

## EDITORIAL

# Editorial: What Does the Future Hold for Psychological Treatments in Youth? Long-Term Perspectives on Sleep and Circadian Interventions

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**Y**outh represents a vulnerable developmental period associated with significant sleep and circadian changes. One notable change is increased eveningness, which refers to a tendency for later sleep and daily activities. Eveningness has been associated with various adverse outcomes in youth, including compromised sleep, mental health, and physical well-being.<sup>1,2</sup> As such, it is imperative to develop effective interventions to address these issues. While some evidence suggests short-term benefits of interventions targeting circadian problems,<sup>3</sup> the extent of our knowledge regarding the long-term impact on youth remains uncertain. In this issue of the *Journal*, Susman *et al.*<sup>4</sup> shed light on this crucial question through their study that examined the effects of the Transdiagnostic Sleep and Circadian Intervention for Youth (TranS-C) - a modular cognitive-behavioral intervention that specifically targets sleep and circadian issues.

Susman *et al.*<sup>4</sup> conducted a preregistered analysis of long-term follow-up over an average period of 8 years to examine the effects of TranS-C compared with a psychoeducation control on various sleep and health-related outcomes. The study included 106 young adults with eveningness, who were initially 10 to 18 years of age at the time of participation in the original randomized controlled trial. These participants were recontacted and asked to complete outcome measures related to sleep and circadian functioning, risks across 5 health domains (assessed through self-report and ecological momentary assessment), sleep health behaviors (eg, maintaining a regular bedtime and wake up time), and physical measurements. Contrary to the authors' hypotheses, the long-term follow-up analyses did not reveal any significant differences between the TranS-C and psychoeducation groups across all outcome measures. However, the authors did observe significant associations between greater eveningness and poorer sleep with higher self-reported scores across all 5 health domains. In addition, they found a significant association

between greater morningness and increased utilization and habit formation of sleep health behaviors.

Despite the absence of significant findings of their primary hypothesis, the results of this study convey 2 important messages. First, corroborating previous research, this study showed that poorer circadian and sleep functioning were associated with greater risk across all health domains. This finding underscores the crucial role of sleep and circadian factors in the health of youth and highlights the necessity for interventions and strategies that effectively address these issues to enhance their well-being.<sup>5</sup> Second, although the TranS-C group did not exhibit a greater adoption of sleep health behaviors compared with the psychoeducation group, the study revealed that practicing good sleep health behaviors was linked to better circadian functioning. This suggests the feasibility of cultivating long-term healthy sleep behavior that positively impacts circadian health and, to a greater extent, mental health of adolescents. However, a key question remains: How can behavioral changes be sustained beyond the active treatment period to ensure the long-term effectiveness of intervention? Research has shown that interventions incorporating booster sessions could effectively maintain treatment effects for youth managing mental health problems.<sup>6</sup> While this could be a viable option to consolidate long-term treatment gains, further investigation is needed to examine the timing and frequency of delivering such booster sessions.

The lack of a significant difference in this long-term follow-up study raised an intriguing question: Could it be possible that adolescents simply outgrow their eveningness as they mature? This notion presents an interesting area for exploration: whether the so-called fade-out of increased eveningness represents a developmental phenomenon wherein increased eveningness during adolescence is merely a transient phase that gradually shifts toward a more conventional pattern (eg, reduced eveningness) as individuals grow older. The

concept of eveningness is typically understood in 2 ways. First, it can be defined as a self-perceived preference, a traitlike construct positioned along a morningness–eveningness continuum. Second, eveningness can also refer to one's actual sleep behavior, a more statelike construct based on the timing of sleep on free days.<sup>7</sup> Eveningness has been shown to be relatively stable during adolescence. In a 3-year follow-up study by Chen *et al.*,<sup>8</sup> 46.2% of the 500 adolescents who were classified as evening type at an average age of 13 continued to be evening type at age 16. As adolescents progress into late adolescence and young adulthood, it is possible that their sleep patterns gradually shift toward less eveningness to accommodate societal expectations, such as going to work in the morning. This suggests that external factors, such as job demands, lifestyle changes, and significant life events, may play a role in shaping the observed sleep and circadian patterns during this developmental period. However, these aspects remain unexplored, and future research should incorporate these factors to gain a comprehensive understanding of the development of various sleep and circadian outcomes throughout the entire developmental period.

The study conducted by Susman *et al.*<sup>4</sup> possesses several strengths, including being the first study to our knowledge to examine the long-term treatment outcomes of the TranS-C intervention, upholding scientific rigor by using the Open Science Framework and preregistration, and using ecological momentary assessment outcomes to enhance ecological validity. However, certain limitations, which the authors also acknowledged, should be taken into account when interpreting the results. These include reduced statistical power and generalizability of the findings due to the issue of participant attrition, which is a common challenge in long-term follow-up studies, and increased risk of type I error resulting from multiple comparisons of outcomes.

In summary, the study by Susman *et al.*<sup>4</sup> provides valuable insights into the long-term effects of sleep and

circadian interventions in adolescents with eveningness despite not finding significant maintenance effects for the TranS-C intervention. Healthy sleep and circadian rhythm are an integral aspect of overall well-being across the life span. However, the evidence regarding interventions targeting sleep and circadian rhythms in adolescents remains limited. While this study addressed some gaps in the literature, there are unanswered questions that warrant further exploration. Further research is needed to investigate how developmental changes from various aspects (eg, environmental, psychosocial) influence the trajectory of sleep and circadian rhythms from adolescence to young adulthood and to develop a more comprehensive understanding of how to effectively optimize and sustain the benefits of psychosocial interventions for adolescents.

### CRediT authorship contribution statement

**Forrest Tin Wai Cheung:** Conceptualization, Writing – original draft, Writing – review & editing. **Shirley X. Li:** Conceptualization, Supervision, Writing – review & editing.

Accepted August 8, 2024.

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The authors have reported no funding for this work.

Disclosure: Drs. Cheung and Li have reported no biomedical financial interests or potential conflicts of interest.

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0890-8567/\$36.00/©2024 American Academy of Child and Adolescent Psychiatry

<https://doi.org/10.1016/j.jaac.2024.08.003>

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