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Early identification and intervention for children with initial signs of reading deficits - A blinded randomized controlled trial

Susanne Volkmer*, Katharina Galuschka, Gerd Schulte-Körne

Department of Child and Adolescent Psychiatry, Psychosomatics and Psychotherapy, University Hospital, LMU Munich, Nußbaumstr. 5a, 80336 Munich, Germany

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ABSTRACT

Early identification of reading disorder (RD) can prevent a "wait-to-fail" situation and can increase the efficacy of subsequent interventions. In this study we identified children in the middle of first grade of German elementary schools who were at risk for RD and evaluated a subsequent phonics intervention. We assessed 234 children and randomly allocated those performing below the 30th percentile in a short standardized reading speed test to a six-week phonics (n = 29) or blinded motor control intervention (n = 26). Both interventions were implemented at school three times a week in small groups. Results showed that the first graders who had received the phonics instruction improved significantly in reading ability compared to the control group. Moreover, significantly more children in the control group exhibited RD than in the phonics group. This study provides the basis for developing school-based early identification and intervention programmes to remediate reading deficits and prevent RD.

1. Introduction

According to DSM-5 (American Psychiatric Association, 2013), specific learning disorders are defined by difficulties in the development of academic skills which are not the result of inadequate schooling, neurological, visual, or auditory impairment. The affected abilities lie significantly below the level that is to be expected due to chronological age. Specific learning disorder with impairment in reading, or reading disorder (RD), is characterized by deficits in word reading accuracy, reading fluency and/or reading comprehension (APA, 2013). The estimated percentage of children with RD ranges from 3.9% to 7.5% (Fortes et al., 2016; Landerl & Moll, 2010; Lewis, Hitch, & Walker, 1994). As reading is very important for social and occupational life and academic achievement in our society, deficits can have far-reaching consequences: Children with RD show more school difficulties and on average achieve a lower academic qualification than non-affected peers (McGee, Prior, Williams, Smart, & Sanson, 2002). Furthermore, RD shows high levels of comorbidity with attention deficit hyperactivity disorder (especially inattentive type), conduct disorder, anxiety disorders and depressive symptoms (McGee, Williams, Share, Anderson, & Silva, 1986; Ruland, Willmes, & Günther, 2012). It is generally acknowledged that repeated experiences of school failure can precipitate, maintain and intensify these associations (Maughan & Carroll, 2006) and that these differences appear at an early stage of literacy acquisition (Costa et al., 2013; Gooch, Hulme, Nash, & Snowling, 2014). This reinforces the need for early identification and intervention for children at risk of RD.

1.1. Early identification

Longitudinal studies have found high stability of reading development from first grade into adulthood (Ferrer et al., 2015; Klicpera, Schabmann, & Gasteiger-Klicpera, 2006; Kohn, Wyschkon, Ballaschk, Ihle, & Esser, 2013; Landerl & Wimmer, 2008; McGee et al., 2002). This means that reading deficits can affect children for their whole lives. However, it also means that early reading skills can be used to identify students at risk of RD (Compton, Fuchs, Fuchs, & Bryant, 2006).

Precursors of reading, such as rapid automatized naming (RAN, the ability to quickly name a series of items, e.g. colour patches, pictures or familiar objects), vocabulary knowledge, letter knowledge or phonological processing (the ability to perceive, store, and manipulate segments of language like phonemes and syllables) can be used for a very early risk identification in kindergarten or preschool. They show a moderate predictive value for later reading development (Ennemoser, Marx, Weber, & Schneider, 2012; Georgiou, Parrila, & Papadopoulos, 2008; Wilson & Lonigan, 2010), which is influenced by the consistency

* Corresponding author.
E-mail addresses: Susanne.Volkmer@med.uni-muenchen.de (S. Volkmer), Katharina.Galuschka@med.uni-muenchen.de (K. Galuschka), Gerd.Schulte-Koerne@med.uni-muenchen.de (G. Schulte-Körne).

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of the particular orthography that the child is acquiring (Landerl, Ramus, Moll, Lyytinen, Leppanen, et al., 2013; Lerner & Lonigan, 2016; Moll et al., 2014; Ziegler et al., 2010). In transparent orthographies, which have a rather consistent mapping between letter (grapheme) and sound (phoneme, e.g. German, Italian, Finnish or Spanish), the predictive value of precursor measures has been found to be lower than in non-transparent orthographies like English (Georgiou et al., 2008; Landerl et al., 2013; Mann & Wimmer, 2002; Mayer & Motsch, 2015; Ziegler et al., 2010). Furthermore, although early identification of children at risk for RD in kindergarten and subsequent training is important, these attempts must be continued once children start formal schooling.

Screening in first grade has the advantage that reading ability itself as the best predictor for later reading ability can be included (Compton et al., 2006). In transparent orthographies, the assessment of reading speed seems to provide a reliable measure to identify children at risk of RD from first grade on (Landerl & Wimmer, 2008). Children that learn to read in a transparent orthography achieve a high level of reading accuracy during first grade and mainly improve in reading speed during the following years (de Jong & van der Leij, 2002; Landerl & Wimmer, 2008; Seymour, Aro, & Erskine, 2003; Ziegler & Goswami, 2005), probably due to highly consistent grapheme-phoneme correspondences. Early individual differences in reading speed can therefore serve as a reliable predictor of later reading skills. Landerl and Wimmer (2008) followed children acquiring the German orthography for eight years and found a high predictive value and stability of word recognition speed. Desimoni, Scalisi, and Orsolini (2012) published a similar result: Reading speed of Italian first graders was the most reliable predictor of later individual differences in third grade literacy. In line with these results, Spanish dyslexic children showed a stronger deficit in reading speed than in reading accuracy (Serrano & Defior, 2008). These longitudinal studies show the high potential of measuring reading speed for early risk identification. Additionally, measures of reading speed are easy and relatively quick to administer and therefore not only enable a valid and reliable but also a practical and time-saving screening for students at risk of RD and the implementation of specific intervention before reading problems become too severe.

