the beginning of the study, the parents and guardians were consented and educated on the psychological assessments being used. At the end of the session, the research psychologist debriefed the parents or guardians and gave them a provisional diagnosis of the participant.

Statistical Analysis

Questions 12-28 of the sleep questionnaire were analyzed using a bivariate statistical analysis based off of the Statistical Package for Social Sciences (SPSS). Gender frequencies for the ASD and TD groups were obtained using a crosstabulation (see Table 1), while age frequencies were obtained using frequency tables. Normality was tested using the Kolmogorov-Smirnov Test for each sleep variable. Since our data was not normally distributed, the variance between ASD and TD infants was not equal, thus the Wilcoxon-Mann-Whitney non-parametric test was used to test for the significance of each sleep variable (see Table 2). Any questions that were not answered were declared "Missing" and were omitted from the statistical analysis.

Results

A significant difference was found for Question 13: My child has difficulty getting to sleep at night ($p < .05$), Question 24: My child wakes from sleep screaming or confused so that I cannot seem to get through to him/her ($p < .05$), and Question 25: My child is difficult to wake up in the morning ($p < 0.01$) (see Table 2). These results indicate that ASD children have more trouble falling asleep and waking up in the morning compared to TD children. In addition, ASD children wake up screaming or confused more often than TD children. No significant differences were found between ASD and TD children in Questions 12, 14-23, or 26-28 (see Sleep Questionnaire in supplementary information).

Discussion

The purpose of the current study was to investigate sleep behaviors in autistic infants in comparison to typically developing infants. Finding specific differences in sleep behaviors may lead potential treatments to correct these behaviors. While past research suggested that sleeping differences occur between autistic and typically developing children, the current study sought to

review this past literature and to test additional sleep variables in TD and ASD infants at a younger age.

The hypothesis was supported as ASD infants experienced several sleeping problems more often than TD infants. In particular, these ASD infants had more difficulty falling asleep at night, often woke up screaming or confused, and had more trouble waking up in the morning. These findings agree with past research suggesting that ASD children have longer sleep latencies (Krakowiak et al., 2008; Elrod & Hood, 2015; Wiggs and Stores (2004), as cited in Glickman, 2009). In addition, waking up screaming or disoriented and having difficulty waking in the morning suggests that disturbances during the night may lead to lower sleep efficiency in autistic children, as past research has shown (Elrod & Hood, 2015). While there are no concurrent reasons as to why these sleeping problems are more likely in ASD infants, it may possibly be due to differences in brain activity or circadian rhythms between ASD and TD children **(**Glickman, 2009).

Melatonin, which was found in lower levels in people with ASD (Nir et al., 1995, as cited in Melke, Botros, Chaste, Betancur, Nygren, Anckarsater, Rastam, Stahlberg, Gillberg, Delorme, Chabane, Mouren-Simeoni, Fauchereau, Durand, Chevalier, Drouot, Collet, Launay, Leboyer, Gillberg, & Bourgeron, 2008), has been shown effective as treatment of sleep difficulties in autistic children. In the past, Melke et al. (2008) found that individuals with ASD and low melatonin levels exhibited abnormal sleep-wake cycles. Since melatonin is involved in synaptic plasticity, this deficit in melatonin may weaken synapses and thus deteriorate these neuronal networks over time (Melke et al., 2008). The researchers suggested that these low melatonin levels may be genetically caused by a mutation to the gene ASMT, which encodes the final enzyme in the melatonin synthesis (Melke et al., 2008). Since these findings, melatonin

treatment has been used on ASD children and effectively reduced their sleep latencies (Malow, Adkins, McGrew, Wang, Goldman, Fawkes, & Burnette, 2012). However, this study was limited to a small sample size and lack of placebo or control group. In addition, there is speculation about whether other medications autistic children may be taking would interfere with the effectiveness of melatonin (Malow et al., 2012).

An earlier study by Giannotti, Cortesi, Cerquiglini, Bernabei (2006) showed that melatonin treatment was effective in improving sleep patterns over a longer period of up to 24 months in autistic children not taking any other medications. These improvements include longer sleep length, less night awakenings, less daytime tiredness, and less sleep onset delay (Giannotti et al., 2006). However, they also did not have a placebo or control group. Garstang & Wallis (2006) did demonstrate in a double blind-study that melatonin treatment reduced sleep latencies in comparison to the placebo or baseline groups, but their sample size was very small.

Overall, these results are promising, showing that some autistic children tolerate and benefit from melatonin treatment, but more research needs to be done to confirm this relationship with larger and more generalizable sample sizes, placebo, and control groups. It should also be noted that melatonin treatment should be paired alongside behavioral treatments such as a regular bedtime routine in order to be effective (Jan & Freeman, 2004, as cited by Giannotti et al., 2006). Other behavioral treatments may include extinction, and preventive parent education, which have shown to be the most helpful in reducing sleep disturbances in children as well as improving the whole family's well-being (Mindell et al., 2006).

