

# Investigating the convergence between actigraphy, maternal sleep diaries and the Child Behavior Checklist as measures of sleep in toddlers

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## Abstract

The current study examined associations between actigraphy, maternal sleep diaries, and the parent-completed Child Behavior Checklist (CBCL) sleep items, which are instruments widely used by clinicians and researchers to assess sleep among young children. 80 middle-class families participated in this study when children were aged 2 years. Children wore an actigraph monitor for a 72-hour period and mothers completed a sleep diary during the same period. Both parents also completed the CBCL. The results show that these sleep measures assess different aspects of children's sleep, and suggest particularly low concordance between the subjective and objective sleep measures.

## Introduction

- Different instruments are used to assess sleep among young children (e.g., retrospective questionnaires, prospective sleep diaries, actigraphy).
- Each of these measures has its advantages and drawbacks.
- While research has examined the degree of convergence between sleep measures among school-age children and adolescents (e.g., Gregory et al., 2011), to our knowledge, research has yet to examine the extent to which different sleep assessment methods converge when they are used with toddlers.
- Furthermore, there is next to no evidence of convergent validity for the CBCL sleep items, which is of concern given their widespread use as a sleep measure with young children
- **Aims of the study:** The current study examined associations between actigraphy, maternal sleep diaries, and the parent-completed CBCL sleep items.

## Method

### PARTICIPANTS

- **Eighty families** (41 boys and 39 girls; mostly **Caucasian**) drawn from a community sample.
- Children were 2 years old ( $M = 25.35$  months)
- **Mothers** were between 20 and 44 years old ( $M = 32$ ); **fathers** between 21 and 47 years old ( $M = 34$ )

### MEASURES

- Families were given instructions in order for their child to wear an **Actiwatch** (Mini-Mitter, Oregon) during 72 consecutive hours, to derive child sleep/wake status based on motor activity.
- On the same three consecutive days, mothers completed a **diary** of their child's sleep.
- 89% of the mothers and 75 % of the fathers also filled the **Child Behavior Checklist** (CBCL/1.5-5; Achenbach & Rescorla, 2000).

## Results

Sleep variables	N	Min	Max	Mean	SD
<b>Actigraphy</b>					
Sleep duration (min)	80	389.3	678.3	563.2	59.5
Sleep efficiency (%)	80	67.0	99.6	90.4	7.1
<b>Diary</b>					
Sleep duration (min)	80	487.5	772.5	638.7	48.4
Sleep efficiency (%)	80	81.8	100.0	98.3	3.7
<b>CBCL sleep problems scale</b>					
Mothers	71	0	10.0	3.1	2.7
Fathers	53	0	8.0	2.5	2.5

## Results

Mother and father CBCL scores were highly correlated.

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<b>CBCL sleep problems scale</b>	<b>.57**</b>
Doesn't want to sleep alone	<b>.61**</b>
Has trouble getting to sleep	<b>.26<sup>t</sup></b>
Nightmares	<b>.58**</b>
Resists going to bed at night	<b>.27<sup>t</sup></b>
Sleeps less than most children during day and/or night	<b>.24<sup>t</sup></b>
Talks or cries out in sleep	<b>.46**</b>

$p < .05$ ; \*\*  $p < .01$

Good correspondence was found between maternal CBCL's and maternal sleep diaries, and between paternal CBCL's and sleep efficiency (but not duration) derived from maternal sleep diaries. Very few correlations between actigraphy and CLBL scores reached statistical significance.

	Diary duration	Diary efficiency	Actigraphy duration	Actigraphy efficiency
<b>CBCL filled by mothers</b>				
Sleep problems scale	-.21	<b>-.31*</b>	-.17	-.21
Doesn't want to sleep alone	<b>-.36**</b>	<b>-.25*</b>	-.09	-.01
Has trouble getting to sleep	<b>-.39**</b>	-.13	<b>-.34**</b>	-.18
Nightmares	.06	<b>-.27*</b>	.06	-.06
Resists going to bed at night	<b>-.28*</b>	-.14	<b>-.24*</b>	-.12
Sleeps less than most children	-.10	-.15	-.11	-.10
Talks or cries out in sleep	.04	-.21	-.07	-.18
Wakes up often at night	-.09	<b>-.35**</b>	.02	-.15
<b>CBCL filled by fathers</b>				
Sleep problems scale	.08	<b>-.36**</b>	.06	-.15
Doesn't want to sleep alone	-.26	<b>-.35*</b>	.04	.07
Has trouble getting to sleep	-.02	-.15	.08	-.14
Nightmares	.17	<b>-.39**</b>	.19	.01
Resists going to bed at night	.08	.02	.10	-.02
Sleeps less than most children	-.01	-.08	.05	.01
Talks or cries out in sleep	.23	-.27	-.01	-.18
Wakes up often at night	.05	<b>-.34*</b>	.10	-.03

$p < .05$ ; \*\*  $p < .01$

## Results

The Bland and Altman method revealed that sleep diaries and actigraphy showed poor **agreement** with each other, although their estimates of sleep duration were significantly **correlated**.

### Sleep variables

Sleep duration	≤ 30 minutes	≤ 60 minutes	≤ 90 minutes*	≤ 120 minutes
	25.0	46.2	70.0	78.7
Sleep efficiency	≤ 5 %	≤ 10%*	≤ 15 %	≤ 20 %
	37.5	71.3	83.7	92.5

\* satisfactory agreement criteria

## Conclusions

- Consistent with findings among older children groups, this study suggests that the CBCL sleep items, sleep diaries, and actigraphy tap into different aspects of sleep among toddlers.
- The choice of which of these measures to use should be based on the exact aspects of sleep that one aims to assess.
- Great care should be exercised before choosing the CBCL as a sleep measure, given its poor relations to objective sleep measures.

## References

1. Gregory, A. M., Cousins, J. C., Forbes, E. E., Trubnick, L., Ryan, N. D., Axelson, D. A., ... Dahl, R. E. (2011). Sleep items in the Child Behavior Checklist: A comparison with sleep diaries, actigraphy, and polysomnography. *Journal of the American Academy of Child & Adolescent Psychiatry*, 50, 499-507. doi:10.1016/j.jaac.2011.02.003
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