1.2. Early intervention

Early reading interventions targeting first-grade children with mild RD or at risk of RD have shown higher effects in improving literacy skills than interventions starting later with more severely impaired participants (Ehri, Nunes, Stahl, & Willows, 2001; Galuschka, Ise, Krick, & Schulte-Körne, 2014). The Response-to-intervention (RTI) model, which has its origins in the USA and is also applied in Finland and Canada (Björn, Aro, Koponen, Fuchs, & Fuchs, 2016; Ekstam, Linnanmäki, & Aunio, 2015; McIntosh et al., 2011; Thuneberg et al., 2013), is based on the idea of intervening before deficits in school become severe (Berkeley, Bender, Peaster, & Saunders, 2009; Fuchs, Fuchs, & Compton, 2012). The model relies on evidence-based intervention programmes (Fuchs & Fuchs, 2006) and consists of three different tiers, which are built one upon the other. Tier 1 comprises a detailed evaluation and consideration of the instructional methods and the children's learning progress in class, starting with the beginning of formal instruction in school. Children who show some form of difficulties in school, e.g. in learning to read, temporarily receive more intense instructions mostly within a small group setting (Tier 2). They only continue to Tier 3 if they are unresponsive to Tier 2. Tier 3 consists of extra-curricular, individualized instructions designed for children with learning disabilities. Following this approach, it is possible to identify struggling readers early, react with effective support and thus prevent substantive performance deficits (Torgesen, 2009; Vellutino, Scanlon, Small, & Fanuele, 2006). Frustration caused by reading performance deficits can negatively impact reading motivation while reading motivation, in turn, influences reading ability (Logan, Medford, & Hughes, 2011; Morgan & Fuchs, 2007). Early intervention can interfere in this negative circle. One positive example is an RTI-model that has been implemented on the Canary Islands for Spanish at-risk readers from preschool to second grade. The programme showed small but significant effects on reading performance and decreased the number of at-risk children significantly (Jiménez et al., 2010). In Germany, however, like in many other European countries, established models of early screening and subsequent intervention for children with initial reading deficits are rare, mostly not evidence-based and have only been implemented in a minority of schools (Mahlau et al., 2014).

A comparative study by Ise et al. (2011) showed that support systems for poor readers are not sufficiently implemented in European school systems. Instead, deficits are identified when they have already become manifested by significant problems, because children must first demonstrate failure to receive educational support (Grosche & Volpe, 2013). Often, remedial teaching is performed by offering extra lessons, but clustering students with specific reading problems is not a common practice (Ise & Schulte-Körne, 2010). A more intense intervention in small groups or individual setting, which generally does not take place at schools, is only provided to children who meet formal diagnostic criteria and therefore qualify for services (e.g. severe reading deficits combined with emotional problems, Grosche & Volpe, 2013). Such a wait-to-fail model leads to a loss of valuable time, because reading problems become more difficult to remediate the longer a child has struggled with reading (Ehri et al., 2001). Therefore, there is a need for early, evidence-based identification and subsequent support for children at risk of RD.

In Germany, many intervention programmes for children at risk of RD focus on phonological awareness training. Phonological awareness (PA) refers to the ability to focus on and manipulate phonemes in spoken words. Interventions usually train phoneme recognition, phoneme segmentation or phoneme deletion in spoken words (National Institute of Child Health and Human Development, 2000). Research has shown that in preschool years, this can have beneficial effects on children's later reading and writing development, in the context of the home learning environment (e.g. Niklas & Schneider, 2017) or kindergarten (e.g. Schneider, Visé, Reimers & Blaesser, 1994; Schneider, Ennemoser, Roth, & Küspert, 1999), especially if PA trainings are combined with exercises that train grapheme-phoneme-correspondence skills (Schneider, Roth, & Ennemoser, 2000). However, once children start learning to read, studies report limited effects on reading performance, even more so in transparent orthographies (Mann & Wimmer, 2002; McArthur et al., 2012; Wolf, Schroeders, & Kriegbaum, 2016). The RTI model (Fuchs & Fuchs, 2006) focuses on evidence-based interventions like phonics training, which concentrates on letter-sound correspondence and syllable analysis and synthesis and has been found to be most effective for improving reading (Ehri et al., 2001; Galuschka et al., 2014). Phonics training is closely related to PA training. However, in contrast to the oral PA training, phonics training focuses on teaching grapheme-phoneme correspondences, e.g. convert letters into sounds, blend the sounds, and transform sounds into letters (National Institute of Child Health and Human Development, 2000).

Although positive effects of phonics interventions for first-grade children at risk for RD have repeatedly been shown during the last decades in English-speaking-countries, very little research has been conducted in more consistent orthographies like German. The few existing studies that have tried to prevent RD in first grade with phonics intervention in the context of a consistent orthography present promising results (Houtveen & van de Grift, 2012; Lyytinen, Erskine, Hämäläinen, Torppa, & Ronimus, 2015).

Before reading becomes faster, grapheme-phoneme correspondence rules have to be sufficiently automatized (Torgesen, 2002). According to the self-teaching hypothesis (Share, 1995), phonological decoding (letter by letter) is regarded as critical for successful reading acquisition. Repeated decoding leads to building up word-specific representations or representations for larger units (e.g. syllables).