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## Sleep Problems and Temperament in Adolescents

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### Abstract

The aim of this study was to determine the association between temperament and sleep in adolescents. Participants included 516 adolescents and their mothers drawn from the community. Findings indicated that as with younger children, sleep and dimensions of temperament (sociability, impulsivity, and negative affect) are related in adolescents.

### Keywords

SLEEP; ADOLESCENCE; TEMPERAMENT; PERSONALITY

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Though adolescent sleep difficulties may be largely related to environmental factors, normative biological changes, and/ or sleep disorders, temperament may also play a role. Few studies have examined associations between temperament and sleep problems in adolescents, although these relationships have been studied in infants and toddlers for more than 30 years. Carey (1974) found that a low sensory threshold in infants related to night wakings, and expanding on this, Sadeh, Lavie, and Scher (1994) found more frequent night wakings related to low sensory thresholds and less adaptive, more distractible, and more demanding temperaments in 9-24 month-olds. Weissbluth (1984) found that "easy" infants (e.g., those with a positive mood, mild manner, and adaptability) slept longer than "difficult" infants, and this relationship held at toddler age follow up.

In school-aged children, Owens et al. (1997) compared temperament, sleep, and parenting styles in a group of school-age children and found that behavioral sleep problems related to negative emotionality and high intensity. Using subjective and objective measures, El Sheikh and Buckhalt (2005) found that higher emotional intensity related to higher reports of sleep problems, shorter sleep duration, and more activity at night in 6-12 year-olds.

There have been few studies exploring sleep and temperamental (or personality) characteristics in adolescents. Monroe and Marks (1977) compared poor sleepers with matched controls, and found that neurotic characteristics were three times more likely in those who reported difficulty sleeping. Similarly, Gau (2000) studied personality and sleep problems in junior high school students in Taipei and found that neurotic characteristics were associated with later bedtimes, shorter sleep duration, more sleep problems, and more daytime sleepiness.

Taken together, the evidence suggests a clear association between temperament and sleep in young children; however, given the small number of studies, it remains unclear whether this relationship remains in adolescents. We theorized that temperamental dimensions related to neuroticism (e.g., negative affect) and distractibility/impulsivity would be significantly related to sleep problems in adolescents.

## Methods

### Participants

Participants included 516 adolescent twins and their mothers ( $n = 258$ ) from the Michigan State University Twin Registry (MUSTR) (Klump and Burt, 2006). The sample ranged in age from 10-16 (mean age =  $12.68 \pm 1.51$  years) and with regard to demographic factors, was representative of the geographic area.

### Procedure

This study involved secondary data analysis of previously collected data from the MSUTR (Klump and Burt, 2006). The original study and secondary data analyses were approved by an Institutional Review Board, and written informed consent or assent was obtained from all participants.

### Measures

**Sleep composite:** The sleep composite score was derived from the four sleep-related questions on the Child Behavior Checklist parent report (Achenbach, 1991a) and the Youth Self Report adolescent report (Achenbach, 1991b), which are psychometrically sound screening measures designed to identify child and adolescent behavior and emotional problems. Items used in this study included “overtired”, “sleeps less than most kids”, “sleeps more than most kids during the day and/or night”, and “trouble sleeping”. Each item is given a score of 0 (not true), 1 (somewhat or sometimes true), or 2 (very true or often true), and the higher score (either parent or child) for each item was used. The sum of these scores comprised the composite sleep variable (range 0-8), with higher scores indicating worse outcomes. Cronbach’s alpha for the sleep composite was 0.70.

**Early Adolescent Temperament Questionnaire- Revised (adolescent report) (EATQ-R; Ellis and Rothbart, 1999):** The EATQ-R is an 86-item questionnaire with demonstrated reliability and validity measuring specific dimensions of temperament. The four factor scores (surgency/extraversion, affiliativeness/ sociability, negative affectivity, and effortful control/ impulsivity) were used in this study.

## Results

The mean sleep composite score was  $0.92 \pm 1.51$  (range = 0.00-8.00). Bivariate Spearman correlations demonstrated significant associations between sleep and effortful control, affiliativeness, and negative affectivity (see Table 1). No significant relationships were found between sleep and adolescent-reported surgency/extraversion.

Hierarchical linear modeling (HLM) including significant covariates (age, sex, and income) was used to test four models looking at each temperament variable independently and an additional model including all of the temperament variables together (see Table 2). *Pseudo*  $R^2$  was used to determine the amount of variance in sleep problems accounted for by the main effects of independent variables (i.e.,  $R^2$ ).

With regard to the individual HLM models, significant positive associations were found between sleep and adolescent-reported affiliativeness/ sociability and negative affectivity (See Table 2) wherein a higher sleep problem score related to more affiliativeness and more negative affect. There was a significant negative association between sleep and effortful control (see Table 2), indicating that higher sleep problem scores related to less effortful control. No significant relationships were found between sleep and surgency/ extraversion. With all of the temperament variables included, the general pattern of relationships remained, with affiliativeness/ sociability showing significant associations with sleep problems, and effortful control ( $p=.05$ ) and negative affect ( $p=.07$ ) demonstrating trends towards significance.

## Discussion

As hypothesized, higher sleep problem scores related to effortful control and negative affectivity in adolescents, which is consistent with findings in infants, toddlers, and school age children (Carey, 1974; El Sheikh and Buckhalt, 2005; Owens, 1997; Sadeh, Lavie, and Scher, 1994; Weissbluth, 1984). While we did not *a priori* hypothesize the direction of the association, sociability was the strongest predictor of sleep problems in the combined model. Given the developmental importance of social relationships during adolescence and the availability of technology (computers and cell phones), the association between sociability and sleep is not surprising. It is likely that adolescents who are talking, text messaging, emailing, and out later with peers have more sleep problems than those who are less socially active.

