



# Predictors of early literacy skills in children with intellectual disabilities: A clinical perspective<sup>☆</sup>



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## ABSTRACT

The present study investigated the linguistic and cognitive predictors of early literacy in 17 children with intellectual disabilities (ID) (mean age: 7; 6 years) compared to 24 children with normal language acquisition (NLA) (mean age: 6; 0 years), who were all in the so-called partial alphabetic phase of reading (Ehri, 2005). In each group, children's performances in early literacy skills (phonological awareness, letter knowledge, and word decoding) were assessed, as well as their achievement in linguistic and cognitive measures associated to these skills. The results showed that, notwithstanding the fact that there were no differences in word decoding, children with ID lagged behind on all predictor measures relevant to early literacy skills compared to children with NLA. Moreover, whereas children with NLA showed a regular predictive pathway of early literacy skills, children with ID showed a deviant pattern, in which nonverbal intelligence and rhythmic skills proved to be of major importance. Also letter knowledge appeared to be involved in their early literacy processing. It can be tentatively concluded that in the ID group, children's level of nonverbal intellectual abilities in combination with rhythmic ability proves pivotal in the development of their early literacy skills.

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## 1. Introduction

Most children learn to read seemingly effortlessly from first grade onwards, but this process is less obvious in children with intellectual disabilities (ID). In children with normal language acquisition (NLA), the palette of linguistic and cognitive predictors of early literacy skills seems to be quite clear (Hammill, 2004; National Early Literacy Panel, 2008). And although problems that children with significant ID encounter in acquiring early literacy skills are well established (Erickson, Hanser, Hatch, & Sanders, 2009), little is known about the linguistic and cognitive correlates of these skills. Most research in the domains of literacy and ID was on a specific subgroup of ID (e.g. Down's Syndrome; Martin, Klusek, Estigarribia, & Roberts, 2009; Næss, Melby-Lervag, Hulme, & Halaas Lyster, 2012; Yoder & Warren, 2004), or included a population with a larger age-span and with only a small subset of predictors (e.g. Barker, Sevcik, Morris, & Romski, 2013; Chanell, Loveall, & Conners, 2013; Soltani & Roslan, 2013; Wise, Sevcik, Romski, & Morris, 2010). In the present study, we therefore investigated the role of linguistic and cognitive skills associated with early literacy skills (i.e. phonological awareness, letter knowledge, and word

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decoding) in both six to eight year old children with NLA and children with ID with various etiologies, in the partial alphabetic phase of literacy learning.

### 1.1. Predictors of early literacy in children with normal language abilities

For children with NLA, several important skills are involved in learning to read, which can be subdivided into linguistic and cognitive skills. Linguistic skills related to reading include print awareness, phonemic awareness, alphabet knowledge, sound-letter correspondences, rapid automatized naming (RAN), and oral- and silent reading fluency, and cognitive skills include memory related components (Hammill, 2004). The importance of phonemic awareness (a hierarchically complex subset of phonological awareness skills, wherein awareness of the most fundamental units of speech-sounds are involved), letter-sound knowledge, and memory was again stressed in a recent meta-analysis by Melby-Lervåg, Halaas Lyster and Hulme (2012). Furthermore, the National Early Literacy Panel (2008) considered phonological memory to be one of the key factors in learning to read. Also executive functioning was found to be a critical component in the development of preschool children starting to learn to read (Altemeier, Abbott, & Berninger, 2008; Garon, Bryson, & Smith, 2008; Van de Sande, Segers, & Verhoeven, 2013).

In addition, the National Early Literacy Panel (2008) stressed the role of oral language skills, in which vocabulary and speech production skills are involved. Proficiency in these skills, combined with early literacy abilities phonological awareness and letter knowledge, will benefit later on in the reading process. Moreover, according to the lexical restructuring hypothesis, vocabulary can provide the foundations for phonological sensitivity, or the combination of both phonological and phonemic awareness skills (Dickinson, McCabe, Anastasopoulos, Peisner-Feinberg, & Poe, 2003), and may therefore be an important underlying skill for learning to read.

A final important, but less frequently studied parameter associated with early literacy is rhythm. Several neurocognitive studies have indicated that the perception of rhythm enhances executive control functions, i.e. attention regulation and sequential, phonological working memory (Baddeley, Gathercole, & Papagno, 1998; Saito, 2001). Through the processing of rhythm, synchrony, tempo, and intensity, infants develop their capacity to differentiate, analyze, and store information from more than one sense modality (Bahrick & Lickliter, 2004). This capacity is also required for the analysis of auditory and visual information during speech and reading (Anvari, Trainor, Woodside, & Levy, 2002). David, Wade-Woolley, Kirby, and Smithrim (2007) and stressed the importance of non-speech rhythm in relationship with meta-linguistic skills such as phonological awareness. They found that in earlier phases of reading, relatively high demands are placed on the child's phonological awareness skills during the process of decoding simple monosyllabic words. Moreover, in speech rhythm processing, the correct detection of the onset of rhythm tempo and patterns (called rise-time) explained a significant amount of variance in all sorts of literacy-related tasks (Goswami et al., 2002) as well.

### 1.2. Predictors of early literacy in children with intellectual disabilities

Whereas the picture of early literacy skills and its predictors in children with NLA is relatively clear, this is by no means the case in populations with ID. It is known that early literacy skills in children with ID are hampered, although there is clear evidence that individuals with ID are able to learn to read to some extent (Loveall & Conners, 2013). The level of intelligence was found to directly predict word decoding skills and to mediate the relationship between early literacy skills and later word decoding (Levy, 2011). And the mastery of a certain level of early literacy skills does not seem to guarantee that they are able to acquire functional reading comprehension skills later on in life (Jones, Long, & Finlay, 2006). Due to the large heterogeneity in groups of children with ID, research often focused on groups with a specific subtype of ID with distinct cognitive profiles (e.g. children with Down syndrome; Snowling, Nash, & Henderson, 2008). Problems related to linguistic skills like phonological awareness and expressive vocabulary are often present in this group, leading to language problems. With specific instruction, however, a certain level of literacy in children with Down syndrome can be achieved (Martin et al., 2009). Direct word recognition, or sight-word reading, appeared to be more commonly used as a word reading strategy in this group of children, whereas decoding words proved to be difficult, due to their phonological problems (Snowling et al., 2008; Verucci, Menghini, & Vicari, 2006).

Erickson et al. (2009) reviewed research on literacy acquisition in students with significant ID based on the various linguistic skills reported in the National Early Literacy Panel (2008). They concluded that especially problems in phonological awareness prevented proper reading acquisition in this group of children. However, in a review study by Joseph and Seery (2004), it was found that children with ID can make substantial progress in reading and in grapheme-to-phoneme connections. More recently, Finnegan (2012) suggested that children with ID benefited from systematic phonics instruction, and that it is important to maintain this form of instruction for children with ID throughout their education.

Several other studies focused on the importance of phonological awareness skills in learning to read in adults and children with ID. Iacono and Cupples (2004) found that phonological awareness contributed significantly to both real- and nonword recognition in a group of adults with complex communication needs and ID, and so did Vandervelden and Siegel (2001) in a group of children with complex communication needs who used augmentative and alternative communication (AAC). Wise et al. (2010) found comparable results in a group of children with mixed etiologies, and again stressed the importance of phonological awareness skills in learning to read. With respect to these findings, it was tentatively concluded

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