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Brief report

Relationships between chronotypes and affective temperaments in healthy young adults

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ABSTRACT

Background: Chronotype, an individual's preferred time for activity and sleep, has been known to be associated with affective disorders. Affective temperaments may be subclinical manifestations that represent a biological diathesis for affective disorders. Therefore, the aim of this study is to investigate the relationships between circadian preferences and affective temperaments.
Methods: Six hundred and forty one healthy young adults (376 male, 265 female) completed the Korean Translation of Composite Scale of Morningness to measure diurnal preferences and the Temperament Scale of Memphis, Pisa, Paris and San Diego - Autoquestionnaire (TEMPS-A) to measure cyclothymic, depressive, hyperthymic, irritable, and anxious affective temperaments. Multivariate analyses of covariance were computed with the five affective temperaments as dependent variables, chronotype and gender as an independent variable, and age as a covariate.
Results: One hundred and sixteen subjects were classified as having morning-type (18.1%), 402 as intermediate-type (62.7%), and 123 as evening-type (19.2%) circadian preferences. Evening-type was significantly associated with greater depressive, cyclothymic, irritable, and anxious temperaments, while morning-type was significantly associated with hyperthymic temperament.
Limitations: The present study only used self-report questionnaires to measure diurnal preference.
Conclusions: Evening-type subjects were more likely to have depressive, cyclothymic, irritable and anxious temperaments, whereas morning-types were more likely to have hyperthymic temperament. This relationship between chronotype and affective temperament might be important for vulnerability to affective disorders.

1. Introduction

Circadian rhythm refers to the cycle with oscillations of close to 24 h of biochemical, physiological, and behavioral processes that generate an organism's dynamic internal milieu (Czeisler et al., 1999; Othmer et al., 1969). The internally derived circadian systems are entrained by external cues called zeitgebers such as day–night cycles (Jewett et al., 1991). Optimal coordination of circadian rhythms in the internal milieu and external world is essential for an organism's fundamental adaptation and optimal functioning. Desynchronization of human circadian rhythms may play a critical role in the development of health problems including psychiatric disorders (Evans and Davidson, 2013).

Over the past several decades, there has been growing interest in disrupted circadian rhythms in affective disorders (Adan et al., 2012). Several studies have reported sleep problems and circadian rhythm disruptions in euthymic states (Millar et al., 2004; Sitaram et al., 1982) as well as in manic and depressive episodes (Harvey, 2008). These findings suggest that disturbances in the circadian timing system might be not only a core symptom, but also a fundamental pathophysiological element in affective disorders.

Circadian preference indicating an individual's preferred time for activity and sleep has been known to account for substantial variation in circadian rhythm (Giannotti et al., 2002). Several studies have shown relationships between circadian preferences and affective disorders (Ahn et al., 2008; Gaspar-Barba et al., 2009; Selvi et al., 2010). A Korean study of euthymic patients with bipolar disorder reported an association between evening preference and bipolar disorder (Ahn et al., 2008), consistent with other studies (Wood et al., 2009). Evening preference is related to severe depressive symptoms in both depressive patients and nonclinical populations (Selvi et al.,

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2010). These findings suggest that evening-type individuals may be particularly vulnerable to affective disorders (Adan et al., 2012).

Affective temperaments may be subclinical manifestations that represent a biological diathesis for affective disorders (Akiskal et al., 1995; Kochman et al., 2005). Several previous studies using the Temperament Scale of Memphis, Pisa, Paris and San Diego - Autoquestionnaire (TEMPS-A) or similar instruments showed that healthy first-degree relatives of bipolar I patients were more likely to have cyclothymic temperament than normal controls (Chiaroni et al., 2005; Kesebir et al., 2005). Other studies revealed that patients with bipolar disorder had higher cyclothymic, depressive, irritable, and anxious temperament scores compared to normal subjects (Evans et al., 2005; Mendlowicz et al., 2005). Therefore, affective temperament may reflect a fundamental predisposition for affective disorders (Rihmer et al., 2010).

However, until recently there has been little research examining direct relationships between affective temperament and circadian preference. A web-based survey in a Brazilian sample using the Circadian Energy Scale (CIRENS) and the 52-item Affective and Emotional Composite Temperament Scale (AFECTS) showed that apathetic, cyclothymic, dysphoric, and disinhibited temperaments were associated with an evening preference (Ottoni et al., 2012). This suggests that evening preference might be associated with affective temperaments. Studies using more popular comprehensive measurements of circadian preference and affective temperaments are needed to elucidate the relationship between them.

Therefore, the present study aimed to investigate relationships between circadian preference and affective temperaments measured by the TEMPS-A. We hypothesized that cyclothymic, irritable, anxious, and depressive temperaments, which have been reported to be related to affective disorders, would be more associated with evening preference.

