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Temperament and characteristics related to attention deficit/hyperactivity disorder symptoms

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Abstract

Objective: Adult attention deficit/hyperactivity disorder (ADHD) exhibits symptoms, such as attention deficit and impulsivity, that make it difficult for patients to manage social activities. In this study, we investigated the association of adult ADHD symptoms with temperament and character dimensions, taking into account possible sex interactions.
Method: A total of 2917 (1462 males and 1455 females) college students completed the 140 5-point Likert items on the Temperament and Character Inventory-Revised Short version (TCI-RS) and the Attention Deficit/Hyperactivity Disorder Self-Rated Scale (ASRS). According to the ASRS score, subjects were classified into the control group, the inattentive ADHD symptom (IA) group, or the hyperactive/impulsive ADHD symptom (HI) group. Additionally, the scores of the four temperament dimensions and the three character dimensions were compared.
Results: In the IA and HI groups, the NS and HA levels of the temperament dimension were high and the PS level was low compared with the control group. In the character dimension, the levels of SD and CO were significantly lower in the ADHD groups than in the control group ($P < 0.001$). Meanwhile, the ST level in the HI group was significantly higher than in the control group. In the regression analysis after age and gender correction, NS and SD in the IA group and NS, CO, and ST in the HI group were associated with adult ADHD symptoms.
Conclusion: The current findings suggest that high novelty seeking may be related to adult ADHD symptoms in the temperament dimension. Furthermore, some character dimensions were associated with adult ADHD symptoms.

1. Introduction

The major symptoms of attention deficit/hyperactivity disorder (ADHD) include attention deficit, impulsivity, and hyperactivity. ADHD patients account for 50% of outpatients who visit child and adolescent mental health clinics [1]. ADHD symptoms were previously thought to have been specific to childhood [2] and to improve with age. According to recent long-term follow-up studies, 30% to 70% of adults who were ADHD patients as children satisfied the adult ADHD criteria, and the incidence rate of ADHD among adults reached 1% to 6% [3–7]. In adult ADHD, attention deficit and impulsivity are more problematic than hyperactivity due to the difficulty in establishing human relations, frequent traffic violations, and a deterioration of socioeconomic achievements [8]. In adult ADHD follow-up studies, the ADHD group showed lower levels of education, self-esteem, and social skills [9]. Interest in adult ADHD is increasing due to its growing incidence, frequent association with psychiatric disorders, and social and vocational problems that develop from childhood to adulthood [10].

Various hypotheses on the onset mechanism of ADHD have been suggested, but none of these have been confirmed. Most recently, studies on gene influences on ADHD have been actively conducted [11,12]. One of these studies examined temperament. According to Cloninger et al., whose study was based on the biogenetic temperament theory, congenital temperament had a genetic tendency that determined personal

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character properties [13]. In the study, congenital temperament was classified into novelty seeking (NS), harm avoidance (HA), and reward dependence (RD) dimensions, which were considered to have been associated with dopamine, serotonin, and norepinephrine, respectively. These functional associations in the neurobiological dimension were expected to explain the mechanism of diversity and personality and behavioral disorders. Individuals with high sensation-seeking tendencies are impulsive, easily agitated, and disorganized, exhibiting an association with low dopamine activity. They seek additional exploratory behaviors to compensate for increased dopamine activities. Individuals with risk-aversion tendencies show features of anticipatory anxiety, fear of uncertainty, shyness, a tendency to easily become tired, and an association with high serotonin activities. Individuals with high social sensitivities are sentimental, dependent, and easily attached to other people, showing an association with a deterioration in norepinephrine activities. Cloninger developed the Temperament and Character Inventory (TCI) based on a psychobiological character model by adding persistence (PS) items to the temperament properties. The tool was composed of temperament and character dimensions. The tool could confirm the congenital expression and maintenance of temperament, genetic tendency, and biological temperament associated with dopamine, serotonin, and norepinephrine activities. Furthermore, it could evaluate congenital, biological, acquired, and psychological influences [14].

The associations between adult ADHD and the TCI dimensions have been reported in previous studies, but most of them were focused on the temperament dimension and not on the character dimension [15,16]. Even studies on character did not consider subtypes with various symptom dimensions [17,18]. Additionally, sex effects on the temperament and character dimensions of Cloninger's model have been quite large in most of the previous studies [19,20].

In this study, the temperament and character properties according to the symptom groups of the adult ADHD screening test were compared. In addition, we analyzed whether there are interactions with the variable of sex because sex affects personality traits and adult ADHD symptoms.

2. Method

2.1. Study subjects

This study used data from a survey conducted as a part of the University Competence Empowerment Project in the Health Service Center of Kongju National University in 2013. The privacy policy and the purpose of this study were explained, and written consent was obtained. Of the 2924 cases that responded, 2917 cases were analyzed, excluding seven that were considered unreliable. This study was approved by the Institutional Review Board of Kongju National University.

2.2. Measurement tools

2.2.1. The temperament and character inventory (TCI)

The TCI is a test tool that was developed based on Cloninger's temperament and character psychobiological theory [13,21]. It is composed of 4 temperaments—NS, HA, RD and PS—and 3 personalities—self-directedness (SD), cooperativeness (CO) and self-transcendence (ST) [13]. In this study, we used a Korean version of the adult Temperament and Character Inventory-Revised Short version (TCI-RS), of which the reliability and validity were verified [22]. The TCI-RS is a 140-item questionnaire with a 5-point rating for each statement. The internal reliability for all of the temperament and characteristic dimensions was adequate (NS $\alpha = 0.811$, HA $\alpha = 0.876$, RD $\alpha = 0.816$, PS $\alpha = 0.855$, SD $\alpha = 0.875$, CO $\alpha = 0.833$, ST $\alpha = 0.858$).

2.2.2. Attention deficit/hyperactivity disorder self-rated scale (ASRS)

The Attention Deficit/Hyperactivity Disorder Self-Rated Scale is a short screening scale for use in the general population [23,24], Nine questions address the frequency of inattentive symptoms and nine address the frequency of hyperactivity symptoms. The participants indicate how often the symptoms occur using a 0–4 Likert scale (0 = never, 1 = seldom, 2 = sometimes, 3 = often, 4 = very often). Each item explores how often a particular symptom of ADHD has occurred over the past 6 months, rated on a 5-point scale, with the response options of never (0), rarely (1), sometimes (2), often (3), and very often (4). In our study, we used the ASRS to define subtypes of ADHD categorically. The inattentive subtype was defined as having a score of 21 or more on the first nine items, the hyperactive/impulsive subtype as having a score of 21 or more on the last nine items, and the combined subtype as having a score of 21 on both parts [25,26]. In this study, we used both a continuous and a categorical scoring method (21 or more on each subscale to define subtypes).

In this study, the hyperactive/impulsive symptom subtype and the combined subtype were classified as the hyperactive/impulsive ADHD symptom (HI) group, and the inattentive type was classified as the inattentive ADHD symptom (IA) group. The Korean version used in this study had good reliability and validity [27]. The Cronbach's alpha coefficients for the inattentive subtype and hyperactive subtype were 0.827 and 0.839, respectively.

2.3. Statistical analysis

A frequency analysis and descriptive statistics were used to analyze the general properties of the subjects. Cronbach's α, used for confirming internal consistency, was calculated to verify the reliability of the test tool. We conducted χ^2 tests and analyses of variance (ANOVAs) to confirm the difference in demographic variables and groups. To control each dimensional score of the TCI-RS with a dependent variable, a fixed factor multiple analysis of covariance (MANCOVA) was performed with age and gender as covariates [19,20,28,29].