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The relationship between chronotype and mood fluctuation in the general population ☆

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ABSTRACT

There is a lack of evidence for the relationship between chronotype and subthreshold mood fluctuation. The present study aims to investigate the relationship between chronotypes and mood fluctuation in the general population. Participants ($n=302$) who have had no experience of major mood episodes were included. The Korean version of the Composite Scale of Morningness (CSM) was used to classify participants according to three chronotypes. Mood fluctuation was measured using the Mood Disorder Questionnaire (MDQ) and the Bipolar Spectrum Diagnostic Scale (BSDS). Mean scores achieved by the three chronotype groups on the MDQ and the BSDS were compared. There were no significant differences in the frequency of positive responses on the MDQ for the three chronotype groups. However, there was a significant group difference in total BSDS scores. The eveningness group had significantly higher BSDS-D scores than did either the morningness or the intermediate group have. In addition, the eveningness group had significantly higher BSDS-M scores than the morningness group. After adjusting for age by the analysis of covariance (ANCOVA), there were still significant group differences in total BSDS scores. The present results suggest that eveningness may be more related to mood fluctuation than morningness. The eveningness may be an important factor related to soft bipolarity or mood fluctuation.

1. Introduction

A circadian rhythm is a biological oscillation spanning around 24 h, and is driven by the "circadian clock" in the suprachiasmatic nucleus of the hypothalamus. This rhythm influences many other rhythms of the body, such as those of sleep, activity, and appetite. In addition, the circadian rhythm is likely to be related to mood. Some studies report that abnormality in circadian rhythm may underlie the pathogenesis of mood disorder (Mendlewicz and Linkowski, 1987; Mendlewicz, 2009). Research has shown that genes involved in the functioning of the circadian rhythm are associated with mood disorder (Desan et al., 2000; Mansour et al., 2006). Further, those affected by circadian rhythm disorders, such as delayed sleep phase syndrome (DSPS) and familial advanced sleep phase syndrome (FASPS), often also manifest depressive symptoms (Hamet and Tremblay, 2006). Abnormalities in circadian rhythm are often observed in patients with mood disorder (Mendlewicz and Linkowski, 1987).

Chronotype is known as a trait that reflects individually preferred times for activity and sleep (Smith et al., 1989; Greenwood, 1994; Caci et al., 2000). According to the preferred times for activity, chronotypes are classified into "morningness", "intermediate", and "eveningness" types. Individuals of the morningness type prefer to be active in the early morning, whereas those of the eveningness type prefer to be active late in the evening. In recent decades, several self-rating questionnaires have been developed to measure chronotypes that reflect the relevant characteristics of the circadian rhythm (Horne and Ostberg, 1976; Smith et al., 1989). The reliability and validity of self-rating questionnaires such as the Morningness-Eveningness Questionnaire (MEQ) and the Composite Scale of Morningness (CSM) have been verified by a variety of sources (Greenwood, 1994; Caci et al., 2000; Diaz Morales and Sanchez-Lopez, 2004; Taillard et al., 2004).

There have been several studies conducted on the relationship between chronotype and depression. In healthy participants, eveningness type was related to more severe depressive symptoms than either morningness or intermediate type (Hidalgo et al., 2009). Among college students with depression, a significant correlation was found between eveningness and severity of

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depressive symptomatology (Chelminski et al., 1999). Further, in individuals with major depression, those with the eveningness chronotype reported experiencing a greater number of suicidal thoughts, a greater degree of impairment of work and other activities, more paranoid symptoms, and higher levels of anxiety than those belonging to the morningness chronotype (Gaspar-Barba et al., 2009). Given the results of recent studies, it has been suggested that difference in chronotype may be associated with susceptibility to depression and that the eveningness chronotype in particular plays a significant role in increased susceptibility.

Studies have recently been conducted into the relationship between chronotype and bipolar disorder. One study reported that CSM scores were bimodally distributed for participants with bipolar I disorder, indicating that bipolar I patients are much more likely to belong to the morningness or eveningness type but less so to the intermediate type (Mansour et al., 2005). However, other studies tend to show that patients with bipolar disorder are more likely to have the eveningness chronotype than are control subjects (Ahn et al., 2008; Giglio et al., 2010). In particular, patients with bipolar I disorder and rapid mood swings were more likely to belong to the eveningness chronotype (Mansour et al., 2005). Given the continuum between bipolar disorder and normal variations in mood, it is possible that a specific chronotype may be related to mood fluctuation or subsyndromal soft bipolarity. However, there is a lack of evidence for the relationship between chronotype and mood fluctuation in the general population. Therefore, the aim of the current study is to investigate the existence of such a relationship in the general population without experience of major mood episodes that can be distressing problems requiring psychiatric treatment.

