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Effects of reading and spelling predictors before and after school entry: Evidence from a German longitudinal study

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ABSTRACT

Previous studies indicate that the effectiveness of reading and spelling predictors in transparent orthographies is affected by the onset of literacy training at school entry. In this longitudinal study with 65 German speaking children, the effects of literacy predictors on reading and spelling abilities were compared before and after school entry. Phonological awareness, letter sound knowledge, and rapid naming were assessed before and after school entry. In addition, reading and spelling abilities were assessed at the end of first grade. Path model analyses showed that letter sound knowledge before school entry predicted reading and spelling at the end of first grade, while rapid naming after school entry predicted reading but not spelling abilities. This study shows that the onset of schooling influences the predictability of early literacy predictors and indicates that with the onset of formal literacy education, predictors representing automaticity in serial processing increase in significance for reading abilities.

1. Introduction

Reading and writing are two important cultural skills that support children's independence and foster social integration and career opportunities throughout the life span (Cunningham & Stanovich, 1997). Several precursor skills have been identified across languages which predict early reading and spelling abilities. Early word reading or decoding abilities in turn are precursors for more advanced reading abilities like reading comprehension (see i.e., Caravolas et al., 2012; Van Viersen, de Bree, Zee, Maassen, van der Leij, de Jong, 2018).

The most regularly identified predictors of early reading abilities are phonological awareness (i.e., rime awareness, phoneme awareness), letter sound knowledge and rapid naming (e.g., Caravolas et al., 2012; Caravolas, Lervag, Defior, Málková, & Hulme, 2013; Castles & Coltheart, 2004; Ennemoser, Marx, Weber, & Schneider, 2012; Georgiou, Papadopoulus, & Kaizer, 2014; Georgiou, Parrila, Cui, Papadopoulus, 2013; Hulme, Nash, Gooch, Lervåg, & Snowling, 2015; Leppänen, Aunola, Niemi, & Nurmi, 2008; Lervag, Lyster, & Hulme, 2012; Muter, Hulme, Snowling, & Stevenson, 2004; Näslund & Schneider, 1996; Schatschneider, Fletcher, Francis, Carlson, & Foorman, 2004; Torppa, Lyytinen, Erskine, Eklund, & Lyytinen, 2010; Ziegler et al., 2010). Phoneme awareness, letter sound knowledge and rapid naming have, furthermore, been connected to spelling (Caravolas et al., 2012; Caravolas, Hulme, & Snowling, 2001; Moll et al., 2014).

In addition, it is known that various subcomponents of early reading (i.e., word reading ability, reading fluency) and spelling abilities are predicted by different predictors (Ziegler et al., 2010; Leppänen et al., 2008; Moll et al., 2014; Muter et al., 2004; van Viersen, de Bree, Maassen, van der Leij, & de Jong, 2018). For example, early word reading and spelling abilities are predicted by phonological awareness and letter sound knowledge (e.g., Caravolas et al., 2001; Caravolas et al., 2012; Caravolas, Lervåg, Defior, Málková, & Hulme, 2013) while reading fluency is additionally explained by rapid naming (e.g., Moll et al., 2014; Ziegler et al., 2010; van Viersen et al., 2018).

The significance of phonological awareness, letter sound knowledge and rapid naming on reading and spelling abilities is consistent across alphabetic languages. However, the trajectories of reading and spelling acquisition differ as a function of language transparency (Caravolas et al., 2012, 2013; Ziegler et al., 2010; Ziegler & Goswami, 2005) and educational environment (Holopainen, Ahonen, Tolvanen, & Lyytinen, 2000). For example, the effect of phonological awareness on reading and spelling has been found to be stronger in opaque than transparent orthographies (Leppänen et al., 2008; Mann & Wimmer, 2002; Moll et al., 2014; Ziegler et al., 2010).

While evidence on the trajectories of literacy development in different orthographies is increasing (i.e. Caravolas et al., 2013; Moll

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et al., 2014), studies on the influence of changes in the educational environment on the trajectory of predictors and literacy outcomes are still scarce. Most studies on reading and spelling predictors have been conducted after the onset of formal literacy education (Caravolas et al., 2001, 2012; Moll et al., 2014; Murphy & Farquharson, 2016; Ziegler et al., 2010) and longitudinal studies which study development across school entry did not compare the predictability of different precursor skills before and after school entry (i.e., Hulme et al., 2015; Torppa et al., 2010).

However, there is some evidence that suggests that the effects of precursor abilities vary as a function of institutional change, especially in educational environments where educational traditions differ strongly before and after school entry. For example, Caravolas et al. (2013) studied growth patterns of word-picture-matching abilities in Czech, Spanish and English-speaking children living in the Czech Republic, Spain and the U.K. During the course of the study, Czech and Spanish speaking children entered school, while English speaking children already attended school. Results show that growth patterns increased strongly in Czech and Spanish speaking children as a function of school entry but remained linear in English speaking children. In line with this finding, the predictors explaining these growth patterns might also change as a function of school entry.