Although there is behavioral evidence of sleep problems in ASD children, more research needs to be done using EEG recordings to investigate the specific brain activity patterns altered in autistic children. Recently, a group of researchers compared the electroencephalogram (EEG)

recordings of TD and ASD children, and investigated the correlation between brain activity and intelligence (Tessier, Lambert, Chicoine, Scherzer, Soulieres, & Godbout (2015). Through the EEG recordings, the researchers monitored non-rapid eye movement (non-REM) sleep, sleep spindles, Sigma activity, and intelligence quotient (IQ) measurements. The researchers found that autistic children had significantly lower sleep spindle density and shorter durations of sleep spindles than TD children. In addition, ASD children showed less of the fast Sigma EEG activity during the final two hours of the night. IQ was correlated with sleep spindle duration in TD children, whereas it was correlated with sleep spindle density in ASD children. Sigma activity was also related to IQ in TD children, but not autistic children. These findings are one of the first to show evidence of a correlation between cognition and EEG sleep spindles as well as Sigma EEG activity in TD and ASD children (Tessier et al., 2015). The researchers suggest that cognitive differences in TD and ASD infants may be due to the differences in brain processes involved in sleep spindles and Sigma EEG activity during sleep (Tessier et al., 2015). Future research should expand on these findings in order to identify what neural mechanisms to target in future treatment techniques for sleep problems in ASD children.

Another area for future research is comparing the sleeping behaviors in ASD children with epilepsy and ASD children without epilepsy. Using EEG recordings, Yasuhara (2010) discovered that ASD children with a lower IQ had smaller occurrence rates of EEG epileptic spike dischargers, and a higher prevalence of epilepsy (Yasuhara, 2010). In addition, they found that treating epileptic autistic children with sodium valproate (VPA), which diminishes the children's epileptic effects, inadvertently improved their behavioral deficits (Yasuhara, 2010). Their study suggests that the presence of epilepsy in ASD children is correlated with the level of

brain dysfunction; thus, treating comorbid epileptic seizures can help in treating symptoms of ASD (Yasuhara, 2010).

Other studies have demonstrated that epileptic children have more sleep problems than normal controls, which puts them at risk for biological impairments such as cognitive deficits and social difficulties (Wirrell, Blackman, Barlow, Mah, & Hamiwka, 2005). Using a Sleep Behavior Questionnaire (SBQ), Child Behavior Checklist (CBCL), and Quality of Life Childhood Epilepsy, the researchers sought to investigate the factors of epilepsy that contributed the greatest to sleep fragmentations in children. Epileptic children showed greater sleep latencies, parent-child interaction, sleep fragmentation, parasomnias, and daytime drowsiness on the SBQ, as well as social and attention problems on the CBCL questionnaire (Wirrell et al., 2005). Thus, epileptic children may be more at risk for sleep problems and the cognitive as well as social deficits that arise from them.

Epilepsy is linked with both autism and sleep. Therefore, future research should study the link between these three variables. This may lead to new knowledge about the neuronal mechanisms underlying these abnormal sleep behaviors in ASD children, as well as new treatment options. Treating comorbid sleep problems may reduce autistic and epileptic symptoms. These treatments may include melatonin, antiepileptic drugs, or vagus nerve stimulator treatment, as suggested by Accardo & Malow (2014). Since there are still issues with these treatments, more extensive research needs to be done to find plausible treatments that can ethically be used in children.

A potential limitation is that the current study used a parent-reported questionnaire. Though parent-reports are normally reliable, our study is limited in that parents may underreport or overestimate their children's sleeping problems (Krakowiak et al., 2008). In the future, using a

multi-method assessment would be more useful and reliable. For example, incorporating parent-reports, EEG recordings, and brain imaging during sleep. In addition, a narrow sample was used for the current study, including only infants in the San Diego county. This limited sample population makes the results difficult to generalize to the larger population. Another potential limitation is that our sample size of controls was lower than our sample size of ASD infants, which may have affected the distribution of each sleep variable. While unequal gender frequencies may be a weakness in the TD group, it is in fact one of the strengths in the ASD group. ASD is four to five times more prevalent among boys than girls (Baio, 2014). In the current study, there were five times more ASD boys than ASD girls, which matches the current gender ratio in autism diagnosis.

If this study were to be replicated in the future, it would be essential for all parents to report their children's medication use as this may alter their sleep behaviors. Past studies that did not report children's medication use reported lower sleep efficiencies than those in which parents reported their children's medication (Elrod & Hood, 2015). Thus, failing to account for the use of medication in children may be a confounding variable in the results of this study. In addition, since the infants used in this study were under the age of 36 months, a provisional diagnosis was used. If this study were replicated, a follow-up investigation of the ASD children would improve the data by checking the precision of the provisional diagnosis, and testing whether or not sleeping abnormalities diminish over time in provisionally diagnosed ASD children receiving treatment.

In conclusion, this study confirms past research findings that ASD children have more difficulty falling asleep and waking up compared to TD children, and suggests that ASD infants wake up screaming or confused more often than TD infants. By identifying these sleep behaviors

that differ between ASD and TD children early on, this may lead to more effective treatment since the brain has more plasticity at a younger age. In addition, researchers may develop new techniques to enhance the quality of life for both the ASD children and their parents by improving these sleep behaviors. Better sleep leads to superior health, and may even have the potential to advance learning and memory in these ASD children, as evidence has shown that sleep is linked to executive functioning (Beebe & Gozal, 2002, as cited in Mindell et al., 2006). Treating these sleep abnormalities early in childhood may reduce the further development of cognitive, psychological, social and behavioral deficiencies in ASD children.

