

Time-of-Day Preference for Preschool-Aged Children

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Abstract

Circadian arousal impacts both physiological and intellectual functioning in humans and has been shown to vary significantly over the lifespan. Normative data indicate that children (ages 7 to 12 years) tend to have morning peaks in arousal, but that adolescents shift to eveningness. This evening preference continues through young adulthood and then shifts back to morningness late in life. While circadian and arousal patterns for older children and adolescents have been well documented, their impact on very young children has not received the attention it merits. The present study assessed circadian patterns for children aged 2 to 6. The data suggest that 2- and 3-year-olds show extreme morning tendencies, with roughly 90% of all children scoring as morning types. Morningness tendencies remain strong, but are more moderate in 4- and 5-year-olds (with roughly 75% scoring as morning types). These findings hold important implications for curriculum development, times for standardized testing, and psychological assessments.

Introduction

Circadian rhythms are daily cycles and fluctuations in mental and physical functions, and are observed in most humans, animals, and even plants. These rhythms not only influence physiological processes such as heart rate, body temperature, hormone secretion, and blood pressure (e.g., Hrushesky 32-7; Monk 331-46), but can also impact performance

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on cognitive tasks such as recognition (May, Hasher, and Stoltzfus 326-30), avoiding stereotypical biases (Bodenhausen 319-22), inhibitory control (May and Hasher 363-79), executive functioning (Hasher, Chung, and May 200-7), implicit and explicit memory retrieval (May, Hasher, and Foong 96-100), and susceptibility to false memories (Intons-Peterson et al. 23-40). Understanding these rhythms and the way they shift over the life span thus holds broad implications for everyday functioning, including scheduling of psychological or cognitive assessment (May, Hasher, and Stoltzfus 326-30), development of school curricula, establishing medication schedules, and diagnosis of certain physiological ailments such as asthma and heart attacks (Hardin 1023; Hasher and Goldstein 12-33).

Significant evidence suggests there are changes in time of day preferences over the course of human development. Most of the investigations have used the Morningness-Eveningness Questionnaire (MEQ; Horne and Ostburg 97-110) to evaluate circadian arousal preferences. These preferences determine what time of day an individual prefers to perform certain tasks, and when they will perform those tasks to the best of their abilities. The MEQ consists of 19 questions that query participants about sleep/wake behaviors and schedules. Scores on the MEQ range from 16 to 86, with low scores (16-41) indicating eveningness, and high scores (59-86) indicating morningness. Five different classifications are derived from scores on the MEQ: definitely evening type, moderately evening type, neutral type, moderately morning type, and definitely morning type. Several studies have shown that scores on the MEQ correlate with physiological measures of arousal, and that the MEQ provides a reliable and valid measure of circadian arousal (Vitiello, Smallwood, Avery, and Pascualy 97-110; Tankova, Adan, and Buela-Casal 671-84).

Early research in this field focused on differences between younger adults (ages 18 to 25 years) and older adults (ages 60+ years) (Adan and Almirall 1123-30; Hasher, Zacks, and May 653-75; May, Hasher, and Stoltzfus 326-30). Generally speaking, these studies have shown a shift from eveningness in young adulthood to morningness in older adulthood. For example, one study assessed morningness-eveningness preferences for 1,364 young adults and 563 older adults, and found that while the majority of young adults were evening (37%) or neutral types (58%),

most older adults were morning types (76%) and not a single older adult scored as an evening type (May and Hasher 363-79). This pattern of age differences in circadian arousal has been replicated not only in North America, but also cross-culturally in Spain (Adan and Almirall 1123-30) and Japan (Ishihara et al. 1353-4).

More recent research has assessed time of day preferences in children and adolescents (e.g. Ishihara et al. 1353-4). Bearpark and Michie (151), for example, assessed 350 children aged 10 to 17 years to evaluate both sleep disturbances and time of day preferences using Horne and Ostburg's (97-110) Morningness-Eveningness questionnaire. They found that MEQ scores decreased significantly, meaning children become more evening type as they proceed through adolescence.

Carskadon, Vieira, and Acebo (258-62) adapted the MEQ so that it could be administered to children, and their revision is known as the CMEP (Child Morningness-Eveningness Preference). As with the MEQ, a higher score on the CMEP indicates a more morning type individual. A score of 42-32 indicates a morning type individual, a score of 31-25 indicates a neutral type individual, and finally a score less than 23 indicates evening types. Carskadon et al. assessed 183 6th-grade boys and 275 6th-grade girls, ages 7 to 9, using the CMEP and measures to assess the biological processes associated with puberty. This study finds a significant main effect of pubertal status on morningness-eveningness preferences in their female participants and a similar, but not statistically significant, pattern in the males. The difference in statistical significance may simply be due to the vast difference in the male and female sample sizes. Carskadon et al. suggest that their data indicate a biological cause for this shift toward eveningness sparked by physiological changes associated with adolescence.

