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Prospective associations between chronic youth sleep problems and young adult health

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ABSTRACT

Objectives: The current study investigated prospective associations between youth sleep problems across childhood and adolescence, as well as the relationship between chronic youth sleep problems and young adult health. Exploratory analyses investigated this sleep–health relationship in the context of several established risk factors, including youth depression and environmental stress.

Design: This project is an extension of the Mater–University Study of Pregnancy, a longitudinal study that followed more than 7000 children across early development.

Setting: Brisbane, Australia.

Participants: Seven hundred ten mother–child dyads assessed from birth to age 20.

Measurements: We used maternal report measures to assess the persistence of youth sleep problems. We used structural equation modeling to explore the relationship between chronic maternal-reported youth sleep problems and subjective reports of young adult health quality and to assess whether associations remained when other potential health risks were included in the model.

Results: Path analyses revealed that sleep problems in early childhood predicted sleep problems in middle adolescence, which predicted sleep problems at age 20. Structural equation models showed that chronic youth sleep problems predicted youth health quality at age 20 ($\beta = .263, P < .001$) over and above the effects of early adversity, chronic childhood illness, maternal depression, lifetime youth depression, and chronic youth stress.

Conclusions: Chronic sleep problems can emerge in childhood and may contribute to negative health outcomes in young adulthood. Chronic youth sleep problems remain a significant predictor of poor health when tested against other known health risk factors, suggesting that sleep may be an important health intervention target.

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Sleep and health are undeniably linked. An extensive body of literature has demonstrated that sleep is critically involved in promoting physical growth, tissue restoration, and homeostatic balance.¹ In addition, patterns of disrupted sleep and patterns of short or long sleep duration have been associated with the presence of several chronic health conditions, including chronic pain,² obesity,³ and cardiovascular disease,^{3,4} as well as lower self-reported health-related quality of life^{5,6} and greater health-related functional impairment.⁷ Despite this, few studies have examined the longitudinal

relationships of sleep disturbance over time or the prospective associations between sleep disturbance and health across childhood and adolescence. Given the extensive cognitive, emotional, and physical development that occurs in childhood and adolescence, examining these relationships may provide information about the role of sleep in health that could inform future health-related prevention programs.

A growing body of research has revealed that sleep patterns change drastically across childhood and adolescence and are generally marked by a decrease in overall sleep duration, napping, and night waking.^{8,9} Although studies have shown that youth sleep varies considerably between individuals, research indicates that many children show stability in their sleep duration trends from infancy through age 10 years.¹⁰ Investigations of the relative continuity of sleep problems in clinical pediatric populations have shown that although the

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majority of children do not have continued sleep difficulties, between 5% and 20% of children have persistent parent-reported sleep difficulties over the course of several (ie, 6–12) months.^{11,12} Collectively, this work suggests that for a subset of individuals, sleep problems emerging in childhood may become persistent, or chronic, in nature; however, to date, no studies have investigated the chronicity of sleep problems from childhood into adolescence.

Prospective studies examining sleep disturbance in childhood and its association with later health outcomes are also rare. Building on cross-sectional studies linking sleep duration and body mass index, one recent study demonstrated that short sleep duration among children is associated with increased risk for adult obesity.¹³ A randomized-control melatonin treatment study found that among children with chronic sleep-onset insomnia, those that received melatonin treatment had concurrent improvements in sleep onset and general health status, suggesting that sleep may play a causal role in youth health.¹⁴ Taken together, these findings demonstrate the potential long-term impact of sleep disruption across development. However, researchers must extend the current literature to fully understand the relationship between sleep problems, particularly those that persist throughout childhood and adolescence, and later health outcomes.

The current study attempts to fill these gaps in the literature by examining the chronicity of sleep problems in childhood and adolescence, as well as the relationship between chronic youth sleep problems and health quality in young adulthood. Given that the longitudinal study from which the data were derived was not designed to examine sleep as a primary focus, our sleep problem measures consist only of subjective maternal reports. As such, this study represents a preliminary investigation of the sleep-health relationship in childhood and adolescence that will potentially serve as a platform for future investigations in this line of research.