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Supplementary Information

Table 1
Gender Frequencies

Sex	ASD	TD	Total
Male (N)	183	88	271
Female (N)	36	62	98
Missing (N)	-	2	2
Total (N)	219	152	371

Table 2
Sleep Variables in TD vs. ASD Infants

Variable	*p* value
(12) Bed Reluctance	0.186
(13) Sleep Difficulty	0.022*
(14) Sleep Anxiety	0.227
(15) Sleep Jerk	0.196
(16) Sleep Repetitive Actions	0.475
(17)Night Wakings	0.550
(18) Wake Sleep Difficulty	0.390
(19) Sleep Twitch	0.115
(20) Sleep Breathing Difficulty	0.762
(21) Sleep Sweating	0.354
(22) Sleep Talking	0.862
(23) Sleep Teeth Grind	0.332
(24) Wake Sleep Screaming/Confused	0.017*
(25) Difficulty Waking Up	0.001**
(26) Awake Tired	0.176
(27) Night Drink	0.255
(28) Sleep Parents Bed	0.059

* $p < 0.05$, ** $p < 0.01$
Sleep Questionnaire.

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[1]Infant Sleep Questionnaire

When answering the following questions, consider each as pertaining to the past 1 MONTH of your child's life. Please mark only one (most appropriate) choice, when you respond to items with multiple options.

Name of Responder: _____ Date:_____
Role of Responder: __ Father __ Mother __Grandparent __ Other, Specify: _____
Name of the Child: _____ Date of Birth:_____
Sex: __Male __Female Birth order of the child: __Oldest __Middle __Youngest ___Only child

1. Sleeping arrangement:
   __Infant crib in a separate room __Infant crib in parents' room
   __In parents' bed __Infant crib in room with sibling
   __Other, Specify:_____

2. In what position does your child sleep most of the time?
   On his/her bell__ On his/her side__ On his/her back___ No set position, my child moves a lot___

3. How long does it take to put your baby to sleep in the evening?

4. On average, how much time does your child spend in sleep during the NIGHT (between 7 in the evening and 7 in the morning?) Hours:_____ Minutes:_____

5. On average, how many times does your baby wake up during the night? _____

6. On average, how much time does your child spend awake each time he wakes up at night?

7. How does your baby fall asleep?
   __While feeding __Being rocked __Being held
   __In bed alone __In bed near parent __Other, Specify:_____

8. What time does your baby usually fall asleep for the night?

9. When does your baby usually wake up in the morning? Please report to the nearest minute (e.g., 6:15)

10. Do you consider your child's sleep as a problem?
    __A very serious problem __A small problem __Not a problem at all

11. If your child wakes up in the middle of the night, how long does he cry for?
    Hours:_____ Minutes:_____

Please answer the following questions by circling or striking the number 1 to 5.
1- Never 2- Occasionally (once or twice per month or less) 3-Sometimes (once or twice per week)
4- Often (3 or 5 times per week) 5 -Always (daily)

12. My child goes to bed reluctantly	1	2	3	4	5
13. My child has difficulty getting to sleep at night	1	2	3	4	5
14. My child feels anxious or afraid when falling asleep	1	2	3	4	5

15. My child startles or jerks parts of the body while falling asleep	1	2	3	4	5
16. My child shows repetitive actions such as rocking or head banging while falling asleep	1	2	3	4	5
17. My child wakes up more than twice per night	1	2	3	4	5
18. After waking up in the night, my child has difficulty falling asleep again	1	2	3	4	5
19. My child has frequent twitching or jerking of legs while asleep or often changes position during the night	1	2	3	4	5
20. My child has difficulty in breathing or gasps during the night	1	2	3	4	5
21. My child sweats excessively during the night	1	2	3	4	5
22. You have observed your child talking in his/her sleep	1	2	3	4	5
23. My child grinds teeth during sleep	1	2	3	4	5
24. My child wakes from sleep screaming or confused so that you cannot seem to get through to him/her	1	2	3	4	5
25. My child is difficult to wake up in the morning	1	2	3	4	5
26. My child awakes in the morning feeling tired	1	2	3	4	5
27. My child wants a drink during the night (including breast or bottle)	1	2	3	4	5
28. My child sleeps in the parents' bed at some time during the night	1	2	3	4	5

The following questions refer to LAST NIGHT only:

29. What time did you start trying to put your baby to sleep last night?_____

30. What time did your baby finally fall asleep for the night last night?_____

31. How many times did your baby wake up last night?_____

32. Did he/she cry when he/she woke up? If so, for how long (please list separate amounts of time for each instance of waking)_____

33. What time did he wake up in the morning?_____

[1] Adapted from Bruni et al. (1996), Owens (2001), Sadeh (2004), and McGreavey et al. (2005)