



Impact of temperament and autistic traits on psychopathology in Japanese children: A nationwide cross-sectional study

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ABSTRACT

Although temperament has been linked to psychopathological outcomes in non-clinical children, little is known about the association between temperament and psychopathological outcomes in children on the autism spectrum whose psychopathological outcomes are highly variable. The current study examined the impact of temperament and autistic traits on emotional and conduct problems during school age in a large-scale sample of non-clinical children with the use of quantitative scales. Cross-sectional data comprising parent reports of recalled temperament, current emotional and conduct problems, and current autistic traits for Japanese children aged 6–15 years ($N = 24,232$) that were collected with a postal questionnaire were analyzed. The results showed that emotional and conduct problems in school age were associated with both autistic traits and toddlerhood temperament. Specific temperament-psychopathology associations between higher negative affectivity and more emotional problems, higher effortful control and fewer conduct problems, and higher surgency and more conduct problems were shared among children with different levels of autistic traits. This study showed that although temperament in toddlerhood differed by the degree of autistic traits, both temperament and autistic traits could predict emotional and conduct problems in school-age children, and that the temperament-psychopathology associations are in most respects universal regardless of the degree of autistic traits.

1. Introduction

In the field of psychological research, there is ample evidence that an association exists between temperament and psychopathology in the non-clinical child population. Soon after birth, possibly under genetic influences, children show substantial variation in the behavioral dimensions considered to be temperament (e.g., emotionality, activity level, attention, etc.). Subsequently, temperament shapes personality together with experience (Rothbart, 2007). In terms of psychopathology, research on childhood temperament has consistently demonstrated that internalizing problems in childhood are predicted by high negative affectivity (e.g., frustration, fear, discomfort) and low effortful control (e.g., attention or inhibitory control), while externalizing problems are predicted by high surgency/extraversion (e.g., activity, approach to novelty and challenge) as well as high negative affectivity, and low effortful control (Muris & Ollendick, 2005; Nigg, 2006). These associations may be primarily explained by common genetic influences (Saudino, 2005).

It is well recognized that a majority of children with autism spectrum disorder (ASD), a lifelong neurodevelopmental disorder, commonly develop emotional and behavioral disorders (Simonoff et al., 2008; Simonoff et al., 2013). Co-occurring emotional or behavioral problems negatively impact on the social functioning of children with ASD (Kaat, Gadow, & Lecavalier, 2013; Mattila et al., 2010) and can aggravate autistic symptoms per se (Close, Lee, Kaufmann, & Zimmerman, 2012). Temperament profiles of children with ASD are reported to be variable just as in the non-clinical child population (Hepburn & Stone, 2006; Konstantareas & Stewart, 2006), although they are extreme as a group, such as high negative affectivity with low surgency/extraversion (De Pauw, Mervielde, Van Leeuwen, & De Clercq, 2011; Schwartz et al., 2009), and low effortful control (De Pauw et al., 2011; Konstantareas & Stewart, 2006). The association between temperament and psychopathology may be similar in children with ASD and non-clinical children. For example, Schwartz et al. (2009) showed that in both typically developing controls and children with high-functioning ASD there was an association between lower surgency

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and more internalizing behaviors, as well as between lower effortful control and more externalizing behaviors. In a later study, De Pauw et al. (2011) found that in both an ASD and non-clinical comparison group high surgency predicted fewer internalizing problems and more externalizing problems whereas high negative affect and low effortful control predicted both internalizing and externalizing problems. These findings indicate that the individual variation in temperament observed in children with ASD may provide a mechanism to help understand the heterogeneity in the developmental trajectories in ASD.

However, to the best of our knowledge, no studies have examined the temperament-psychopathology association in non-clinical children with subthreshold autistic traits. This is an important omission. Recent research showed that increased autistic traits even at a subthreshold level can heighten the risk for anxiety, depression, or conduct problems (Guttman-Steinmetz & Gadow, 2009; Hallett, Ronald, Rijdsdijk, & Happé, 2010; Lundström et al., 2011). Moreover, the evolving understanding of autistic symptomatology also suggests that research on this issue is warranted. Specifically, when conceptualizing ASD, a dimensional approach is increasingly being incorporated with the traditional categorical approach that assumes a discrete boundary between normality and pathology (American Psychiatric Association, 2013). This is supported by evidence which shows that autistic traits are continuously, not bimodally, distributed in the general population throughout the normal range to the clinical extreme (reviewed in Constantino & Charman, 2016) and that there is not a natural cut-off point that can differentiate populations of categorically diagnosed children from children without ASD (Kamio et al., 2013), while research has also shown that a similar etiology is shared between extreme groups at each of the first, second, and fifth percentiles of severity in the general population (Robinson et al., 2011). In addition, other research has found that the risk of developing psychiatric comorbidity is shared between ASD and subthreshold groups who do not meet the diagnostic criteria for ASD but who have substantial autistic symptoms/traits, as mentioned above (Guttman-Steinmetz & Gadow, 2009; Hallett et al., 2010; Lundström et al., 2011).