2. Methods

2.1. Participants

Six hundred and seventy nine Korean volunteers (404 male, 275 female) aged 19 years or older were recruited by advertisement. All participants were interviewed by psychiatrists and subjects with any current or past psychiatric disorder according to Diagnostic and Statistical Manual of Mental Disorders, 4th Edition (DSM-IV), family history of psychiatric disorders, or neurologic disorders were excluded. Thirty eight subjects were excluded for these reasons, leaving 641 subjects (376 male, 265 female) aged 18–47 years (22.7 ± 3.71) who participated in the study. All subjects provided informed consent before the study. The study protocol was approved by the Institutional Review Board of Severance Mental Health Hospital.

2.2. Materials and procedures

Chronotype was assessed with the Korean Translation of Composite Scale of Morning-type (CSM) that was standardized for the Korean population (Yoon et al., 1997). The test has 13 items taken from the Morning-type-Evening-type Questionnaire and Diurnal Type Scale. The CSM is a reliable measure that shows high sensitivity in classifying subjects as morning-type or evening-type (Caci et al., 2005; Smith et al., 1989), and the internal reliability was high in the present sample (Cronbach's $\alpha = 0.83$). Total scores ranged from 13 to 55, with higher scores indicating more morning preference, and lower scores indicating more evening preference. In this study, participants in the top 20th percentile of CSM scores were classified as morning-type, the bottom 20th percentile were classified as evening-type, and the middle 60% were classified as intermediate-type (Prat and Adan, 2013).

Affective temperaments were measured by the TEMPS-A, which was developed as a self-report temperament scale to evaluate various affective temperament dimensions (Akiskal et al., 2005b). This yes-or-no type questionnaire consists of 110 items (109 for male subjects) that pertain to depressive (items 1–21), cyclothymic (items 22–42), hyperthymic (items 43–63), irritable (items 64–84 for female, 64–83 for male), and anxious (items 85–110) temperaments. Each of the subscale is made up of sections on mood, cognitive, psychomotor, and socially adaptive traits. The TEMPS-A is thought to be a suitable description of the affective temperaments in both clinical and non-clinical samples (Di Florio et al., 2010; Rózsa et al., 2008), while not being influenced by current mood state (Akiskal et al., 2005a).

2.3. Data analysis

Partial correlations controlling for age were conducted between the five affective temperaments and total CSM scores. Reliability of the applied scales was assessed using Cronbach's α. Multiple analyses of covariance (MANCOVA) with Bonferroni corrections were performed using the total scores for each TEMPS-A dimension as dependent variables and circadian typology and gender as fixed factors. Age was entered as a covariate to control for possible effects. Partial eta squared (η_p^2) was calculated as a measure of effect size. Data analysis was performed using SPSS statistics (version 20.0), and statistical tests were bilateral with Type I error set at 5%.

3. Results

The number of subjects in each chronotype group was as follows: morning-type 116 (18.1%; 57 male, 59 female), intermediate-type 402 (62.7%; 252 male, 150 female), and evening-type 123 (19.2%; 67 male, 56 female). There was a significant difference in sex between chronotype groups ($\chi^2 = 7.915$, do = 2, $p = 0.019$), such that evening-types were more prevalent in male than in female.

The partial correlation matrix for the five TEMPS-A dimensions and total CSM scores controlling for age is shown in Table 1. There was a significant negative correlation between total CSM score and depressive, cyclothymic, irritable, and anxious temperaments, whereas there was a significant positive correlation between total CSM score and hyperthymic temperament. The pattern of correlations was similar in male and female subjects.

The MANCOVA results are shown in Table 2. There were significant overall effects of chronotype (Wilks $\lambda = 0.90$, $F_{(10, 1260)} = 7.11$, $p < 0.001$) and gender (Wilks $\lambda = 0.96$, $F_{(5, 630)} = 5.97$, $p < 0.001$) on these results, although no effects of chronotype *x* sex interaction (Wilks $\lambda = 0.99$, $F_{(10, 1260)} = 0.74$, $p = 0.68$) were found on TEMPS-A dimensions. Female subjects had significantly higher depressive ($F = 13.66$, $p < 0.001$, $\eta_p^2 = 0.021$), cyclothymic ($F = 8.39$, $p = 0.004$, $\eta_p^2 = 0.013$), and anxious temperament scores ($F = 12.46$,

Table 1
Partial correlation coefficients (age controlled) between the TEMPS-A dimensions and total CSM scores.

	CSM (Total)	CSM (Male)	CSM (Female)
DEP	−0.207†	−0.178†	−0.244†
CYC	−0.195†	−0.160*	−0.241†
HYP	0.192†	0.200†	0.183*
IRR	−0.254†	−0.214†	−0.301†
ANX	−0.200†	−0.181†	−0.226†

Abbreviations: DEP = depressive, CYC = cyclothymic, HYP = hyperthymic, IRR = irritable, ANX = anxious.

* $p < 0.01$.

† $p < 0.001$.