New language outcome measures for Mandarin speaking children with hearing loss

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Abstract

Objective: The paper discusses recent evidence on the assessment of language outcomes in children with hearing loss acquiring oral language.
Methods: Research emphasizes that language tests must be specific enough to capture subtle deficits in vocabulary and grammar learning at different developmental ages. The Diagnostic Receptive and Expressive Assessment of Mandarin (DREAM) was carefully designed to be a comprehensive standardized Mandarin assessment normed in Mainland China.
Results: This paper summarizes the evidence-based item design process and validity and reliability results of DREAM. A pilot study reported here shows that DREAM provided detailed information about hearing impaired children's language abilities and can be used to aid intervention planning to maximize progress.
Conclusion: DREAM represents an example of translational science, transferring methods from empirical studies of language acquisition in research environments into applied domains such as assessment and intervention. Research on outcomes in China will advance significantly with the availability of evidence-based comprehensive language tests that measure a sufficient age range of skills, are normed on Mandarin speaking children in mainland China, and are designed to capture features central to Mandarin language acquisition.
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Keywords: Standardized language test; Language development; Outcome assessment; Mandarin; DREAM

1. Background

Medical advances, as well as technological inventions such as digital hearing aids and cochlear implants, have made significant changes in the likelihood that a child with hearing loss will achieve adequate speech perception, intelligible speech and language competency, though none of these is yet guaranteed for all children (Duchesne, 2015). Despite these advances, it is probable that a child with hearing loss faces a significant delay in exposure to auditory stimulation, leading to delays in the normal course of oral language development through audition. Research findings suggest that children who received an implant even before 12 months had a one year expressive language delay (Manrique et al., 2004). Others (Anderson et al., 2004; Duchesne et al., 2009; Tomblin et al., 2005) found variable degrees of delay with children who received implants before age 2. Lowering the age of implantation does seem to improve the prospects of normal language acquisition but the evidence does not suggest that children

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with cochlear implants perform like hearing peers on average (Blamey and Sarant, 2011; Duchesne, 2015).

It is critical to assess different components of language achievement, for example, receptive and expressive language skills, as well as vocabulary and grammar. For example Duchesne et al. (2008) revealed that children who received a cochlear implant below the age of 3 had different degrees of delay across different components of language. Markman et al. (2011) studied age of implantation in relationship to language development in different domains (such as vocabulary, receptive syntax and expressive syntax) and found that age of implantation before 18 months had a larger positive impact on the development of receptive and expressive syntax than on vocabulary acquisition.

In addition, the age at which the language performance is assessed can also affect the outcome results. Language assessments done at 36 months of age tend to reveal a significant advantage of early implants (Duchesne, 2015). These early advantages might not continue when children are assessed later: Dunn et al.'s (2014) follow-ups at school age (8—10 years) reveal much less difference in language for early (under 2) or later (2—4 years) age of implantation. In a systematic review of results from children receiving a cochlear implant before the age of three, Duchesne et al. (2008) found residual delays in both vocabulary and grammar for most of their subjects, even after five years with the implant. Geers et al. (2016) find that of their sample of children implanted between 12 and 38 months, one third scored within normal range on a battery of standardized language assessments by age 4.5 years, one third caught up by age 10.5 years, and the remaining third had persistent language delay. Therefore a language assessment that covers a wide age range will be valuable for monitoring language acquisition of children with hearing loss over time.

The demands of school language set new criteria for success for children with hearing loss. A school age child needs to have sufficient linguistic knowledge to learn new words from limited contexts, to make inferences across discourse, and to have a metalinguistic awareness about language. Metalinguistic awareness is the ability to reflect on language, such as recognizing that two words rhyme or have different meanings (Nittrouer et al., 2014). The requirements to produce longer narratives or expository text make new demands for coherence and cohesion that can stretch the demands on a child in new directions (de Villiers, 1991). For all these reasons, assessment of the language proficiency of children with hearing loss must be continued past the preschool level, as subtle difficulties might emerge with the new demands of schooling (Moeller et al., 2015). Vocabulary tests are not completely sufficient in this regard, serving only as a proxy for how much language the child has received, but neglecting the linguistic devices in syntax, morphology, and semantics that make complex human communication possible.

Norm-referenced standardized language assessments are commonly used in outcome research studies for children with hearing loss in western countries (Liu, 2015). Some examples of these assessments include vocabulary tests, such as the MacArthur Communicative Development Inventory (Fenson et al., 2007) and the Peabody Picture Vocabulary Test (PPVT) (Dunn and Dunn, 2007), parent questionnaires, such as Reynell Developmental Language Scale (RDLS) (Edwards and Reynell, 1997), comprehensive receptive and/or expressive language tests, such as Clinical Evaluation of Language Fundamentals (CELF) (Wiig et al., 2003), Preschool Language Scales (PLS) (Zimmerman et al., 2011), Comprehensive Assessment of Spoken Language (CASL) (Carrow—Woolfolk, 1999), Test of Auditory Comprehension of Language (TACL) (Carrow—Woolfolk, 1998), and reading tests, such as Test of Reading Comprehension (TORC) (Brown et al., 1995), and Woodcock Reading Mastery Test (Woodcock, 1987). Other assessments are not standardized, such as transcribed spontaneous language samples, which are time-intensive (Koehlinger et al., 2013; Hammer et al., 2014).

In China, the Mandarin MacArthur-Bates Communicative Development Inventories (Tardif et al., 2008) was adapted from MacArthur-Bates Communicative Development Inventories. It is a vocabulary checklist and normed for the Beijing region exclusively for children age 0—30 months. Lu et al. (2013) developed the Mandarin Expressive and Receptive Vocabulary Test (MERVT). MERVT was normed on 245 normal-hearing children ranging in age between 1;6 to 3;11 (1 years 6 months to 3 years 11 months) in Beijing, China. These regionally normed standardized assessments only measure early vocabulary skills in Mandarin. However, there is a significant need for a standardized comprehensive language assessment that covers a wide age range of language skills that could be used for Mandarin speaking children with hearing loss as well as children with other forms of language delay. The availability of such standardized comprehensive language measures in western countries allows careful comparison of language skills in different domains in children with hearing loss who are users of either hearing aid or cochlear implants against a large group of age-matched hearing peers who make up the standardization sample (Ching et al., 2013; Tobey et al., 2013; Nicholas and Geers, 2013; Yoshinaga-Itano et al., 2010). It is also important to note that standard scores in a norm-referenced assessment should only be used in the regions where the norm was developed. Therefore, standardized language assessments that are normed outside of mainland China or only for a specific city in China have limitations in use for Mandarin speaking children in different regions in mainland China.

2. Introduction

The development of the Diagnostic Receptive and Expressive Assessment of Mandarin (DREAM) was fueled by the need for a comprehensive assessment that was normed on Mandarin speakers aged 2;6 to 7;11 in mainland China, and designed to evaluate language difficulties in children with various etiologies, including hearing impairment. The full details of the development of the test are included in the DREAM test manual (Liu et al., 2015a). Here we provide an outline of the rationale and process by which it was created,