Influence of temperaments in Attention Deficit Hyperactivity Disorder symptoms among preschool children

Hee Jeong Yoo1, Jee Hyun Ha2†, Jaehak Yu2, Doo-Heum Park2, Seung-Ho Ryu2

ABSTRACT
The objective of this study was to evaluate the relationship between attention deficit hyperactive symptoms and temperament and character profiles among preschool-age children. Total 694 preschool age children (mean age=5.7±0.45) were recruited for the study. The preschool Temperament and Character Inventory (psTCI) and DuPaul ADHD rating scale (K-ARS) were applied to evaluate the children. Statistical analysis was done to explore the association between psTCI profiles and ADHD symptom domains. The total ARS score was positively correlated with novelty seeking and harm avoidance. Inattention symptom domain was positively correlated both with novelty seeking and harm avoidance, whereas hyperactive symptom domain was only correlated with novelty seeking. Novelty seeking might be a universal genetic background for ADHD, and the level of harm avoidance could potentially be used to classify subtypes of ADHD.

Keywords
Attention deficit hyperactivity disorder, Development, Preschool children, Psychopathology, Temperaments

Introduction
Attention deficit hyperactivity disorder (ADHD) is a highly prevalent psychiatric disorder among children [1]. The prevalence of ADHD is around 8-12% of all children worldwide [2]. Symptoms can adversely impact academic performance, socialization and self-esteem [3]. ADHD is considered to be a highly heritable but clinically heterogeneous disorder that can be classified into three subtypes: inattentive, hyperactive-impulsive and combined [2,4]. Heritability and the early onset of symptoms before the age of 7 suggest that ADHD may be related to biogenic temperament [5]. However, it is difficult to differentiate developmentally healthy levels of inattention and hyperactivity from ADHD at early ages. Furthermore, there is no objective laboratory test to validate clinical impressions [2].

As ADHD can cause significant functional impairments, it is important to detect symptoms and start intervention at an early age [6]. Little data are available regarding ADHD in preschool children, and little is known about the role of temperament in development of ADHD symptoms [7]. Cloninger’s biopsychosocial model of personality presented four temperaments and three characters [8]. Temperament can be defined as the automatic associative response to basic emotional stimuli which determine habits and skills, and to be influenced by disparate neuromodulator pathways in brain. It is conceptualized that moderately heritable and stable over time, may have genetic predisposition,
Assessments

a) ADHD Rating Scale-IV parent version
Attention deficit-hyperactivity/impulsivity symptoms were assessed by the Korean version of DuPaul’s ADHD rating scale (K-ARS), parent version (ARS-IV), which has been standardized in Korean [10]. It has 18 symptom check lists of ADHD based on diagnostic criteria in the 4th edition of the Diagnostic and Statistical Manual-IV (DSM-IV). The internal consistency of K-ARS by age is 0.77-0.89. The internal consistency of this study is 0.88, confirmed by a Cronbach’s alpha.

DuPaul stated that the upper 10th percentile of ARS-IV scores could be defined as ADHD when screening community samples [11]. Hence, we selected 74 subjects (ARS-IV>18, 48 boys and 26 girls) to form the ADHD group. Age and sex matched control group was randomly selected within the whole subjects after exclude the ADHD group.

b) Preschool temperament and character inventory (psTCI)
The psTCI was developed by Constantino [12] et al. to measure the seven factors of temperament originally introduced by Cloninger. It was modified from the original version of the TCI to be easily understood by parents observing their children. It consists of 74 identical items that are scored by the parents. The psTCI was standardized in Korean [13]. Cronbach alpha values for the K-psTCI scales ranged from 0.62 to 0.78 for the temperament scales and from 0.62 to 0.77 for character scales.

Data analysis
Differences in temperaments and characters between the ADHD group and the control group were determined by the independent t-tests. Pearson’s correlation was carried out between seven psTCI factors and each ADHD symptom domains. Logistic regression analysis was performed to determine the significant predictor to develop the presence of ADHD. Statistical significance was defined as p<0.05. All statistical analysis was performed using PASW statistics 17.

Results
Boys had significantly higher K-ARS scores (11 ± 7.4 vs. 8.3 ± 6.9, t=-4.89, p<0.001), hyperactivity...
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ADHD group showed higher scores in novelty seeking (3.2 ± 0.8 vs. 2.4 ± 0.4, t=7.67, p<0.00), and lower score in persistence (3.1 ± 0.8 vs. 3.4 ± 0.4, t=-2.61, p<0.01) and cooperativeness (3.7 ± 0.6 vs. 4.1 ± 0.4, t=4.89, p<0.001) compared with the control group (Table 1).