Kim et al. (1083-90) conducted the most recent study assessing children's morningness-eveningness preferences. The 989 children in the study took the CMEP to evaluate the age differences in morningness-eveningness preferences. They found that CMEP scores were higher among the youngest participant, which means younger children were more morning type than older children. They found a significant difference between scores of the 13- and 14-year-olds, suggesting there is an evening type shift at the age of 13.

Kim et al. also assessed the validity and reliability of the CMEP. Some participants completed both the CMEP and the MEQ, and the correlation between the two measures was $r = 0.83, p < 0.05$. The correlation coefficient of 0.83 suggests a strong relationship between the two test scores (a perfect positive correlation would be 1.0) and the $p < 0.05$ means that there is less than a 5% chance this correlation is due to chance. This suggests that the CMEP provides a valid assessment of arousal. In addition, some participants completed the CMEP twice, with sessions two weeks apart. The strong correlation between the separate test scores ($r = 0.78, p < 0.05$) suggests the CMEP provides reliable scores.

To date, there are no normative data for very young children, ages 2 to 6. To determine this age group's time of day preference, we modified the CMEP so parents of preschool-aged children could complete it on behalf of their children. We found that overwhelmingly, young children are morning type individuals, but there is a significant shift from extremely morning type to moderately morning type with a gradual decline of CMEP scores as children age.

Method

Participants

The parents of 526 children (age 2 to 6 years) completed a revised version of the Children's Morningness-Eveningness Preferences Questionnaire about their children. Parents were recruited through preschools in Charleston and Greenville, South Carolina, and all of the children in our study attended preschool at least two days each week. Each parent received a packet containing two questionnaires, an informed consent form, a self-addressed stamped envelope and a letter explaining our study. Of the 1028 packets we distributed, 526 were completed and returned (response rate of 51%; 36 of those returned were for children whose ages were not examined in our study). Demographic information about our participants is displayed in Table 1.

Materials

The questionnaire parents filled out was an adaptation of Horne and Ostberg's (97-110) Morningness-Eveningness Questionnaire (MEQ).

Table 1
Demographic Information for Pre-schoolers in Our Normative Sample

		Gender (by percent)		Ethnicity (by percent)			
Age	N	Male	Female	Caucasian	African American	Hispanic	Other
2	80	47.5	52.5	95	0	2.5	2.5
3	111	54	46	91	2	2	5
4	140	48	52	93	1.5	1.5	4
5	108	51	49	90	1	2	7
6	51	41	59	94	0	0	6
Total	490						

Carskadon et al. (258-262) adjusted the MEQ so that it could be used to evaluate time of day preferences of literate children age 8 to 16. The questionnaire, entitled the Children's Morningness-Eveningness Preferences (CMEP), consisted of 10 questions. An example of one such question is: "Is it easy for you to get up in the morning? a) no way!, b) sort of, c) pretty easy, or d) it's a cinch." Because most children between the ages of 2 and 6 are not literate, nor do they have an accurate sense of time, we further modified the questionnaire so that parents could answer on behalf of the children. As one example of the modifications, the question above was edited in the following way: "Is it easy for your child to get up in the morning, a) no way!, b) sort of, c) pretty easy, or d) it's a cinch." Scoring followed the exact guidelines developed by Carskadon et al. (258-262), with total scores ranging from 10 to 42, evening-types designated by a score of 10-24, neutral types designated by a score of 25-31, and morning types designated by a score of 32-42.

Procedure

Packets containing a consent form, a letter explaining the study, two copies of the CMEP, and a self-addressed stamped envelope were distributed to parents by preschool teachers and administrators. Parents choosing to participate completed the questionnaires at home and then

returned their signed consent form and the CMEP for their child (or multiple CMEPs if they had multiple children between the ages of 2 and 6 years). Participation was entirely voluntary and anonymous; neither the school administrators nor the investigators knew who chose to participate. Participants were given several weeks to complete and return the questionnaires.

Results

Mean CMEP scores for each age group are shown in Table 2. In addition, the percentages of morning type, neutral type, and evening type individuals with each age group are presented in Figure 1. The primary finding from this study is that very young children show strong morningness tendencies. 90% of 2-year-olds in our sample are morning type individuals, and across all age groups 76% of children are morning types. Very few children (only 3%) show eveningness tendencies.

