

Research Paper

## Association of Adverse Childhood Experiences and Self-Transcendence with Chronotypes among South Indian Medical Students

Dr. Fahad Basheer<sup>1\*</sup>, Dr. Shabnam P<sup>2</sup>, Dr. Jinu Michael<sup>3</sup>, Dr. Fahim Basheer<sup>4</sup>

### ABSTRACT

**Background:** Chronotype, an individual's preference for morningness or eveningness, has been linked to psychosocial factors such as adverse childhood experiences (ACEs) and self-transcendence. However, limited research has explored these associations in young adults within the Indian context. **Objective:** To examine the relationship between chronotype, adverse childhood experiences, and self-transcendence among South Indian medical students. **Materials and Methods:** A cross-sectional study was conducted among 157 medical students aged 18–23 years. Chronotype was assessed using the Morningness–Eveningness Questionnaire (MEQ), ACEs using the Adverse Childhood Experiences scale, and self-transcendence using the Self-Transcendence Scale (STS). Chronotypes were categorized into morning, intermediate, and evening types. Associations were analyzed using the Kruskal–Wallis test, ANOVA, and Fisher's exact test. **Results:** The majority of participants were intermediate types (68.8%), followed by evening (22.9%) and morning types (8.3%). Evening types had slightly higher mean ACE scores than intermediate and morning types, but this difference was not statistically significant ( $p = 0.551$ ). Intermediate types showed the highest mean self-transcendence scores, followed by morning and evening types, with no significant difference ( $p = 0.360$ ). Distribution analysis revealed that intermediate types had the largest proportion of high self-transcendence, while evening types had the highest proportion of low self-transcendence. **Conclusion:** Evening chronotypes tended to report more adverse childhood experiences and lower self-transcendence, while intermediate types demonstrated greater self-transcendence. Although statistically insignificant, these findings suggest potential trends warranting further exploration in larger, longitudinal, and culturally diverse cohorts.

**Keywords:** Chronotype, Morningness–Eveningness Questionnaire (MEQ), Adverse Childhood Experiences (ACE), Self-Transcendence, Medical students, Circadian rhythm

<sup>1</sup>Senior resident, Dept of physiology, Government TD medical college, Alappuzha

<sup>2</sup>Senior resident, Dept of Psychiatry, Government medical college, Manjeri

<sup>3</sup>Senior resident, Dept of Physiology, Government TD medical college, Alappuzha

<sup>4</sup>General practitioner, Care hospital, Thiruvalli

\*Corresponding Author

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## Association of Adverse Childhood Experiences and Self-Transcendence with Chronotypes among South Indian Medical Students

