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The interplay between sleep behavior and affect in elementary school children's daily life



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ABSTRACT

Recent reviews raised the idea of a bidirectional relation between sleep behavior and affect in adults, but little is known about this interplay in general and especially regarding children. In this micro-longitudinal study, the interplay of sleep and affect was captured directly in children's daily life context in and out of school through ambulatory assessment. For 31 consecutive days, 110 elementary school children (8–11 years old) provided information about their last night's sleep and reported their current affect at four daily occasions in school and at home on smartphones. A multilevel approach was used to analyze the relation between sleep and affect the next day (morning, noon, and afternoon) and the relation between evening affect and subsequent sleep. At the within-person level, sleep quality was related to all observed facets of affect the next day and the strongest effects were found in the morning. The effect of sleep quality on positive affect was particularly pronounced for children who on average went to bed early and slept long. There were, however, no direct within-person effects of sleep quantity on affect. Furthermore, evening affect was related to subsequent sleep. The findings support the idea of a bidirectional relation between affect and sleep in children's daily life (including school). They suggest that good sleep provides a basis and resource for children's affective well-being the next day and demonstrate the importance of analyzing within-person variations of children's sleep. Micro-longitudinal findings can contribute to explain how macro-longitudinal relations between sleep and affect develop over time.

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Introduction

Children's affective states are one of the most prominent characteristics of their everyday life. Daily affective well-being is an essential condition to meet the heterogeneous social, cognitive, and emotional demands in school and at home (see [Davis & Suveg, 2014](#), for a review). Therefore, a better understanding of children's affect is desirable. We considered children's nightly sleep behavior to be important for their affect the next day because sleep provides a crucial restorative function (e.g., [Vandekerckhove & Cluydts, 2010](#)). Surprisingly, there is a serious lack of research with children on this issue. Therefore, we start with a rather brief literature summary on adults and adolescents, continue with explaining why research with children is highly needed, and finally focus on the literature on children.

For adults, a growing number of recent literature reviews suggest a bidirectional relation between sleep quantity¹ and quality and affective states; affect in the evening is related to nightly sleep, and nightly sleep is related to affect the following morning (e.g., [Deliens, Gilson, & Peigneux, 2014](#); [Kahn, Sheppes, & Sadeh, 2013](#)). However, this overall intuitive pattern is highly complex, and the field is just beginning to understand its determining factors (e.g., age differences; [Wrzus, Wagner, & Riediger, 2014](#)).

Predicting affect. The influence of sleep behavior on affect was mostly tested by means of experimental variations. In a meta-analysis of 20 effect sizes, [Pilcher and Huffcutt \(1996\)](#) found that affect is strongly influenced by both total and partial sleep deprivation. This finding is further supported by recent studies with adults (e.g., [Kahn, Fridenson, Lerer, Bar-Haim, & Sadeh, 2014](#)) and adolescents, who reported less positive affect ([Talbot, McGlinchey, Kaplan, Dahl, & Harvey, 2010](#)) and more negative affect ([Baum et al., 2014](#)) after partial sleep deprivation. In addition to experimental variations, measurement-intensive micro-longitudinal studies (i.e., studies with a high frequency of measurement occasions) are especially convenient and beneficial to study the sleep–affect relation. They capture *naturally occurring variations* in sleep behavior and affect, thereby allowing for the analysis of within-person relations in practically relevant ranges of variation. A consistent within-person finding of measurement-intensive studies is that better sleep quality ratings were associated with more positive and less negative affect the next day ([De Wild-Hartmann et al., 2013](#); [Kalmbach, Pillai, Roth, & Drake, 2014](#); [McCrae et al., 2008](#); [Simor, Krietsch, Köteles, & McCrae, 2015](#)). A longer self-reported sleep duration was also related to more positive and less negative affect the next day in some studies ([De Wild-Hartmann et al., 2013](#); [Fuligni & Hardway, 2006](#)) but not in all studies ([Kalmbach et al., 2014](#); [Lev Ari & Shulman, 2013](#)). Interestingly, [Wrzus and colleagues \(2014\)](#) showed that the within-person relation of self-reported sleep duration with affect the next morning varied substantially in strength across age groups—with a linear relation for adolescents and an inverted U-shaped relation for adults older than 20 years.

Predicting sleep. The influence of affective states on subsequent sleep has recently received more attention in reviews, but empirical evidence is still scarce. To our knowledge, only a few studies experimentally manipulated pre-sleep affect, finding that induced negative affect was related to shorter sleep duration and increased sleep problems ([Talamini, Bringmann, de Boer, & Hofman, 2013](#); [Vandekerckhove et al., 2011](#)). Measurement-intensive studies provide mixed evidence: In one study average daily positive affect was related to longer self-reported sleep duration and higher sleep quality ratings ([Kalmbach et al., 2014](#)), but most studies found no relations of affect and subsequent sleep in daily life ([De Wild-Hartmann et al., 2013](#); [Lev Ari & Shulman, 2013](#); [Simor et al., 2015](#); [Wrzus et al., 2014](#)).

Why research with school-aged children is needed

Elementary school children are in a crucial learning phase when they acquire the fundamentals for later knowledge acquisition. Good sleep and daily affective well-being seem to be a necessary

¹ Sleep quantity refers to the amount of sleep (e.g., sleep duration, time in bed). Sleep quality is less consistently defined in the literature but typically refers to a subjective evaluation of a past period of sleep (e.g., ease of falling asleep, calmness of sleep; [Åkerstedt, Hume, Minors, & Waterhouse, 1994](#)).

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