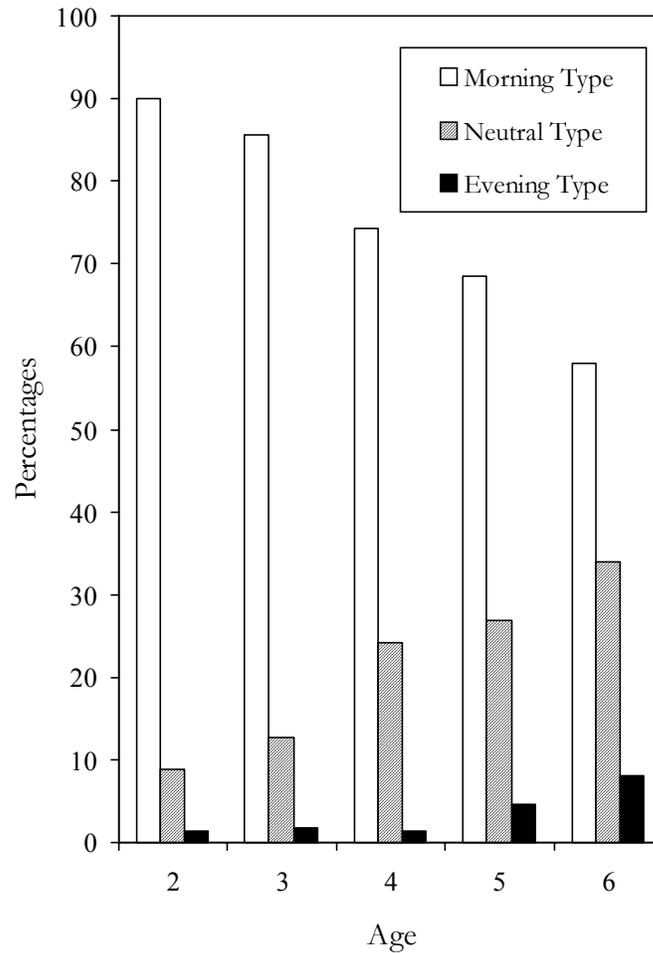
Table 2
Sample Sizes and Mean CMEP Scores by Age Group

Age	N	Mean CMEP*
2	80	36.8
3	111	35.8
4	140	34.6
5	108	34.0
6	51	32.7

*Note: all mean scores fall within the morning-type range (32-42)

A second finding from our study is that the extreme morningness observed in 2- and 3- year-olds attenuates somewhat with age. Although a majority of 4- to 6-year-olds (69%) are morning types, there is a reliable decline in CMEP scores with age, $F(4,489) = 8.2$, $MSe = 22.6$.

To determine when children begin to shift from extremely morning type to morning type, we conducted one-tailed t-tests to compare mean



CMEP scores of different age groups. A comparison of mean CMEP scores for 2- versus 3-year-olds was marginally significant, $t(189) = 1.53$, $p = .063$, and the change from 3- to 4-year-olds was reliable, $t(249) = 2.1$, $p = .02$. By contrast, there was no reliable shift in CMEP scores from 4 to 5, $t < 1$. Finally, the difference between 5- and 6-year-olds was marginally significant, $t(156) = 1.4$, $p = .076$.

Examination of Figure 1 suggests that CMEP scores do change in early childhood, but this shift is one from extreme morningness to moderate morningness. Even our oldest children (age 6) were primarily morning type (59%), with 33% neutrals and only 8% evening types.

Discussion

The current study is the first of its kind to assess the time of day preferences in preschool-age children. The large sample size and equal distribution among male and female participants gives a foundation to normative data concerning time of day preferences of young children.

The discovery of this extreme morningness in young children, along with a gradual shift toward eveningness with age, may have important educational implications. This means that preschools, whose extremely morning type students are capable of functioning well in the early morning, should begin school earlier than elementary and middle schools.

In addition to start time, these findings could also have implications for overall curriculum planning. More challenging tasks for preschoolers, such as learning to read, should be done in the morning. This would allow the children to acquire critical learning skills at their optimal time of day, presumably giving them better retention of what they have learned (May and Hasher 363-79).

Time of day should also be considered as to when children are tested for learning disabilities or ADHD. If a child is tested for a learning disability in the afternoon, they could be misdiagnosed simply because they are not being tested at their optimal time of day. The same holds true for standardized testing. Any assessments, which greatly challenge a young child, should be carried out early in the school day.

While our findings were consistent with previous studies, there was one limitation in our study, namely the lack of ethnic diversity among our participants. An overwhelming 92% of our participants were Caucasian, and thus further research is needed to determine if these circadian preferences maintain across diverse races and cultures.

In conclusion, these data help complete an overall picture of circadian preferences throughout the lifespan. Likewise, understanding the extreme morningness preferences of many young children may give school officials insight into better understanding their students.

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