



# The concurrent and predictive validity of the Dutch version of the Communicative Development Inventory in children with Down Syndrome for the assessment of expressive vocabulary in verbal and signed modalities



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## ABSTRACT

The expressive vocabulary of children with Down Syndrome (DS) is generally measured with parental reports, such as the Communicative Development Inventory (CDI), given that standardized tests for assessing vocabulary levels may be too difficult for most young children with DS. The CDI provides important insight into the parents' perception of their child's vocabulary development. The CDI has proven to be a valid measurement of expressive vocabulary, spoken and gestural, in typical and atypical populations. The validity in children with DS is not well established and signed vocabulary is often not included. This longitudinal study examined the concurrent and predictive validity of the Dutch version of the CDI (N-CDI) in children with DS between 2;0 and 7;6 years old to assess spoken and signed vocabulary. N-CDI scores were assessed on strength of association with mental age, an expressive vocabulary test and spontaneous language analyses in a play setting with parents at T1 and T2 (1.5 years later), and a therapy setting with speech language pathologists at T1. The results of the present study show that the N-CDI is a valuable and valid measurement of expressive vocabulary in children with DS. Strengths and weaknesses of several assessment methods for expressive vocabulary are discussed.

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## What this paper adds?

The MacArthur Communicative Development Inventory: Words and Sentences (CDI) is often used in research and clinical practice to determine the size of expressive vocabulary of children with developmental disabilities, more specifically children with DS. In typically developing children, multiple studies have proven the CDI to be concurrently and predictively valid

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in several languages. The CDI has been adapted for children with DS to include deictic and representational gestures in the assessment of expressive vocabulary. However, in Dutch clinical practice it is a common intervention strategy to incorporate signs, stemming from the official Dutch Sign Language, in daily communication. Sign interventions have been proven effective in these children and several studies showed that the use of signs as primary communication mode is existent in many children with DS before the age of five. We have thus adapted the Dutch version of the CDI to assess both verbal and signed vocabulary. This current paper adds insight into the value and validity of the use of the adapted N-CDI in children with DS, which proved to be concurrently and predictively valid in these children. The results of the present study support the use of the adapted N-CDI in research and clinical practice for the assessment of expressive vocabulary in samples that use multiple modalities, but stresses the need for a combined assessment with other measures of expressive vocabulary in children with DS given that some questions could be raised about the reliability of parental input.

## 1. Introduction

Down Syndrome (DS) is a genetically based neurodevelopmental disorder and the most frequent genetic cause of an intellectual disability (Morris & Alberman, 2009). DS is often characterized by a delay in language development that is greater than would be expected on the basis of the individual's general cognitive level. However, some authors have also found that there is no specific dissociation between cognitive level and lexical development (Vicari, Caselli, & Tonucci, 2000, Galeote, Sebastián, Checa, Rey, & Soto, 2011). There is agreement in the literature that there are large individual differences among children with DS in their vocabulary development (Berglund, Eriksson, & Johansson, 2001; Galeote, Soto, Checa, Gómez, & Lamela, 2008; Roberts, Price, & Malkin, 2007).

Many children with DS show a significantly delayed onset of the production of their first words, despite them having normal babbling patterns (Næss, Lyster, Hulme, & Melby-Lervag, 2011; Stoel-Gammon, 1997). Smith and Oller (1981) found that children with DS have a delayed onset of meaningful first words and that the majority of utterances made by them were not meaningful, even after the appearance of their first intelligible words (Smith & Oller, 1981; Stoel-Gammon, 1997). Although Stoel-Gammon (2001) claims that children with DS produce their first spoken word around the average age of 1;9 years, Gillham (1990) determined that word onset in children with DS is possibly not until the age of 3;9 years. Berglund et al. (2001) used a Swedish version of the Communicative Development Inventory (CDI) in a large sample of 330 children with DS between one and five years old. They found that some of them started to talk around their first birthday while others had not even started at the age of five, showing large individual differences in vocabulary development. Zampini and D'Odorico (2011) investigated the lexical development in Italian children with DS, with a mean vocabulary size of 450 words, by assessing spontaneous verbal productions during a 20-min semi-structured parent-child play session. They found the vocabulary composition of the children with DS to be simpler than that of typically developing peers at the same vocabulary size. Especially the use of function words was significantly lower. Also, their production of multi-word utterances was less frequent.

The expressive vocabulary size of children with DS in clinical practice is often measured in one or multiple ways: standardized tests, spontaneous language analyses and/or parental reports. All have their own advantages and disadvantages. Standardized tests in clinical or laboratory settings have the advantage of being based on observable behavior at a specific moment in time, which can be related to normative data. However, the attention span of young children is an important factor influencing the assessment and therefore the result is likely to prove unrepresentative of the child's abilities (Feldman et al., 2005). Secondly, standardized tests often require the child to interact with an unfamiliar adult, possibly influencing the child's responses (Pan, Rowe, Spier, & Tamis-Lemonda, 2004), which may be particularly true for children with DS (Miller, Sedey, & Miolo, 1995). In standardized tests, language is provoked in an isolated situation and may not represent active use of these words for a specific child during the day. Especially because words are provoked within a constraint time frame, where children with DS are known to have a slower response time (Inui, Yamanishi, & Tada, 1995). Spontaneous language analysis has the advantage of providing insight into how the child actually uses language in interaction with communicative partners, and are thus potentially more ecologically valid (Pan et al., 2004). However, language samples recorded in conversation with a researcher or a parent may be highly influenced by personality and contextual factors, such as setting and materials used (Feldman et al., 2005; Yont, Snow, & Vernon-Feagans, 2003). Recordings of parent-child interactions may consistently lead to underestimation of vocabulary size, because (a) young children talk less when they are in unfamiliar settings or around people they do not know, and (b) it is impossible to simulate the wide variety of situations in which a child produces language, and much of this language is context-bound (Mervis & Becerra, 2003). Furthermore, it requires lengthy time to obtain, transcribe and analyze spontaneous language samples, which generally limits the length of the sample and the number of children who can be studied (Pan et al., 2004). Although spontaneous language analysis gives a precise overview of the expressive vocabulary used in a particular context, other words could have been found when other contexts are analyzed.

Contextual factors, attention span of the child, and lengthiness of data acquisition are less likely to influence assessment via parental reports, of which the CDI is the most often used. For the speech language pathologist, these parental reports are cost-effective and administration is minimally intrusive. Parents may have a good understanding of their child's vocabulary use, because they observe and interact with their child in several contexts on a daily basis (Feldman et al., 2005; Pan et al., 2004), and in the case of children with DS, their parents may understand imprecise articulated speech or signs of their child better. The particular moment of the word produced in time is not relevant, and parents may take days to fill out the forms.

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