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Eveningness Diurnal Preference Associated with Poorer Socioemotional Cognition and Social Functioning among Healthy Adolescents and Young Adults

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Abstract

Recently there has been growing interest in associations between sleep, emotion, and social functioning. Less is known about relationships between chronotype preference and socioemotional cognition and functioning, particularly among adolescents, who experience dramatic normative shifts in diurnal preference, affective functioning, and social competence. Fifty-five healthy adolescents and young adults completed a self-report chronotype preference measure, a computerized measure of socioemotional cognition, and a semistructured clinical interview assessing interpersonal functioning. Greater eveningness preference was associated with poorer socioemotional cognition and social functioning in this age group. Future studies should assess these relationships across development and using objective measures of circadian timing.

Keywords

Chronotype; Diurnal Preference; Morningness-Eveningness; Social Functioning; Socioemotional Cognition; Adolescents

Introduction

Sleep is critical for supporting nearly all aspects of daytime functioning, including performance in academic, occupational, and social domains (1–3). Recently, there has been growing interest in the relationship between sleep and emotion, and how this link may impact the ability to adeptly navigate social interactions. For example, sleep deprivation has been shown to reduce emotional recognition and expressivity and increase emotional reactivity, which in turn has an adverse effect on interpersonal effectiveness (2). These associations may be particularly salient during adolescence, a period characterized by

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Conflicts of Interest Statement

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dramatic developmental changes in sleep architecture and behavior, affective functioning, and social competence (4). Indeed, evidence from both cross-sectional and longitudinal studies has consistently indicated relationships between insufficient and/or poor quality sleep and impaired social interactions, interpersonal rejection, and loneliness among adolescents, and these links appear to be mediated by emotional dysregulation (5).

Comparatively less is known about potential associations between circadian timing and/or chronotype preference and socioemotional functioning (2) and to date, very few studies have examined this topic among adolescents, a surprising gap given both the normative shift toward eveningness diurnal preference that is characteristic of this developmental period (6) in addition to well-established links between eveningness preference and poorer overall daytime functioning among adolescents (7). Emerging findings from recent population-based studies have revealed associations between greater eveningness chronotype and poorer self-reported emotional self-regulation (8) and greater difficulty with prosocial behavior (9) among adolescents, suggesting potential associations between later diurnal preference, poorer socioemotional cognition, and social deficits.

However, the handful of studies to date have been limited by self-report assessments, which have the potential for response and recall bias and may be susceptible to social desirability demands (10). As such, objective measures of socioemotional cognition, such as the Mayer-Salovey-Caruso Emotional Intelligence Test (MSCEIT) (11), have been increasingly employed to assess socioemotional cognition and its relationship with sleep (2). In addition, it is unclear how responses on self-report questionnaires translate into social functioning in “real world” settings; e.g., the ability to form and maintain close peer and intimate relationships, effectively resolve peer conflicts, and engage in social activities. Indeed, there is evidence to suggest that performance on objective measures of socioemotional cognition may be a better predictor of real world social competence than self-report assessments (12).

The current study builds on the literature linking sleep, emotion, and social functioning by examining the impact of diurnal preference on socioemotional cognition and interpersonal functioning among adolescents and young adults, a group defined by dramatic changes in sleep-wake patterns and social and affective development. In addition, to our knowledge, this investigation is the first to examine relationships between morningness/eveningness preference and socioemotional performance in this age group using 1) an objective measure of socioemotional cognition as well as 2) a reliable assessment of social functioning designed to evaluate “real world” social competence in adolescent/young adult samples. Based on the prior literature, we hypothesized that greater preference for eveningness would be associated with poorer socioemotional cognition and interpersonal functioning in our sample.

Materials and Methods

Participants.