A relationship between autistic traits and temperament has been observed in infant siblings who had an older sibling with ASD (Garon et al., 2009) and non-clinical students (Pisula, Kawa, Danielewicz, & Pisula, 2015). Moreover, the results from a recent adult twin study suggest that autistic traits and most aspects of temperament may share common genetic and environmental factors (Picardi et al., 2015).

Given that childhood mental health problems have been associated with adverse outcomes in adulthood (Copeland, Wolke, Shanahan, & Costello, 2015) and that the risk of developing such problems may be increased by the interplay between autistic traits and temperament, then clarifying the role of autistic traits and temperament in non-clinical children for later psychopathology may be important for ensuring better outcomes in this population. However, as yet, no studies have simultaneously examined the predictive role of autistic traits and temperament for childhood mental health problems.

To address this research gap, the present study thus examined the impact of toddlerhood temperament and current autistic traits on emotional and conduct problems during school age in a large-scale non-clinical sample of Japanese schoolchildren with the use of quantitative scales. The exploration of how temperament and autistic traits contribute to later psychopathology in non-Western culture may be particularly instructive, especially as previous research has indicated that there are both similarities and differences between Japanese and Western mothers in the areas where early development is desired (Kashiwagi & Azuma, 1977), and the degree to which they perceive temperamental characteristics (Slobodskaya, Garstein, Nakagawa, & Putnum, 2013) or autistic symptoms/traits in their child (Kamio et al., 2013; Matson et al., 2017).

Based on previous research, we hypothesized that both temperament and autistic traits would contribute to psychopathological outcomes. We also expected that any association between temperament

and psychopathological outcomes would be shared irrespective of the degree of autistic traits.

2. Methods

2.1. Participants and procedure

Study participants were recruited from 148 primary and 71 secondary schools located throughout Japan. A questionnaire was distributed to the parents of all schoolchildren (aged 6–15 years) attending mainstream classes together with a letter from the investigators and school principals informing them about the purpose of the study, that participation was voluntary and that confidentiality and anonymity were assured. From the 87,548 postal questionnaires that were distributed, 25,779 were returned (a 29.4% response rate), from which we used parent-report data for 24,232 (12,304 males) children with complete answers in the current study.

2.2. Instruments

2.2.1. Temperament in toddlerhood

Parents reported retrospectively on the frequency of specific child behaviors when the child was between 18 and 36 months with the use of a 36-item temperament measure, which was developed as an Interim version (Putnam, Gartstein, & Rothbart, 2006) of the Very Short Form (Putnam, Jacobs, Gartstein, & Rothbart, 2010) (IVSF) of the 201-item Early Childhood Behavior Questionnaire (ECBQ) (Putnam et al., 2006; Sukigara, Nakagawa, & Mizuno, 2015). Each item is rated on a 7-point scale (1 = never to 7 = always). The IVSF can be completed in 10 min, whereas the standard ECBQ takes about one hour to complete. Both scales consist of three factors, *Negative Affectivity*, *Surgency* and *Effortful Control* (see Appendix 1). The internal consistency of the 36 items for the total sample in this study was acceptable ($\alpha = 0.67$). The alphas for the individual factors were also acceptable (*Negative Affectivity* $\alpha = 0.68$, *Surgency* $\alpha = 0.76$, *Effortful Control* $\alpha = 0.72$) and were comparable to those in the original report (Putnam et al., 2010). The correlation coefficients for the standard and IVSF versions for 318 Japanese children aged 18–36 months were 0.754 for *Negative Affectivity*, 0.824 for *Surgency*, and 0.730 for *Effortful Control* (Nakagawa, unpublished). The three factor scores were used in the following analysis.

2.2.2. Childhood psychopathology

Parents completed the Strengths and Difficulties Questionnaire (SDQ) about the psychopathology and positive strengths of their child over the past 6 months (Goodman, 1997). In this study, we used scores of two 5-item subscales, the emotional symptoms and conduct problems subscales from the Japanese version of this instrument (Moriwaki & Kamio, 2014). These Japanese version SDQ subscales have been shown to have excellent test-retest reliability and acceptable internal consistency (emotional symptoms $\alpha = 0.64$, conduct problems $\alpha = 0.54$). Their validity has also been demonstrated in a recent study which found a strong correlation between these subscales and the corresponding CBCL subscales in a sample of Japanese schoolchildren aged 7–15 years (Moriwaki & Kamio, 2014).

In previous studies high emotional symptoms scores were associated with a greater risk of depressive or anxiety diagnoses, whereas high conduct problems scores were associated with a greater risk of oppositional defiant disorder, conduct disorder, or other disruptive behavioral disorders (Goodman, 2001). Each item is scored on a 3-point scale (0 = not true, 1 = somewhat true, 2 = certainly true), and each subscale score ranges from 0 to 10 with higher scores indicating more difficulties. In the present study, we used the SDQ data in two ways, as raw scores and to divide children into two groups with and without emotional or conduct problems. A score of 5 points and above on both the emotional symptoms and conduct problems subscales was used to determine the existence of symptoms/problems, since prior research

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