The classification of chronotypes—individual differences in circadian rhythms—was pioneered by Horne and Östberg in 1976. They developed the Morningness–Eveningness Questionnaire (MEQ) to assess whether individuals are morning types, evening types, or intermediate. In their original study, they found that 49.8% of participants were morning types, and 5.6% were evening types. However, it's important to note that this study had a relatively small sample size of 48 participants. (1) A more extensive study by Paine et al. (2006) applied the Horne and Östberg classification to a larger sample of 2,526 New Zealand adults aged 30–49 years. This study also found that 49.8% were morning types and 5.6% were evening types, suggesting consistency with the original findings. (2) Regarding the distribution of chronotypes, Adan et al. (2012) conducted a comprehensive review and reported that approximately 40% of the adult population falls into the extreme morning or evening types, while the remaining 60% are intermediate types (3) The Morningness-Eveningness Questionnaire (MEQ) is a widely used self-assessment tool that classifies individuals based on their preferred timing of sleep and daily activities. According to the MEQ, chronotypes are typically categorized into five groups: definite morning type, moderate morning type, intermediate type, moderate evening type, and definite evening type. These classifications reflect individual differences in circadian rhythms, influencing alertness, cognitive performance, and mood throughout the day. Morning types tend to rise and function best earlier in the day, while evening types prefer later activity and peak performance in the evening. Intermediate types fall between these two extremes and do not exhibit a strong preference for morning or evening activity patterns (4) The Adverse Childhood Experience (ACE) scale is a questionnaire developed to assess the impact of traumatic experiences during the first 18 years of life. It includes ten categories of adversity, such as physical, emotional, and sexual abuse, as well as household dysfunction like substance abuse, domestic violence, and parental separation. Higher ACE scores have been linked to increased risks of mental health disorders, substance use, and chronic medical conditions in adulthood. The ACE scale highlights the cumulative effect of multiple early-life stressors on long-term health and well-being. It is widely used in both research and clinical settings to identify individuals at risk and inform trauma-informed care. (5) Adverse Childhood Experiences (ACEs) have been shown to influence the development of chronotypes, particularly increasing the likelihood of eveningness in adulthood. Individuals with higher ACE scores are more likely to exhibit disrupted circadian rhythms, potentially due to stress-related alterations in neurobiological systems. This association suggests that early-life trauma may contribute to long-term changes in sleep-wake preferences and overall circadian functioning. (6) The Self-Transcendence Scale (STS) is a psychometric tool designed to measure an individual's capacity to expand personal boundaries and find meaning beyond the self. It assesses dimensions such as connectedness with others, spiritual beliefs, and acceptance of life's uncertainties. High self-transcendence is associated with greater psychological well-being, resilience, and life satisfaction, especially in populations facing life-threatening or chronic illnesses. The scale is often used in both clinical and research settings to evaluate personal growth and spiritual development. Developed by Pamela Reed, the STS reflects a key component of holistic nursing theory and existential psychology (7) Morning-oriented individuals showed a stronger association with social values such as conservation and self-transcendence, whereas evening-oriented individuals were more aligned with individualistic values like openness to change and self-enhancement. Additionally, females tended to score higher in self-transcendence, while males demonstrated higher levels of self-enhancement. (8) In this study, we explore the relationship between adverse childhood experience and chronotypes and the relationship

## Association of Adverse Childhood Experiences and Self-Transcendence with Chronotypes among South Indian Medical Students

between self-transcendence ability and chronotype in the age group between 18 and 23 among south Indian medical students.

### **METHODS**

#### *Participants*

Our study group has 157 medical students in age group between 18 and 23 with 101 female and 56 males.

#### *Materials*

We used Morning eveningness questionnaire (MEQ), Adverse childhood experience (ACE) and Self transcendence scale (STS).

#### *Procedure and data collection*

We did a cross-sectional study by assessing 157 medical students in Government TD medical college, Alappuzha in South India on March 2025, aged between 18 and 23, by giving the MEQ questionnaire to differentiate to different chronotypes. Then we gave ACE questionnaire among students to assess the severity of adverse childhood experience, to correlate which chronotype has more adverse childhood experience. Then we gave self-transcendence scale to assess which chronotype has more self-transcendence ability.

#### *Objectives*

1. To assess the distribution of chronotypes among South Indian medical students aged 18–23 years using the Morningness–Eveningness Questionnaire (MEQ).
2. To examine the association between chronotype and adverse childhood experiences (ACEs) as measured by the ACE questionnaire.
3. To evaluate the relationship between chronotype and self-transcendence using the Self-Transcendence Scale (STS).
4. To compare levels of self-transcendence (low, moderate, high) across different chronotype groups.

#### *Hypotheses*

- (ACE–Chronotype): Students with higher adverse childhood experience scores are more likely to belong to the evening chronotype compared to intermediate or morning chronotypes.
- (STS–Chronotype): Intermediate chronotypes will have higher self-transcendence scores compared to morning and evening chronotypes.
- (Self-Transcendence Levels): The proportion of students with high self-transcendence will be greater among intermediate types, while evening types will have the highest proportion of low self-transcendence.
- (Null Hypothesis): There is no significant association between chronotype and either adverse childhood experiences or self-transcendence levels

#### *Scoring*

Scoring for all instruments followed established protocols. For the Morningness–Eveningness Questionnaire (MEQ), a total score (range: 16–86) was calculated by summing points from all 19 items, with higher scores indicating a greater morning preference. Participants were then categorized into chronotypes using standard cut-offs: Definite/Moderate Morning (59–86), Intermediate (42–58), and Definite/Moderate Evening (16–41). The Adverse Childhood Experiences (ACE) scale was scored by summing

## Association of Adverse Childhood Experiences and Self-Transcendence with Chronotypes among South Indian Medical Students

affirmative responses to its 10 binary (Yes/No) items, yielding a cumulative score from 0 to 10, where a higher score indicates greater exposure to childhood adversity. For the Self-Transcendence Scale (STS), a total score was derived by summing all item responses. Additionally, to facilitate categorical analysis, total STS scores were classified into Low, Moderate, and High levels of self-transcendence based on tertile splits of the sample distribution.

