



The road to reading for South African learners: The role of orthographic depth



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ABSTRACT

The study examined profiles of reading skills and cognitive skills for South African children from schools that differed in opacity of medium of instruction. The sample included 122 third graders instructed in Afrikaans (transparent language), 109 in Setswana (transparent), and 127 in English (opaque). The link between cognitive skills (short-term memory and working memory) and reading comprehension was expected to be mediated by phonological awareness, word fluency, text fluency, and vocabulary. Multigroup invariance analyses revealed differences in strength of relations between cognitive skills and reading skills across mediums of instruction. For English, phonological awareness played a smaller and vocabulary a larger role compared to Afrikaans and Setswana, largely in line with theories on orthographic depth and reading; furthermore, predictors of reading comprehension showed weaker interrelations in Afrikaans and Setswana. Our study stresses the need to align reading instruction with orthography.

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1. Introduction

Requirements for becoming a skilled reader may depend on orthography (Aro & Wimmer, 2003; Georgiou, Torppa, Manolitsis, Lyytinen, & Parrila, 2012; Ziegler et al., 2010). We focus on profiling reading skills as it is an important prerequisite for appropriate reading instruction and improvement. In our study context, profiling refers to the combination of information from assessments of several reading components to create an overview of learners' strengths and needs (Chall, 1994; McShane, 2005). Knowledge of profiles is particularly relevant in a multilingual setting like South Africa where languages with both shallow and deep orthographies are used. By studying reading profiles for Grade 3 learners from South African schools with different opacities in medium of instruction (i.e., Afrikaans, English, and Setswana), we address the relations between orthographic depth, various reading skills and cognitive skills.

1.1. Reading literacy in South Africa

The present study also has an important applied component. The current South African school context poses a serious challenge for many learners. Low reading literacy levels are found across all language groups and across all phases of the educational system, from the foundation phase up to university level (Nel, Dreyer, & Kopper, 2004; Republic of South Africa, Department of Basic Education, 2002, 2010a, 2010b; Republic of South Africa, Department of Education, 2008). South African learners perform poorly in international comparisons (Howie, Van Staden, Tshela, Dowse, & Zimmerman, 2012; Moloi & Chetty, 2010; Mullis, Martin, Kennedy, & Foy, 2007). There are a number of factors that contribute to a suboptimal learning environment for many South African children. Eleven official languages combined with an educational system that for many schools requires only English-medium instruction from Grade 4 regardless of a child's mother tongue, form a possible threat to scholastic achievement (Brock-Utne & Holmarsdottir, 2004). In addition, teacher training frequently fails to meet the required standards, leaving major concerns for the quality of education in South Africa (Republic of South Africa, Department of Education, 2008; Van Staden & Howie, 2009). Profiling reading skills for various language groups could highlight children's challenges and opportunities for improvement in one of the key areas of academic performance (Alexander, 2005; Pretorius & Mchet, 2004). Such improvement is a goal not only of the South African Department of Basic Education (Republic of South Africa, Department of Basic Education,

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2010a), but also of UNESCO's Education for All campaign (UNESCO, 2005, 2006).

1.2. Reading development

The development of reading skills has been extensively described (e.g., Adams, 1990; Ehri, 2005; Hudson, Torgesen, Lane, & Turner, 2012). Letter knowledge (Adams, 1990), phonological awareness (Melby-Lervåg, Lyster, & Hulme, 2012), and rapid automatized naming (Powell, Stainthorp, Stuart, Garwood, & Quinlan, 2007) have been identified as requirements for reading acquisition (Georgiou et al., 2012). Fluent reading of single words predicts reading fluency in passages (Hudson, Pullem, Lane, & Torgesen, 2009). In order to comprehend a written text, a child is not only required to read fluently (Petscher & Kim, 2011), but also to have sufficient oral language skills, such as an adequate vocabulary and listening comprehension (Nation & Snowling, 2004; Pearson, Hiebert, & Kamil, 2007; Verhoeven & Van Leeuwe, 2008; Wise, Sevcik, Morris, Lovett, & Wolf, 2007). The current study takes a close look at an important set of these reading skills, namely phonological awareness, word fluency, text fluency, vocabulary, and reading comprehension (Snow, Burns, & Griffin, 1998). This implies that both print-based skills (such as phonological awareness) as well as meaning-based skills (such as reading comprehension) are captured by the term "reading skill".

