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Use of the Chinese version modified checklist for autism in toddlers in a high-risk sample in Taiwan



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ABSTRACT

This study examined the utility of the Chinese version Modified Checklist for Autism in Toddlers (C-M-CHAT) in a high-risk sample. This study recruited 236 children aged from 18 to 47 months old in rural area of Southern Taiwan, including 113 children with Autism Spectrum Disorder (ASD) and 123 children with Developmental Delay (DD). Using failing any four of the 23 C-M-CHAT items as cutoff, it showed a sensitivity of 77.0% and a specificity of 72.4%. The positive predictive value (PPV) was 71.9% while the negative predictive value (NPV) was 77.4%. Using failing any three of the 14 new critical items—referred to as the “Brief 14”—as cutoff, it yielded a sensitivity of 70.8% and a specificity of 82.1%. The PPV of the “Brief 14” was 78.4% while the NPV was 75.4%. The preliminary results of the C-M-CHAT and the “Brief 14” performance demonstrated an acceptable predictive validity and promising utility for use in high-risk, rural populations in Taiwan.

1. Introduction

Autism Spectrum Disorder (ASD) is a neurodevelopmental disorder characterized by impairments in social interaction and communication, as well as repetitive interests and stereotyped behavior (American Psychiatric Association, 2013). Global prevalence estimates of ASD vary by nations, with current estimates in the United States as high as 1 in 100 school aged children (Autism & Developmental Disabilities Monitoring Network, 2012, 2014; Baird et al., 2006; Christensen et al., 2016). In Taiwan, the prevalence of ASD increased from 9.1 per 10,000 to 16.1 per 10,000 between 2007 and 2010 (Lai, Tseng, Hou, & Guo, 2012). Some of the possible factors contributing to the increasing prevalence rate include an increase in awareness of ASD, as well as an improvement of early screening and service availability (Elsabbagh et al., 2012; Wallace et al., 2012).

The lower prevalence of ASD in Taiwan compared to Western countries may be due in part to challenges in implementing ASD early detection. Early diagnosis of ASD through using of Autism Diagnostic Interview-Revised (ADI-R; Lord, Rutter, & Le Couteur, 1994) and Autism Diagnostic Observation Schedule (ADOS; Lord, Rutter, DiLavore, & Risi, 1999) by clinicians were difficult to implement due to time-constraints, limited clinical infrastructure to enable multidisciplinary assessment, and low health insurance reimbursements (Durkin et al., 2015). In order to aid in early diagnosis, some screening tools were developed and used in early-age

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population. Screening tools for ASD can be divided into two levels (Robins, 2008). Level 1 screening tools are used for screening in community when a public health nurse first encounters a child and determines whether he/she should be further assessed. When a child is found to be developing atypically and is transferred for confirmation, Level 2 screening tools are used. The Taiwan version of Screening Tool for Autism in Two-Year-Olds (T-STAT; Chiang et al., 2013) is a Level 2 screening tool. Currently, the T-STAT is the only measure had been validated and replicated in Taiwan for use in high-risk samples. Therefore, high-validity screening tools that can be implemented in a short period of time are needed to improve the process of early identification for children who are at high-risk of ASD in Taiwan so that they can start early interventions.

Among the many commonly used ASD screening tools, the Modified Checklist for Autism in Toddlers (M-CHAT; Robins, Fein, Barton, & Green, 2001) constitutes one of the most widely-used and well-studied in early childhood. The M-CHAT consists of 23 yes/no questions designed to assess the development and behavior of children aged 16–30 months and can be completed by a parent or a caregiver within 5–10 min. Children who fail either 3 of the 23 items or 2 of six critical items are considered a “positive screen” and at high-risk for ASD or developmental delay (DD) (Chlebowski, Robins, Barton, & Fein, 2013; Kleinman et al., 2008; Robins et al., 2001). The six critical items include item 2 (interest in other children), 7 (pointing for interest), 9 (showing), 13 (imitation), 14 (response to name), and 15 (following pointing). The six critical items possess good standardized canonical discriminant function coefficients, and the failure rate is more than 50% in children with autism. The M-CHAT showed high sensitivity and low specificity for detecting high-risk children with ASD aged 17 to 48 months in English-speaking populations (Eaves, Wingert, & Ho, 2006; Snow & Lecavalier, 2008). Recently, the M-CHAT authors suggested a “Best7” score (failing 2 of Best7) as an alternative method (Robins et al., 2010). The Best7 items include item 2 (interest in other children), 5 (pretend play), 7 (pointing for interest), 9 (showing), 14 (response to name), 15 (following pointing), and 20 (suspected deaf). To reduce the number of the false-positive outcomes, the Modified Checklist for Autism in Toddlers-Revised with Follow-Up (M-CHAT-R/F; Robins et al., 2014) was further developed.