The current study uses longitudinal data collected from a cohort of more than 700 families over 2 decades to test hypotheses that: (1) youth sleep problems in the preschool period will be associated with youth sleep problems in middle adolescence, which in turn will be associated with sleep problems in early adulthood; and (2) chronic youth sleep problems will predict subjective reports of health quality in early adulthood. Exploratory analyses will also investigate whether the relationship between chronic youth sleep problems and young adult health remains after accounting for the effects of psychosocial factors that have been shown to significantly contribute to adult health outcomes, including early adversity,¹⁵ experiences of chronic environmental stress,^{16,17} and youth depression.¹⁸

Participants and methods

Seven hundred ten mother-youth dyads participated in the current prospective study from birth to youth age 20. This sample was part of a larger birth cohort that comprised the Mater-University Study of Pregnancy (MUSP), which enrolled more than 7000 children born between 1981 and 1984 in Queensland, Australia, and followed them through age 5.¹⁹ We recruited this subset of mother-youth dyads to participate in a follow-up study focused on the intergenerational transmission of depression when youths were ages 15 and 20. Specifically, we identified this at-risk youth sample using maternal self-reported histories of depression measured from birth to youth age 5 and selected mothers who represented a wide range of depressive symptom chronicity and severity. Of the 991 mother-youth dyads targeted for continued study participation, 815 (82.2%) participated at age 15, and 710 (71.6%) participated and completed at least 1 health-related measure at age 20.

Mother-youth dyads in the current sample were primarily white (91.5%; 8.5% Asian, Aboriginal, or Pacific Islander) and lower to

middle income; 48.5% of the youths in the age 20 sample were male. Participants in the current study did not differ significantly from the original MUSP cohort with respect to initial family income ($t[6747] = .089, P = .93$), number of siblings ($t[6667] = .741, P = .46$), and ethnicity ($\chi^2[3, 7018] = 7.211, P = .07$). Differences in youth sex among the current sample and the MUSP cohort approached significance, such that there was a greater proportion of females in the current sample ($\chi^2[1, N = 7223] = 3.848, P = .05$). Relative to the original MUSP cohort, mothers in the current sample had a significantly higher level of education ($t[7164] = 2.171, P = .03$).

Procedures

We assessed mothers once in pregnancy, once in the days following their child's birth, once 6 months after their child's birth, and once when their child was 5 years old. During each visit, mothers completed questionnaires related to their health and psychosocial experiences, as well as that of their child. When youths were 15 and 20 years of age, we administered questionnaires and semi-structured interviews assessing mental and physical health to each dyad. During all waves of data collection, participants provided written informed consent and assent and were compensated for their time. The University of Queensland Ethics Committee approved the study protocols for all waves of data collection; the University of California, Los Angeles (UCLA) and Emory University Institutional Review Boards additionally approved assessments at youth age 15 and 20.

Measures

Sleep

Mothers reported on their child's sleep problems at youth age 5, 15, and 20. When youths were 5 years old, mothers reported the extent to which their child's sleep was irregular between ages 2 and 4 years. Responses ranged from 1 (never) to 4 (often). At ages 15 and 20, mothers responded to 4 sleep-related items (eg, does your child have nightmares, trouble sleeping, sleep less than other children) on the Child Behavior Checklist (CBCL), used for ages 6–18, and 2 sleep-related items (ie, does your child feel tired without good reason, have trouble sleeping) on the Adult Behavior Checklist (ABCL), used for ages 18–59. Item responses ranged from 0 (not true) to 2 (very/often true), where higher scores indicated higher levels of sleep disturbance. As such, combined item responses on the CBCL ranged from 0 to 8; responses ranged from 0 to 4 on the ABCL. Combined item scores for both the CBCL and ABCL were highly skewed and were log transformed for subsequent analyses (see "Data analytic plan"). Across ages, the CBCL and ABCL demonstrate high reliability and good internal consistency.^{20,21} In the current sample, maternal-reported sleep problems were significantly associated with youth-reported sleep problems on CBCL ($r = .257, P < .001$) and ABCL ($r = .325, P < .001$).

Youth health

Mothers reported the number of chronic illnesses their child had at youth age 5. Responses ranged from 0 to 4. At age 20, youths responded to health-related questions on the semi-structured UCLA Life Stress Interview. Specifically, interviewers asked youths about their general health over the past 6 months and probed for information related to specific indicators of physical illness (eg, being overweight, receiving medical treatment). We used these responses to rate youths' overall quality of health on a 5-point scale, where higher scores indicated poorer health quality. This measure demonstrated good interrater reliability (intraclass correlation coefficient = .77) and was moderately correlated ($r = .41, P < .001$) with youth-reported health at age 20.

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