



Research Paper

Modeling individual variation in early literacy skills in kindergarten children with intellectual disabilities[☆]



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ABSTRACT

In the present study, we investigated (i) to what extent the early literacy skills (phonological awareness, letter knowledge, and word decoding) along with cognitive (nonverbal reasoning, attention, phonological short-term memory, sequential memory, executive functioning) and linguistic (auditory discrimination, rapid naming, articulation, vocabulary) precursor measures of 53 six-year old children with intellectual disabilities (ID) differ from a group of 74 peers with normal language acquisition (NLA) and (ii) whether the individual variation of early literacy skills in the two groups to the same extent can be explained from the precursor measures. Results showed that children with ID scored below the NLA group on all literacy and precursor measures. Structural equation modeling evidenced that in the children with NLA early literacy was directly predicted by phonological awareness, PSTM and vocabulary, with nonverbal reasoning and auditory discrimination also predicting phonological awareness. In children with ID however, the variation in word decoding was predicted by letter knowledge and nonverbal reasoning, whereas letter knowledge was predicted by rapid naming, which on its turn was predicted by attentional skills. It can be concluded phonological awareness plays a differential role in the early literacy skills of children with and without ID. As a consequence, the arrears in phonological awareness in children with ID might put them on hold in gaining proper access to literacy acquisition.

What this paper adds: This paper adds to the theoretical knowledge base on literacy acquisition in a special population, namely children with intellectual disabilities (ID). It addresses factors that influence early literacy learning, which have not been investigated thoroughly in this special and specific group. Furthermore, the children are not tested solely on literacy, but also on cognitive measures that may influence literacy acquisition. Whereas most research in ID focuses on groups with specific syndromes/etiologies, this paper takes a varied group of children with ID into account. The paper also adds to educational insights, since the findings imply that children with ID are able to use phonological pathways in learning to read. Educators could teach these children phonics-based literacy skills tailored to their individual learning needs.

1. Introduction

It is a well-established fact that phonological awareness is critical for literacy acquisition (Melby-Lervåg, Halaas Lyster, & Hulme, 2012; Verhoeven, van Leeuwe, Irausquin, & Segers, 2016). In kindergarten classrooms, children begin to discover that sounds can be

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manipulated (while singing rhyme- and nursery songs), and that letters represent sounds (while playing games like searching for words that start with a specific letter or sound). Through all these early literacy experiences, children become prepared for formal literacy instruction in first grade (Dickinson, McCabe, Anastasopoulos, Peisner-Feinberg, & Poe, 2003; Lonigan, Burgess, & Anthony, 2000). For children with intellectual disabilities (ID), however, only the first steps have been made in understanding how and to what extent these children can become literate (e.g., Barker, Sevcik, Morris, & Ronski, 2013). Whereas both children with normal literacy acquisition (NLA) and children with ID are exposed to literacy from a young age onwards, it can be assumed that there are differences in the significance of precursor measures of literacy skills in both groups. There is an ongoing debate on the question to what extent children with ID can become phonologically aware and how this impacts the development of their early literacy skills. Therefore, the present study investigated to what extent children with mild ID with mixed etiologies develop early literacy skills, and how the individual variation related to the complex process of learning to read in this group can be explained.

1.1. Early literacy in children with normal language acquisition

Before children receive formal literacy education, they develop early literacy skills such as knowledge of grapheme to phoneme connections and word decoding (see Pullen and Justice, 2003; Storch and Whitehurst, 2002). Phonological awareness, rapid automatic naming (RAN) and phonological short-term working memory (PSTM) are considered to be important predictors of later word decoding skills (e.g. Melby-Lervåg et al., 2012; Näslund and Schneider, 1996). The lexical restructuring hypothesis (Goswami, 2001; Metsala, 1999, 2011) claims that oral vocabulary may trigger children to develop phonological representations of language, thus strengthening their phonological awareness and early literacy skills. Furthermore, at a higher-order level, the development of early literacy has shown to be dependent on higher-order skills such as sequential memory processing, (e.g., rhythm; David, Wade-Woolley, Kirby, & Smithrim, 2007), selective attention, and executive functioning (Diamond, 2013). As a case in point, Van de Sande, Segers, and Verhoeven (2013) found that phonological awareness mediated the relation between executive functioning and learning to read in a group of typically developing children from kindergarten to first grade.