Moving forward, longitudinal research should identify factors that predict sleep and temperament across the lifespan. It may be that parental responses to sleep issues that arise over time are related (likely in multiple, complex ways) to temperament. Further research investigating sociability and sleep using more specific measures of both sleep and sociability variables is also warranted.

Results from this study should be interpreted in light of potential limitations. The use of a single composite score did not allow us to look at specific sleep disorders, and may have limited reliability and validity, though initial reliability estimates were high ( $\alpha = .70$ ). Also, the amount of variance predicted in the models was fairly small (i.e., 11-14%), though consistent with previous studies (El Sheikh and Buckhalt, 2005; Owens, 1997; Sadeh, Lavie, and Scher, 1994), and reinforces the need for further research investigating other predictors of sleep problems.

## Conclusion

This study provides evidence that associations between temperament (negative affect, impulsivity) and sleep problems identified in infants, toddlers, and school-age children, are also present in adolescents. Additionally, an important finding extending previous research is that affiliativeness/ sociability may be a particularly strong predictor of adolescent sleep problems.

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**Table 1**

Bivariate Spearman correlations between sleep, temperament, and demographic variables

	1	2	3	4	5	6	7
<b>Sleep composite</b>							
Sleep composite	r=-.21**	r=.09*	r=.03	r=.23**	r=.20**	r=-.17**	r=-.19**
1. Effortful Control	r=-.21**	r=.14**	r=-.09*	r=-.61**	r=-.05	r=.04	r=.31
2. Affiliativeness	r=.09*		r=.49**	r=.03	r=.17**	r=.19**	r=.05
3. Surgency	r=.03	r=-.49**		r=.29**	r=-.01	r=.24**	r=-.13**
4. Negative Affect	r=.23**	r=-.61**	r=.29**		r=.05	r=-.04	r=.23**
5. Age	r=.20**	r=-.05	r=-.01	r=.05		r=-.05	r=-.05
6. Sex	r=-.17**	r=.19**	r=.24**	r=-.04	r=-.05		r=-.09
7. Parent income	r=-.19**	r=.05	r=-.13**	r=-.23**	r=-.05	r=-.09	

\* p≤.05

\*\* p<.01

**Table 2**

## Hierarchical Linear Models Examining the Influence of Temperament on Sleep

Model	B (SE)	t	df	p
<b>Effortful Control, <i>pseudo R</i><sup>2</sup>=.13</b>	<b>-.004 (.00)</b>	<b>-3.46</b>	<b>434.63</b>	<b>.001</b>
Intercept	.199 (.01)	13.86	241.78	<.001
Age	.030 (.01)	3.21	246.11	.002
Sex	.047 (.01)	3.26	241.44	.001
Ethnicity	-.018 (.01)	-1.38	242.89	.17
Parent income	-.044 (.01)	-3.61	261.91	<.001
<b>Affiliativeness, <i>pseudo R</i><sup>2</sup>=.13</b>	<b>.003 (.00)</b>	<b>2.08</b>	<b>444.95</b>	<b>.04</b>
Intercept	.197 (.01)	13.86	243.50	<.001
Age	.028 (.01)	3.02	250.84	.003
Sex	.052 (.01)	3.62	250.09	<.001
Ethnicity	-.015 (.01)	-1.20	250.13	.23
Parent income	-.056 (.01)	-4.72	249.40	<.001
<b>Surgency, <i>pseudo R</i><sup>2</sup>=.11</b>	<b>.002 (.00)</b>	<b>1.51</b>	<b>440.48</b>	<b>.13</b>
Intercept	.198 (.01)	13.76	245.13	<.001
Age	.031 (.01)	3.30	247.85	.001
Sex	.052 (.01)	3.53	254.06	<.001
Ethnicity	-.015 (.01)	-1.20	245.42	.23
Parent income	-.053 (.01)	-4.44	250.44	<.001
<b>Negative Affect, <i>pseudo R</i><sup>2</sup>=.14</b>	<b>.004 (.00)</b>	<b>3.62</b>	<b>434.81</b>	<b>&lt;.001</b>
Intercept	.196 (.01)	13.94	242.42	<.001
Age	.030 (.01)	3.24	246.86	.001
Sex	.047 (.01)	3.29	241.77	.001
Ethnicity	-.016 (.01)	-1.31	248.56	.19
Parent income	-.046 (.01)	-3.83	258.09	<.001
<b>All Temperament Variables, <i>pseudo R</i><sup>2</sup>=.15</b>				
Intercept	.199 (.01)	14.08	237.34	<.001
Effortful control	-.003 (.00)	-1.96	408.00	.05
Affiliativeness	.003 (.00)	2.08	420.10	<.05
Surgency	.001 (.00)	-.52	413.94	.60
Negative affect	.002 (.00)	1.84	398.06	.07
Age	.026 (.01)	2.78	250.76	<.01
Sex	.050 (.01)	3.47	249.93	<.01
Ethnicity	-.019 (.01)	-1.45	238.50	.15
Parent income	-.044 (.01)	-3.62	261.44	<.001

Note: To correct for positive skew, the sleep composite was log transformed. Collinearity statistics demonstrated tolerance levels greater than .5 and inflation factors greater than 2.0. All predictors were centered on the grand mean, and sex was effect coded (i.e., girls = -1, boys = +1) prior to analysis.