



Original Article

Temperamental predictors of developmental trajectories of inattention and hyperactivity–impulsivity problems in schoolchildren

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ABSTRACT

Background: The current study aimed to examine the temperamental predictors of developmental trajectory subgroups of children's inattention and hyperactivity–impulsivity problems through a short-term longitudinal study.

Methods: Children ($n = 1344$) were divided into younger (age 6–8 years) and older (age 9–11 years) groups in order to observe changes in inattention and hyperactivity–impulsivity problems. Inattention and hyperactivity–impulsivity problems were measured three times at 5-month intervals and Cloninger's four temperaments (novelty seeking, harm avoidance, reward dependence, and persistence) were examined on the first occasion only. A cohort sequential design and growth mixture model were used for investigating trajectory subgroups and multiple logistic regression analysis to examine the temperamental predictors.

Results: Developmental trajectories of inattention and hyperactivity–impulsivity showed different subgroupings depending on the age group of children. Temperament (high score on novelty seeking and low score on persistence as well as high score on reward dependence) and gender predicted the likelihood of belonging to high-risk versus low-risk subgroups.

Conclusion: Suggestions taking into account the predictors of developmental trajectories in inattention and hyperactivity–impulsivity problems for future research are discussed along with the limitations of the current study.

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1. Introduction

Since the Attention Deficit/Hyperactivity Disorders (ADHD) is reported to be prevalent in 3–12% of school-age children¹ and 30–50% of the referred cases to psychiatry.^{2,3} ADHD has the full attention of many researchers and clinicians.⁴ Although ADHD is reported to have three subtypes of Inattention Predominant (I), Hyperactivity–impulsivity predominant (HI), and Combined Predominance (C) in Diagnostic and Statistical Manual of Mental Disorders Fourth Edition, these are not sufficient to cover the heterogeneous characteristics of ADHD in terms of demographics, comorbidity, clinical presentations, response to medication, and prognosis.^{5–7} Therefore, it is necessary to identify the developmental homogeneous trajectories or pathways within the heterogeneous ADHD⁸ for the better understanding and treatment of them, considering that the diagnostic stability of ADHD is merely up to 50%.^{9–11}

While the appearance of statistical methods incorporating developmental changes such as latent growth curve model or general growth mixture model (GGMM) is now possible,¹² several studies have been conducted to investigate the developmental trajectories of problem behaviors,^{13,14} but not much regarding ADHD or attention problems including I and HI problems/symptoms.

Simultaneously, children with ADHD are reported to have a certain personality when compared with those without ADHD.^{15,16} For example, I is correlated with diligence negatively and with neuroticism positively;^{17–19} HI is correlated with compliance negatively and extraversion positively,²⁰ which were mostly conducted in cross-sectional studies. Therefore, factors that necessitate the potentially different developmental trajectories in ADHD should be examined with longitudinal data. The search for the factors that predict the diverse developmental trajectories of attention problems or ADHD has been of interest to developmental and clinical psychologists as well as child and adolescent psychiatrists.

Considering the importance of the biological contexts in development of attention problems, temperament has been able to be regarded as one of the most studied predictors.¹⁹ Temperament is defined as the individual differences in the adaptation system with regards to the diverse environmental stimuli, and attention problems might be considered as the individual differences in the biological tendency of behavior. As the neurobiological aspects are taken into account due to the higher association between attention problems and biological background, Temperament and Character Inventory (TCI)²¹ was chosen to measure this aspect in which many clinicians have shown interest.^{22,23}

Children and adults who have ADHD show higher scores on novelty seeking (NS) and lower scores on persistence (PS) and reward dependence (RD) compared with participants in the control group.^{24,25} For example, Tillman et al²⁶ reported that NS was significantly higher and RD and PS were significantly lower in the ADHD group than in the normal control group of early adolescents. The same results were found in Korea among children in both clinical and community samples in mainly cross-sectional studies.^{27,28}

In this regard, the current study aimed to investigate the effects of children's temperament on the formation of

particular developmental trajectory subgroups of I and HI problems in elementary school children after identifying different subgroups of developmental trajectories. Since the inclusion of preschoolers^{29,30} and adolescents^{29,31,32} in previous studies hindered researchers from observing minute and fine changes of I and HI problems, the present study focused solely on elementary schoolchildren whose attention problems are known to be more prominent than in other age groups.^{5,33}

Furthermore, we divided the sample into two age groups; those above and below age 9 years, in order to catch the more minute changes in problem behaviors based on a review of the literature;^{34–36} there is a change of attention problems including I and HI problems around the age of 9 years. In addition, as the majority of studies dealing with clinical samples might not be suitable to be applied to the general development of normal children, the present study used a community sample of elementary school children.

As there is limited literature regarding the predictors of subgroup classification, the results of our study may provide the ideas of predictors contributing to the higher-risk groups of I and HI problems and suggest proper screening and interventions for them in advance.

2. Methods

2.1. Participants

Parents of 2287 students in two elementary schools in Gyunggi Province, South Korea, were initially contacted by mail to inform them of the research opportunity after the Department Review Committee of Yonsei University approved the current study in February of 2010. The survey was conducted in three assessment waves during one academic year at 5-month intervals (April 2010, September 2010, and February 2011) with parent-reporting.

The current study was intended to include only cases that had all three measurement results in the analyses for statistical convergence. Additionally, the responses by guardians other than parents and cases with missing responses to >10% of the survey items were excluded in the analyses. Thus, the sample consisted of 1384 children (Table 1). To check for attrition bias, the I and HI scores from the initial pool of participants at the first assessment wave and scores of remaining participants at the third assessment wave were compared. The results suggest that there was a random rather than systematic attrition bias at the third assessment wave ($n = 1384$, $t = 1.8574$, $p = 0.0595$ for I; $t = 1.74$, $p = 0.0821$ for HI).

The sample was then divided into two different age groups—younger ($n = 515$, 6–8 years) and older ($n = 829$, 9–11 years)—based on literature suggesting changes in attention-related problems begin around the age of 9 years.^{34–36} Forty 12-year-old students were thus excluded due to their small number as well as for statistical convergence. Therefore, the final data consisted of 1344 participants (674 boys and 670 girls), whose cross-distribution was even ($\chi^2_{(5, N = 1344)} = 10.584$, $p > 0.05$).

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