



Psychometric properties of the Japanese ADHD-RS in preschool children



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ABSTRACT

Background: Children with ADHD show multiple difficulties in their lives. Its early detection is important to provide timely intervention.

Aims: To evaluate the psychometric properties of the Japanese version of the home and school form of the ADHD-Rating Scale-IV (P- and T-ADHD-RS) for screening five-year-olds with ADHD.

Methods: The parents and teachers of 838 children (452 boys, 386 girls; including 28 boys, 18 girls diagnosed ADHD) completed the ADHD-RS and the Strengths and Difficulties Questionnaire in a community health check-up.

Results: The P- and T-ADHD-RS confirmed the two-factor model (Inattention and Hyperactivity-Impulsivity) and internal consistencies (CFI = 0.968, 980; RMSEA = 0.049, 0.055; SRMR = 0.030, 0.024; $\alpha = 0.86-.93$). Japanese boys and girls scored significantly lower in all scales of the P- and T-ADHD-RS ($d = 0.65-1.14, 0.36-0.59$) than US children. The P-ADHD-RS showed higher accuracy in area under the curve (AUC), sensitivity, and positive predictive value (PPV) than the T-ADHD-RS (AUC = 0.955, 0.692; sensitivity = 89.13%, 30.23%; PPV = 46.59%, 16.05%).

Implications: The P-ADHD-RS shows good reliability and validity for screening children with possible ADHD in a community. Longitudinal studies are needed to examine its predictive validity of adaptation in their lives at school.

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What this paper adds?

The ADHD-RS-IV has demonstrated its reliability and validity in assessing ADHD symptoms, but its accuracy in screening and predictive validity for children with ADHD have not been verified in Japan.

The results of the present study confirmed the good reliability and validity of the two-factor model of the home and school forms of the ADHD-RS in preschool children. Japanese preschool children in this study showed significantly lower Inattention, Hyperactivity-Impulsivity, and total score in the ADHD-RS compared to children from the US. Furthermore, the

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home form of the ADHD-RS had high accuracy for children scoring above the 90th percentile and predictive validity with respect to ADHD diagnostic criteria based on the DSM-5.

The home form of the ADHD-RS is a convenient and accurate screening tool to detect children with possible ADHD at a community health check-up in Japan, although the school form of the ADHD-RS is relatively lower in accuracy.

1. Introduction

Attention-deficit/hyperactivity disorder (ADHD) affects not only developmental and social difficulties in childhood—it also affects employment, driving ability, and relationships in adulthood (Barkley, 2002). The *American Academy of Pediatrics* (2011, p. 1007) stated that “the primary care clinician should initiate an evaluation for ADHD for any child 4 through 18 years of age who presents with academic or behavioral problems and symptoms of inattention, hyperactivity, or impulsivity” in the Clinical Practice Guideline for diagnosis, evaluation, and treatment of ADHD in children and adolescents. It is necessary to identify children with ADHD and support them and their family at an early stage in their life.

An essential feature of ADHD is “a persistent pattern of inattention and/or hyperactivity-impulsivity that interferes with functioning or development,” according to the Diagnostic and Statistical Manual of Mental Disorders (5th ed.; DSM-5; *American Psychiatric Association [APA]*, 2013, p. 61). The prevalence of ADHD is higher in boys than in girls, with a ratio of approximately 2:1 in children (APA, 2013, p. 63). Previous studies have shown multiple difficulties in children with ADHD, including writing performance (Noda et al., 2013), emotional regulation (Shaw, Stringaris, Nigg, & Leibenluft, 2014), and psychosocial functioning (Rasmussen & Gillberg, 2000). In recent studies, behavioral problems were observed in children with ADHD as early as preschool age. Schoemaker, Mulder, Dedović, and Matthys (2013) reviewed previous studies using a meta-analysis, and showed that the executive functions (EF) of children with externalizing behavior problems (i.e., ADHD, oppositional defiant disorder (ODD), and conduct disorder (CD)) from referred samples were more likely to have had externalizing behavioral problems in the preschool years. In a community health check-up for four-year-olds ($N=2475$), Wichstrøm et al. (2012) showed that the most common disorders were ADHD (1.9%), ODD (1.8%), CD (0.7%), anxiety disorders (1.5%), and depressive disorders (2.0%), and that comorbidity among disorders was common. Although it is important to detect ADHD symptoms in the early stages of life, symptoms of ADHD are difficult to be distinguished from normative behaviors of children below aged four, who show highly variable behavior styles (APA, 2013).

DuPaul, Power, Anastopoulos, and Reid (1998) developed the ADHD-Rating Scale-IV (ADHD-RS-IV) to assess ADHD symptoms, and published the Japanese version of the ADHD-RS-IV (ADHD-RS: DuPaul, Power, Anastopoulos, & Reid, 2008). In recent study, McGoey, DuPaul, Haley, and Shelton (2007) presented standardization, reliability, and validity data collected from the ADHD-RS-IV on preschool children in the US (parent rating $N=902$ children; 479 boys, 423 girls, $M=3.80$, $SD=0.66$, teacher rating $N=977$ children; 500 boys, 477 girls, $M=3.84$, $SD=0.64$). In Japan, the reliability and validity of the two-factor model of the home form of the ADHD-RS was confirmed with the parents of 5977 children aged 4–15 (Tani, Okada, Ohnishi, Nakajima, & Tsujii, 2010), and the school form with classroom teachers of 7414 children aged 6–15 (Ohnishi, Okada, Tani, Nakajima, & Tsujii, 2010). However, Tani et al. (2010) and Ohnishi et al. (2010) did not examine the predictive validity of the ADHD-RS to ADHD diagnosis.

The Strengths and Difficulties Questionnaire (SDQ; Goodman, 1997) is widely used in community settings to screen for externalizing and internalizing problems. The five-factor model of the SDQ has been established in children from preschool to school-going age (Croft, Stride, Maughan, & Rowe, 2015). Döpfner et al. (2006) showed a positive correlation between parent-rated SDQ scales and clinician-rated ADHD-RS-IV with small to large effects. In a recent study, Rimvall et al. (2014) examined predictive algorithms in preschoolers with regard to clinically diagnosed ADHD during school-going age and showed that the predictive validity of the SDQ included moderate sensitivity (45.6%), high specificity (97.2%), and relatively low PPV (32.6%). Rimvall et al. (2014) suggest that the SDQ is convenient due to its brevity and low cost (free of charge), making it a useful epidemiological screening instrument for identifying children at high risk of future clinically significant syndromes of ADHD.

The present study aims to verify the psychometric properties of the ADHD-RS in identifying preschool children with ADHD using DSM-5 criteria at a community health check-up for five-year-olds. We aim to confirm the factor structure, internal reliability, concurrent validity, and predictive validity of the home and school forms of the ADHD-RS; compare normative data from the US; and correlate the scale with the parent- and teacher-reported SDQ.

2. Method

2.1. Participants

Our survey was conducted in a city in Aomori Prefecture, located in northeastern Japan. This city had about 180,000 residents, several colleges, and the university, and the main industry is agriculture. In a community health check-up for five-year-old children, we administered the survey to the parents/guardians and teachers of all children residing in the city ($N=1310$). Parents/guardians were informed that this survey was voluntary, and if they agreed to participate, their children's teachers would also be asked to answer the questionnaires.

In the community health check-up, the children were screened for difficulties from multiple aspects: communication, behavior, motor skill, daily adaptation, and their parent's stress. If children obtained a higher score than the cut-off point in

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