Overall correlation between psTCI profiles and ADHD symptoms, novelty seeking was positively correlated with total score, inattention and hyperactivity symptoms (r=0.56-0.60, p<0.01). Persistence (r=-0.18-0.25), self-directedness (r=-0.12-0.19) and cooperativeness (r=-0.39--0.41) were negatively correlated with total score, inattention and hyperactivity symptoms. Harm avoidance was positively correlated with inattention domain and total score (r=0.13-0.20), not correlated with hyperactivity (Table 2).

A logistic regression model was used to assess the possible predictors for the presence of ADHD within seven psTCI profiles. ADHD was predicted by novelty seeking (OR=8.27, 95%, CI=4.51-15.16) and cooperativeness (OR=0.25, 95%, CI=0.11-0.55) (Table 3).

Discussion

The objective of this study was to evaluate the relationship between ADHD symptoms and temperament/character profiles in preschool age children. The prediction of ADHD symptoms with novelty seeking was consistent with previous studies in school age children and adolescents [5,9]. A previous study reported that novelty seeking could predict ADHD diagnosis, although causality could not be determined [7]. Increased novelty seeking has been associated with impulsive behavior, extravagant approaches to external cues, increased response to new stimuli [7]. Psychostimulants that effectively treat ADHD have been shown to block the dopamine transporter. Such findings imply that novelty seeking associated with dopamine could be important in the development of ADHD symptoms, regardless of age [3,14].

Also lower persistence was associated with the specific symptoms of ADHD such as short attention span and easily distracted by stimuli. Cloninger suggested that interactions or combinations of temperaments could construct a comprehensive biogenetic background for any mental illness or personality trait [8]. A previous study showed that increased novelty seeking and decreased persistence can predict hyperactivity and increased novelty seeking and harm avoidance, decreased persistence can predict the inattention domain of ADHD [9]. The results of temperaments profiles were same as school
age group in this study. Such findings can be explained as follows. Subtypes of ADHD might exist with different combinations of underlying biogenetic components. Barkley suggested that inattention-subtype ADHD subjects might present a different pathophysiology [4]. Previous research with school-age children also showed that only inattention was positively correlated with harm avoidance [9]. Inattentive ADHD shows more passive social relations, slowed cognition, and less comorbidity with disruptive behavior disorders.

We therefore cautiously suggest that hyperactivity/impulsivity and inattention subtypes can be differentiated by the intensity of harm avoidance. Increased novelty seeking and lower persistence in temperaments might universally lead to the development of ADHD symptoms, especially novelty seeking followed by logistic regression of the current study. And strength of the correlations with ADHD symptoms was significantly higher (r=0.5-0.60) in novelty seeking than other psTCI profiles. Then the subgroup with higher harm avoidance might represent distinct inattentiveness in ADHD due their background traits.

In the character dimension, low self-directedness and low cooperativeness were correlated with ADHD symptoms. It was consistent with previous reports in school age children [5,9]. However, when compared to temperament dimensions, character dimensions are much more readily influenced by social experience and could thus be affected by maturation. Hence it should be limited to easily accept the results in this study.

As the prevalence of ADHD in Korea was once reported as 5.9% [15] and it differs from DuPaul’s study. Thus the cut-off rate of ADHD – High risk group might be over-estimated. However, the mean score of total ARS-IV of our study was 24.5 ± 6.4 in ADHD group (range 19-47), above suggested cut-off score of ARS-IV (18 for parents and 17 for teachers), it can be regarded to reflect the characteristics of ADHD group properly.

The limitations of this study are as follows. First, the study was performed without diagnostic confirmation using a standardized structured diagnostic interview. Therefore we limited our result to ADHD symptoms not ADHD per se. Second, the authors did not exclude comorbid disorders such as anxiety, depression, cerebral palsy and mental retardation. Third, demographical data such as socioeconomic status and family environments which could be associated with ADHD symptoms were not included in the questionnaire. Therefore the interpretation of the results has a limitation because psychosocial factors were not controlled in the statistical analysis. Final, the study was conducted by self-report questionnaires, cautions needed to interpret the results in the biogenetic perspectives.

Nevertheless, it was the first study to identify the temperaments and characters of ADHD preschool-age children using the psTCI.

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References