Fifty-five healthy adolescents and young adults (aged 14–24 years) were recruited to the Adolescent Development and Preventative Treatment (ADAPT) program via Craigslist, e-mail postings, newspaper ads, bus ads, and community professional referrals as part of a

larger clinical evaluation. Exclusion criteria included history of head injury, neurological disorder, intellectual disability, and past or current psychiatric disorder. This investigation was conducted in the context of a larger study focusing on youth at risk for psychosis as well as typically developing adolescents and young adults, and the present analysis focuses solely on this later group (*Note:* the chronotype data central to study questions have not been published elsewhere in any form). The Institutional Review Board approved the protocol and informed consent was obtained from all participants. The data that support the findings of this study are available from the senior author, V.A.M., upon reasonable request.

Measures.

Medical/Psychiatric Status.—To determine eligibility, participants were administered the Structured Clinical Interview for DSM-IV (SCID (13)) and the Word Reading subtest of the Wide Range Achievement Test, 4th edition (WRAT-4 (14)) to rule out psychiatric illness and intellectual disability. A thorough medical, developmental, and social history was also collected.

Chronotype Preference.—Participants completed the 10-item Superscience Morningness/Eveningness Scale (15), a measurement of chronotype preference commonly used with adolescent samples (16). The Superscience Morningness/Eveningness Scale ranges from 10 to 42, with a score of 10 indicating maximal eveningness preference and a score of 42 indicating maximal morningness preference.

Social functioning.—Social functioning was assessed by trained graduate students using the Global Functioning Scale: Social (GF:S (17)). This interview-based tool was developed for use with adolescents and young adults and is rated on a 10-point Likert scale, with higher scores indicating better functioning. The GF:S focuses on functioning with peers; for example, querying the number of satisfying interpersonal relationships, closeness of friendships, age-appropriate involvement in intimate relationships, and engagement in social activities. In addition, the GF:S assesses potential interpersonal problems, such as difficulty resolving conflicts with peers, social withdrawal, and social isolation.

Socioemotional cognition.—Participants were administered the Managing Emotions subtest of the Mayer-Salovey-Caruso Emotional Intelligence Test (MSCEIT (11)), a measure of socioemotional cognition commonly employed with adolescents and young adults (18). This specific task was selected due to prior findings linking performance on the Managing Emotions subtest and quality of social interactions among young adults (19). On this task, participants are asked to read a series of vignettes and answer questions assessing their perceptions of the presented interpersonal or social situations, the emotions of others, and appropriate responses to social situations as well as their management of their own emotions. Scaled scores adjusted for age and sex have a mean of 50 and a standard deviation of 10.

Data Analysis.—Analyses were completed using SPSS Statistics 24 software. Relationships between demographic variables and measures of interest were completed using Pearson correlations and t-tests. Partial Pearson correlations covarying for sex and age

assessed relationships between chronotype preference and (1) social functioning on the GF:S and (2) performance on the MSCEIT Managing Emotions task.

Results

See Table 1 for a summary of sample demographic variables. Demographic variables were not significantly associated with morningness-eveningness, socioemotional cognition, or social functioning in the current sample (all p 's $> .05$). Chronotype preference ranged from 15 – 41 in our sample with a mean of 25.9 ($SD = 5.2$), MSCEIT t -scores ranged from 32 to 71 with a mean of 50.1 ($SD = 9.6$), and GF:S scores ranged from 6 to 10 with a mean of 8.7 ($SD = .8$). Greater tendency toward eveningness preference was associated lower social functioning scores on the GF:S among adolescents and young adults ($r = .27, p = .03$). In addition, greater eveningness orientation was related to worse performance on the MSCEIT managing emotions subtest ($r = .27, p < .05$). See Figure 1. Performance on the MSCEIT Managing Emotions task was not associated with social functioning on the GF:S in the current study ($r = -.20, p = .22$).