### *Variables*

We used chronotype, adverse childhood experience and self-transcendence as study variables.

## RESULTS AND DISCUSSION

In our study there was 157 medical students, the peak age of this study group was 20, followed by 19 and then by 21. In addition, 64.3% of our students were females, 35.7% were males. In MEQ questionnaire we have chronotypes divided into definitely morning, moderately morning, intermediate, moderately evening and definitely evening. However, definitely morning and moderately morning was clubbed to morning type, intermediate was left as it is and moderately evening and definitely evening was clubbed as evening type. 68.8% of the study group was intermediate type, 22.9% was evening type and 8.3% was morning type. We then compared each chronotypes with adverse childhood experiences using ACE scale, to know which chronotype has most adverse childhood experience and then we correlated each chronotypes with self-transcendence with self-transcendence scale, to know which chronotype has highest ability for self-transcendence.

**Table 1: Correlation between chronotypes in Morning eveningness questionnaire (MEQ) and adverse childhood experience (ACE)**

MEQ	ACE					P value (Kruskal-Wallis test)
	Mean	Std. Deviation	Median	25 <sup>th</sup> quartile	75 <sup>th</sup> quartile	
<b>Morning type</b>	.54	1.391	.00	.00	.50	0.551
<b>Intermediate</b>	.69	1.249	.00	.00	1.00	
<b>Evening type</b>	.78	1.174	.00	.00	1.75	

In the table 1, we can see that the mean of adverse childhood experiences is more in evening type (0.78) than intermediate type and intermediate type (0.69) have more adverse childhood experiences than morning type (0.54). However in overall p value (kruskal-wallis test) is 0.551 which is not significant.

**Table 2: Correlation between chronotypes in Morning eveningness questionnaire with self-transcendence ability according to self-transcendence scale**

MEQ	STS		P Value (ANOVA)
	Mean	Std. Deviation	
<b>Morning type</b>	43.31	6.613	0.360
<b>Intermediate</b>	44.33	5.888	
<b>Evening type</b>	42.58	8.041	

## Association of Adverse Childhood Experiences and Self-Transcendence with Chronotypes among South Indian Medical Students

In the table 2, we can see that the mean of self-transcendence score is highest in intermediate (44.33) followed by morning type (43.31) and this is followed by evening type (42.58). However, the overall p value (ANOVA) is 0.360 which is not significant.

**Table 3: Correlation between chronotypes in Morning eveningness questionnaire with levels of self-transcendence ability according to self-transcendence scale**

MEQ	STS			Total
	Low Level	Moderate	High Levels	
<b>Morning type</b>	0(0%)	9(69.2%)	4(30.8%)	13
<b>Intermediate</b>	2(1.9%)	62(57.4%)	44(40.7%)	108
<b>Evening type</b>	3(8.3%)	19(52.8%)	14(38.9%)	36
<b>Total</b>	5(3.2%)	90(57.3%)	62(39.5%)	157

Fisher's exact p value =0.360

In table 3, the highest level of higher transcendence is for intermediate type (40.7%), highest level of moderate self-transcendence is for again morning type (69.2%) and the highest level of low levels of transcendence is for evening type (8.3%).