For example, letter sound knowledge, a common predictor of reading abilities (i.e., Castles & Coltheart, 2004; Leppänen et al., 2008; Schatschneider et al., 2004), is the bedrock of early alphabetic training in the first years of reading and spelling education. However, it is not clear how and when letter knowledge is acquired and how it develops in educational environments in which it is not mandatory to train letter knowledge before school entry, (i.e., Goswami, Ziegler, & Richardson, 2005; Leppännen et al., 2008; Mann & Wimmer, 2002; Treiman & Kessler, 2014). It can be expected, that letter knowledge is an important predictor of reading and spelling abilities, especially in transparent orthographies, in which children rely on phoneme-based processing early in the reading acquisition process (i.e., Ziegler & Goswami, 2005). However, variability in letter sound knowledge is likely to decrease rapidly after school entry, when formal instruction of grapheme-phoneme correspondences begins and, thus, the influence of letter sound knowledge as a predictor of reading and spelling should become less important.

The opposite trajectory would be expected for predictors that are directly connected to cognitive processing mechanisms in reading or spelling and, thus, share a reciprocal relation with those abilities. For example, the relation between rapid naming and reading has been explained by the shared nature of serial processing in both abilities (Georgiou, Parrila, Cui, & Papadopoulos, 2013). This type of processing is likely to be fostered by reading acquisition and, thus, should increase in importance with the onset of formal reading instruction. It is unclear, however, whether the same trajectory can also be observed with regard to spelling: Studies with children in 4th grade (Moll et al., 2014) suggest that rapid naming is a significant predictor of spelling, but there are no comparable studies investigating the predictive effects of rapid naming on spelling at earlier stages of development.

A similar developmental trajectory can be expected for children's phonological awareness skills. It is well established that the introduction to letters in school fosters phoneme awareness (Castles & Coltheart, 2004; Lervåg, Lyster, & Hulme, 2012; Mann & Wimmer, 2002) and beginning reading in transparent orthographies typically relies heavily on phoneme-based processing (not rime-based processing; Goswami et al., 2005). Phoneme awareness has been identified as an early predictor of spelling abilities in English (Caravolas et al., 2001), but, again, there are no comparable studies with children that do not receive literacy training before school entry. This might be partially due to the fact that phoneme awareness is particularly difficult to assess in these particular circumstances (Castles & Coltheart, 2004; Mann & Wimmer, 2002). In contrast to phoneme awareness, rime awareness, which should be well developed even before school entry (Castles & Coltheart, 2004; Mann & Wimmer, 2002) should decrease in its influence on reading abilities, although it is unclear whether this also holds for spelling.

In summary, it is likely that the effects of different precursor abilities on reading and spelling skills diverge before and after school entry in transparent orthographies and in educational environments in which no strong emphasis is placed on teaching literacy skills before school entry. However, the question how these precursor skills develop and at which time they are particularly important for the development of later reading and spelling skills is of high practical relevance. The aim of this study was, thus, to compare effects of predictors of reading abilities before and after school entry in children that were learning to read in a transparent orthography, in an educational environment were literacy training differs strongly before and after school entry. In addition, as predictive effects on spelling have not been studied extensively in transparent languages, we also included children's early spelling skills as an additional outcome variable.

We conducted a study with young German children, who grow up in an educational environment with no obligation to teach literacy skills (i.e. letter-sound-correspondences) before school entry. We assessed rime awareness, phoneme awareness, letter sound knowledge and rapid naming as predictors at two time points before and one time point after school entry. Fundamental (word-picture-matching) and advanced (reading fluency) reading abilities as well as spelling abilities were assessed at a fourth time point at the end of first grade. We investigated whether predictors were stable across time and compared their effects on reading and spelling abilities before and after school entry using path model analysis. We assumed that predictive effects of letter sound knowledge and rime awareness on reading abilities decrease across school entry, while effects of phoneme awareness and rapid naming would increase. Furthermore, we explored the development of predictive effects on spelling.

2. Method

2.1. Participants

Data reported here are part of the longitudinal project PLAiT, which investigated the literacy development of 104 young children across school entry. The children were recruited from seven Early Childhood Education and Care (ECEC) institutions in Berlin, Germany. A signed consent form of a primary care giver was a necessary condition for participation.

In Germany there is no grade-system before school entry. Children start first grade with school entry. Educators in ECEC institutions have an unsolicited guideline with regard to teaching contents, that, at the time of the study, did not include teaching reading, letters or phonological awareness but text familiarity (i.e., contact to text, joined picture-book reading sessions; Senatsverwaltung für Bildung, Jugend und Wissenschaft, 2014). Teachers in elementary school, on the contrary, follow a well-defined curriculum that includes teaching letter-sound correspondences (phonics approach), reading, and spelling (i.e., Senatsverwaltung für Bildung, Jugend und Wissenschaft, 2017).

Background information (parental questionnaire) and general language and cognitive abilities of children were collected six months prior to the first assessment (T0). Various reading predictors were assessed ten and four months before school entry (T1-T2) and two months after school entry (T3). Literacy abilities were assessed ten months after school entry (T4).

Drop-out rates due to organizational reasons (i.e., moving away, not able to participate at one or more of the measurement points due to absence or illness) were in a range that is typical for longitudinal studies with kindergarten children: Only 17 children (16% overall, i.e. ~ 3–5% at each measurement points) dropped out across the five measurement points (T0-T4). However, school entry in Berlin is only loosely regulated and parents have the option to decide whether their