The use of the M-CHAT was well-studied in English-speaking populations and had been translated into different language versions (Kleinman et al., 2008; Robins, 2008). Some studies showed that the M-CHAT had good utility in screening for ASD in children from Saudi Arabia (Seif Eldin et al., 2008), Spain (Canal-Bedia et al., 2011), Japan (Inada, Koyama, Inokuchi, Kuroda, & Kamio, 2011; Kamio et al., 2014), South Korea (Seung et al., 2015), Iran (Samadi & McConkey, 2015), and Turkey (Kondolot et al., 2016). Inada et al. (2011) suggested the use of a different cutoff score to obtain better sensitivity and specificity for the Japanese version of the M-CHAT in Japanese children aged 18 to 24 months. A recent systematic review of ASD screening in low resource settings found that many studies using western-developed tools in non-western populations reported improved validity through using cutoff scores and critical items that differed from what was recommended (Stewart & Lee, 2017). Beyond simple translation, differences in cultural norms must be considered through rigorous validation and pilot testing of tools before they are considered for general use.

The Chinese-language version of the M-CHAT has previously been used in clinical and community-based samples. Wong et al. (2004) translated the M-CHAT (23 questions) into Chinese with graded scores, and combined it with five observation items from the original Checklist for Autism in Toddlers (CHAT; Baron-Cohen, Allen, & Gillberg, 1992) to constitute a new checklist for aged 13 to 86 months, which is called the CHAT-23 in Hong Kong. Seven key items were identified, included items 2 (interest in other children), 5 (pretend play), 7 (pointing for interest), 9 (showing), 13 (imitation), 15 (following pointing), and 23 (social referencing), named the ‘7 key items’. High sensitivity and specificity value of 77–93% were reported for the CHAT-23. In Singapore, a South-East Asia multi-racial population consisting of 74% Chinese participants, Koh et al. (2014) examined clinical utility of the M-CHAT for detecting high-risk children with ASD aged 18 to 48 months. Their findings also showed good sensitivity and specificity value of 71–81% were reported for both the six critical items and Best7 score of the M-CHAT.

When considering the use of the M-CHAT in Taiwan, the findings of these case-control studies showed the importance of factors such as choice of scoring method, the age-range of the sample, selection of typically developing children along with children with DD to serve as control groups, dialectical differences between Mandarin and Cantonese, and potential variation in western-cultural influenced between Hong Kong, Singapore, and Taiwan. Lung, Chiang, Lin, and Shu (2011) used the Taiwan Birth Cohort Study (TBCS) developmental instrument in the first stage and the M-CHAT in the second stage were utilized to screen children below 3 years old in a community-based setting. Their study examined whether the TBCS developmental instrument can be used for detecting ASD based on the M-CHAT category, and found that 18% children were screened out as being high-risk for ASD. However, they did not confirm the diagnosis of children for examining validity of the M-CHAT. Recently, failing 13/14 of the 23 items was considered optimal for screening of children with ASD at 66 months in a community-based setting (Lung, Chiang, Lin, & Shu, 2017). No study has previously examined the validity and utility of the M-CHAT in a sample of children at high-risk for ASD in Taiwan.

The implementation of culturally appropriate and valid screening for ASD is a critical first step towards improving the pathways to care for children with ASD in Taiwan. Previous studies have found an urbanization disparity in the distribution of ASD diagnosis (Lai et al., 2012; Lung et al., 2017), it highlights the importance of early detecting of children with ASD, especially for rural areas. The M-CHAT is widely used globally in both community and clinical settings screening. In Taiwan, the M-CHAT was only used in community settings with no adaptation from the original form used in Lung et al. (2011). However, adaptations to instrument administration and cutoff scores may be necessary when using tools outside the settings in which they were developed (Stewart & Lee, 2017). In addition, using the M-CHAT in a high-risk sample, cutoff score is different from in a low-risk sample. The current study investigated the validity and utility of the Chinese version M-CHAT (C-M-CHAT) for screening a high-risk sample of children aged 18 to 47 months in Chia-Yi, a rural and agricultural area in Taiwan with a low-socioeconomic status (low-SES) and a large indigenous population. Through validating the C-M-CHAT in a high-risk, low-SES population, this study will inform future ASD screening efforts in Taiwan.

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