Our study explored the associations between chronotype, adverse childhood experiences (ACEs), and self-transcendence among South Indian medical students. The findings, while not statistically significant, reveal notable trends that contribute to the growing body of literature on circadian typology and psychosocial well-being. The distribution of chronotypes in our sample was predominantly intermediate (68.8%), with smaller proportions of evening (22.9%) and morning types (8.3%). This aligns with previous research suggesting that intermediate types are the most common in general adult populations (Adan et al., 2012). However, the underrepresentation of morning and evening types may reflect the unique characteristics of medical students, who often experience irregular schedules and academic demands that could attenuate extreme circadian preferences. Consistent with our hypothesis, evening types reported slightly higher mean ACE scores compared to intermediate and morning types. Although this difference was not statistically significant ( $p = 0.551$ ), the trend supports existing evidence linking adverse early-life experiences with eveningness (McCarthy et al., 2023). Chronic stress during childhood may disrupt the development of circadian regulatory systems, leading to a preference for later sleep-wake patterns. The non-significance may be attributed to the small sample size, particularly the low number of morning and evening types, which limited statistical power. Regarding self-transcendence, intermediate types exhibited the highest mean scores, followed by morning and evening types. This pattern was also reflected in the distribution of self-transcendence levels: intermediate types had the largest proportion of high self-transcendence, while evening types had the highest proportion of low self-transcendence. These findings are in line with previous studies suggesting that morning and intermediate types may be more aligned with social and self-transcendent values (Vollmer & Randler, 2012). The ability to transcend personal boundaries and find meaning in adversity may be more pronounced among those with stable circadian rhythms, though further research is needed to clarify this relationship. The lack of statistical significance in our primary analyses may be due to several methodological limitations. The cross-sectional design precludes causal inference, and the single-center, gender-imbalanced sample limits generalizability. Additionally, the use of self-report measures may introduce recall and social desirability biases. The homogeneity of the sample in terms of age and profession is

## Association of Adverse Childhood Experiences and Self-Transcendence with Chronotypes among South Indian Medical Students

both a strength and a limitation; while it reduces age-related confounding, it also restricts the applicability of findings to other populations. Despite these limitations, this study adds a culturally specific perspective to the chronotype literature. To our knowledge, this is the first investigation to examine ACEs and self-transcendence in relation to chronotype among Indian medical students. The findings suggest that even in a high-stress academic environment, intermediate chronotypes may possess greater psychological resilience, as reflected in higher self-transcendence.

### *Limitations*

1. **Unequal Chronotype Distribution:** A large proportion of participants were intermediate types (68.8%), while morning (8.3%) and evening (22.9%) types were underrepresented, limiting statistical power and generalizability.
2. **Cross-Sectional Design:** The study design prevents establishing causality between ACEs, chronotype, and self-transcendence.
3. **Single-Center Recruitment:** Conducted in one medical college, findings may not generalize to broader populations, including different age groups, professions, or cultural contexts.
4. **Self-Report Bias:** Reliance on questionnaires for ACE and self-transcendence may be subject to recall and social desirability biases.
5. **Lack of Control for Confounders:** Potential covariates (e.g., socioeconomic status, family environment, current stress levels, mental health status, or sleep hygiene practices) were not adjusted for, which may influence both chronotype and psychological outcomes.
6. **Non-Significant Findings:** Both primary associations (ACE–chronotype, STS–chronotype) were statistically non-significant, reducing the interpretive strength of conclusions.
7. **Gender Imbalance:** Majority female sample (64.3%) may have introduced gender-related biases, as sex differences are known in both chronotype distribution and self-transcendence.

Future research should include larger and more diverse samples with balanced chronotype representation and adopt longitudinal designs to better establish causal relationships. Controlling for confounders such as socioeconomic status, lifestyle, and mental health will strengthen validity. Incorporating objective measures like actigraphy, hormonal rhythms, and neurobiological markers could provide deeper insights into mechanisms linking adverse childhood experiences, chronotype, and self-transcendence. Additionally, cross-cultural studies, gender-specific analyses, and intervention-based approaches (e.g., chronotherapy or resilience training) may help translate findings into clinical and student wellness applications.

### **CONCLUSIONS**

From the results of this study, we came into three conclusions

1. The more the adverse childhood experiences, the more the chronotype is likely to be evening type followed by intermediate type and then followed by morning type, however this is statistically insignificant
2. The intermediate type has the highest self-transcendence, followed by morning type and then the least self-transcendence ability is for evening type, however this is statistically insignificant

## Association of Adverse Childhood Experiences and Self-Transcendence with Chronotypes among South Indian Medical Students

- Intermediate chronotypes had the largest proportion of high self-transcendence. Morning types had more participants in the moderate self-transcendence category. Evening types had the highest proportion of low self-transcendence.

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### Conflict of Interest

The author(s) declared no conflict of interest.

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