1.2. Early literacy in children with intellectual disabilities

The aforementioned theoretical framework of the relationship between phonological awareness and literacy skills stems from research in children with NLA and it can be questioned whether the same framework applies to literacy acquisition in children with mild ID (International IQ criterion = 50–70; Boat & Wu, 2015, pp. 170–171; Dutch IQ criterion = 50–85; de Beer, 2011). Research in literacy acquisition in children with ID is relatively scarce and findings are not always congruent (Erickson, Hanser, Hatch, & Sanders, 2009). There is evidence that children with ID learn to read in a similar fashion as children with NLA by using, at least to some extent, explicit phonological skills such as phonological awareness and letter knowledge. In a study by Wise, Sevcik, Ronski, and Morris (2010), it was found that children with ID in Grade 2–5 relied heavily on phonological processing in identifying words and nonwords. These findings were confirmed by Barker et al. (2013) in a study with children with ID in the upper primary grades. They found phonological awareness and naming speed to be related to reading abilities, suggesting that children with ID use the same phonological processing structures compared to children with NLA. In a similar vein, Soltani and Roslan (2013) found both phonological awareness and naming speed to be related to word decoding in a group of adolescents with ID, with PSTM supporting decoding abilities by influencing explicit phonological awareness skills. Furthermore, research on literacy skills in groups of children and adolescents with Down syndrome (DS) showed that this specific group is weak in linguistic processing (for a meta-analytic review, see Næss, Melby-Lervåg, Hulme, & Halaas Lyster, 2012). Both phoneme awareness and vocabulary turned out to be important for reading in this specific group. Kennedy and Flynn (2003), for example, found that in three children with DS aged 7 and 8 years old, their ability to get a grasp of phoneme awareness was related to better performances in literacy outcomes.

The studies above show that children with ID are lagging behind in literacy development, yet they may ultimately become phonologically aware and may have the possibility to unravel the orthographic code. An important question is then to what extent children with ID are capable of developing early literacy skills at kindergarten level and first grade and how the individual variation in early literacy in this heterogeneous group can be explained. Van Tilborg, Segers, van Balkom, and Verhoeven (2014) found that children with ID who possessed some letter knowledge skills, still had lower levels of early literacy skills as compared to their kindergarten peers with NLA. Within a group of children being marked as having an ID, variation in nonverbal reasoning levels in this study still significantly predicted early literacy skills, which especially applied to learning grapheme-to-phoneme correspondence rules. Nonverbal reasoning thus seemed to play an important role in the emergence of early literacy skills in children with ID, which is in support of Levy (2011), claiming that word decoding is a task that primarily relies on general cognitive resources that are often distorted in children with ID. Also, Catts, Fey, Tomblin, and Zhang (2002) found in their longitudinal study that nonverbal reasoning was related to differences in reading outcome in both groups of children with NLA and children with ID. This implies that visual-spatial and analytical skills that are tapped with nonverbal reasoning skills are involved in learning to read. In all, nonverbal reasoning can be seen as a cognitive predictor influencing literacy acquisition in both groups of children.

Furthermore, it has been found that phonological awareness and PSTM processes can affect early literacy acquisition in children with ID (Dahlin, 2011; Schuchardt, Maehler, & Hasselhorn, 2011). Moreover, abilities related to attention, working memory, and executive functioning also have found to be related to the development of early literacy in children with ID (Costanzo et al., 2013; Danielson, Henry, Messer, & Rönnerberg, 2012). In the field of research of literacy acquisition in children with ID, a comprehensive, comparative account on the cognitive and linguistic precursors of early literacy development in children with ID so far is generally lacking. No attempt has been made to relate precursor measures and early literacy measures at kindergarten level in children with ID

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