Discussion

To our knowledge, this study is the first to examine associations between chronotype preference, socioemotional cognition, and social functioning among adolescents and young adults using an objective measure of socioemotional cognition as well as an assessment designed to evaluate real-world interpersonal functioning in this age group. Findings indicated that greater tendency toward eveningness was associated with poorer socioemotional cognitive performance as well as worse interpersonal functioning with peers, suggesting that youth who tend toward greater eveningness may display deficits in these areas compared to their peers with an earlier diurnal preference. Interestingly, socioemotional cognition and interpersonal functioning were not associated in the current sample, which may have been due to a limitation of our sampling strategy. Specifically, participants were psychiatrically, medically, and intellectually healthy and as such, tended to score highly on the GF:S, restricting the range of scores and limiting power to detect an effect. Future studies using larger samples with greater diversity in psychiatric health and psychosocial performance may further clarify relationships between socioemotional cognition and interpersonal functioning among adolescents and young adults.

Our findings extend the prior literature linking sleep, emotion, and social functioning by focusing on a less frequently studied aspect of sleep/wake functioning – chronotype preference – and dovetail with recent findings linking greater eveningness orientation with poorer emotional self-regulation and difficulty with prosocial behaviors using self-report assessments (8, 9) as well as poorer daytime functioning more generally (7) among adolescents. Our results are also similar to prior work in adult samples showing relationships between greater eveningness orientation and poorer self-reported emotional repair ability (20) and deficits in objectively-measured emotional processing (e.g., negative biases in emotional categorization, recognition/recall, and attention (21)), but are in contrast to another study, which found no correlation between chronotype and the ability to manage emotions among adults (22). Future research should examine if and how relationships

between chronotype, socioemotional cognition, and social functioning change over the course of development.

This study is subject to several limitations. First, the timing of the MSCEIT task was not standardized in the current study; rather, participants were allowed to schedule their appointment at their preferred time provided it took place during the workday (between 9:00 and 17:00). Although this procedure is similar to prior studies evaluating chronotype and socioemotional cognition (e.g., (21)), there is some evidence to suggest circadian influences on socioemotional performance (see (2) for a review), and future studies should examine time-of-day and synchrony (i.e., matching the testing time with the optimal time of day according to an individual's chronotype profile) effects on socioemotional cognition and interpersonal functioning among adolescents. Second, chronotype preference was assessed solely by self-report in this study, and although we employed a commonly used measure among adolescents, future studies using objective measurements of circadian timing, such as acrophase of cortisol and core body temperature (23) or dim-light melatonin onset (24), would further elucidate the impact of circadian rhythms on socioemotional cognition and functioning among adolescents and young adults.

Third, as this study was cross-sectional, the direction of causation underlying these associations is unknown. Perhaps delayed chronotype results in poorer socioemotional cognition and functioning, or the reverse may be true – e.g., poorer social cognition, loneliness, and social isolation may contribute to later bedtimes, or the association may be bidirectional. Future studies should assess the direction of the effects as well as mechanisms underlying these relationships. Fourth, it is notable that we did not observe a relationship between age and diurnal preference in this study, which may be due to characteristics of our sample. Specifically, our sample did not include young adolescents (e.g., youth between the ages of 10 and 14 evidence an earlier chronotype than older adolescents (6)). Future work using larger samples and encompassing an extended age range (i.e., young adolescents through young adulthood) should examine how relationships between morningness-eveningness, socioemotional cognition, and functioning with peers may change over the course of adolescence and young adulthood.

Finally, it is important to note that an individual's chronotype is only one aspect of his or her sleep/wake functioning, and as mentioned in the introduction, other aspects – such as sleep deprivation and poor sleep quality – have also been linked to poorer socioemotional cognition and social functioning (2). Future studies should investigate the relative impact of each facet of sleep/wake functioning, as well as interactions among these facets, on socioemotional cognition and interpersonal functioning among adolescents and young adults.

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Figure 1. Associations between chronotype preference and social functioning (left panel; $r = .27$, $p = .03$) and socioemotional cognition (right panel; $r = .27$, $p < .05$).

Table 1.

Demographics of the sample

Variable	Number	Percentage
Sex (female)	30	55%
Race/Ethnicity		
White/Non-Hispanic	32	58%
Black	2	4%
Asian	8	15%
Hispanic	12	22%
More than 1 race	1	2%
	Mean	SD
Age	19.4	2.4
WRAT Score	105.9	13.1
Parental Education	15.8	2.8