2. Methods

2.1. Subjects

Subjects were recruited among the people encountered in public places such as department stores, transit stations, hospitals, companies, and educational institutions between January 2012 and January 2013. The purpose of the study was explained to each participant prior to its commencement. Informed consent was received from each individual, and the study protocol was approved by the Institutional Review Board at Pusan National University Hospital. The inclusion criteria specified that participants should be: (1) Aged 18–65 years; (2) Individuals having no experience of major mood episodes such as manic, mixed, or major depressive episodes as described by the Diagnostic and Statistical Manual for Axis I disorders fourth edition (DSM-IV), and (3) People experiencing no distressing problems requiring psychiatric treatment. Exclusion criteria were the following: (1) Anyone previously admitted to a psychiatric ward of any description; (2) shift workers; (3) Persons experiencing sleep difficulties due to a serious medical condition, (4) Individuals with organic mental disorders and/or mental retardation, and (5) Individuals unable to read and/or write. Finally, a total of 302 subjects were successfully participated in the study.

2.2. Design and assessment

2.2.1. Assessment of chronotype

Chronotypes were measured using the Composite Scale of Morningness (CSM). The CSM is a 13-item self-report questionnaire that assesses the circadian preference of an individual for carrying out various activities. Possible scores range from 16 to 86, with higher scores indicating greater morningness tendencies. Several studies have shown that the CSM has acceptable psychometric properties (Greenwood, 1994; Caci et al., 2000; Diaz Morales and Sanchez-Lopez, 2004). The Korean version of the CSM (Yoon et al., 1997) has shown good split-half reliability(0.85), test–retest reliability(0.91), and a good level of internal consistency as measured by Cronbach's alpha(0.82) (Yoon et al., 1997). In the present study, circadian preferences were classified into three chronotypes according to scores achieved on the Korean version of the CSM: “Eveningness” (ranging from 16 to 26 points), “intermediate” (from 27 to 40), and “morningness” (from 41 to 60) (Yoon et al., 1997).

2.2.2. Assessment of mood fluctuation

The degree of mood fluctuation among participants was measured using the Mood Disorder Questionnaire (MDQ) and the Bipolar Spectrum Diagnostic Scale (BSDS). These scales are frequently used to screen for bipolar disorder in patients with depression and in the general population (Hirschfeld et al., 2000, 2003; Nassir Ghaemi et al., 2005). The MDQ is a self-report screening instrument used to detect the presence of bipolar spectrum disorder. It consists of the following three parts. Part A, which contains 13 items assessing the subject's lifetime history of manic or hypomanic symptoms; Part B, which determines whether or not any of the manic or hypomanic symptoms assessed in Part A were experienced simultaneously, and Part C, which ascertains the severity of any resulting functional impairment. In order to draw the conclusion that bipolar disorder is in fact present in a test subject, it is necessary that at least seven of the 13 questions in Part A be answered in the affirmative, that there be indication of the co-occurrence of two or more of the symptoms determined by Part B, and that there be signs of moderate to severe functional impairment as measured in Part C (Hirschfeld et al., 2000). Previous reports have shown that the MDQ has psychometric properties applicable in patients with depression, as well as in the general population (Hirschfeld et al., 2000, 2003). Further, in Korean studies, the MDQ has shown adequate psychometric properties for detecting bipolar disorder (Kim et al., 2008; Jon et al., 2009). In the current study, the cut off score in Part A of the MDQ has been set at 7 points. The mean scores in Part A were also compared to examine if there is a difference among the chronotypes, as well as the frequency of positive screen results on all three parts of the MDQ.

The Bipolar Spectrum Diagnostic Scale (BSDS) is a two-part self-report screening questionnaire for bipolar spectrum disorder. The first part contains 19 sentences describing depressive and (hypo)manic symptoms, and the euthymic state between depression and (hypo)mania. It is to be marked at the end of each sentence whether or not the sentence describes the participant well. The second part asks participants to rate how well the description of the 19 sentences comprising first part represents them in general. Previous studies have shown that the BSDS has good psychometric properties for detecting bipolar disorder (Nassir Ghaemi et al., 2005). In Korean studies, the BSDS had good sensitivity(0.75) and specificity(0.69) (Wang et al., 2008). For the present study, total BSDS scores were compared with the scores on the depression and (hypo)mania subscales.

2.3. Statistical analysis

For the purposes of the current study, demographic data and scores on the MDQ and BSDS were compared on the basis of chronotypal difference. Categorical variables were compared using either a Chi-square or Fischer's exact test as appropriate, and continuous variables were compared using analysis of variance (ANOVA) and Bonferroni post hoc testing. In order to examine the relationship between chronotype and mood fluctuation, Pearson's correlations between CSM scores and scores on the MDQ and BSDS