1.3. Transparent and opaque orthographies

An orthography is considered transparent (shallow or consistent) when the grapheme–phoneme correspondence is high, such as for Finnish or Greek; an orthography is seen as opaque (deep or inconsistent) when this correspondence is low, such as for English (Georgiou et al., 2012; Seymour, Aro, & Erskine, 2003). Dutch, the language from which Afrikaans originates, is classified as having an intermediate orthographic depth (Patel, Snowling, & de Jong, 2004; Seymour et al., 2003). Afrikaans is considered more transparent than Dutch (Gooskens & van Bezooijen, 2006), as it has a more systematic phonological and orthographic structure (Cockroft, Broom, Greenop, & Fridjohn, 2001; De Sousa, Greenop, & Fry, 2011). The grapheme–phoneme correspondence in the Bantu language of Setswana is high, yet many initial consonants contain two or three letters, thereby increasing complexity (Lekgoko & Winskel, 2008). Both Afrikaans and Setswana can be considered as transparent when compared to English.

1.4. Theories on orthographic depth and reading

Deeper orthographies require more complex pathways to reading, which can lead to slower literacy acquisition (Georgiou, Parrila, & Papadopoulos, 2008; Seymour et al., 2003; Ziegler & Goswami, 2005; Ziegler et al., 2010). According to the *Psycholinguistic Grain Size Theory* (PGST; Goswami, 2008; Ziegler et al., 2010; Ziegler & Goswami, 2005), readers of transparent orthographies can focus on relatively small grain sizes (units), such as graphemes, in order to successfully read words or text as each grapheme tends to contribute to a word in a predictable manner. However, more opaque orthographies require analyses of larger grain sizes (such as rimes, syllables or even whole words) to make sense of words or text, because small grain sizes such as graphemes do not consistently correspond with the same phoneme across different words (e.g., *ou* in *house* and *rough*).

PGST overlaps with earlier theories such as the *Orthographic Depth Hypothesis* (ODH; Katz & Frost, 1992). Whereas PGST focuses on one (phonological) route for reading, ODH proposes two routes: a phonological (nonlexical) and an orthographical (lexical, visual) route. The former is applied in transparent languages; the latter is applied in opaque languages, where children need to rely on whole word recognition. Despite the theoretical differences between PGST and ODH in suggested mechanisms, both theories relate reading development to

the transparency and granularity of languages (Perfetti, Cao, & Booth, 2013).

In line with theories on orthographic depth, it has been suggested that phonological awareness only contributes to children's reading in the very early stages of learning to read a consistent orthography. These children generally read above 90% accuracy after the first year of formal education, implying that phonological awareness is sufficiently developed in these readers and quickly loses its capacity to predict reading skills over time (Babayigit & Stainthorp, 2011; Furnes & Samuelsson, 2010; Seymour et al., 2003). Although studies have also shown a contribution of phonological awareness to reading in opaque orthographies (e.g., Katzir, Schiff, & Kim, 2012; Ziegler, Van Orden, & Jacobs, 1997; Ziegler et al., 2010), other studies have stressed that this role is only minor due to the low grapheme–phoneme correspondences (Ellis et al., 2004; Katzir et al., 2012). The above implies that the contribution of phonological awareness may be small or even nonsignificant for both transparent and opaque languages after the first grades (i.e., the initial phases of learning to read), but for different reasons.

For opaque orthographies, vocabulary has been shown to have a stronger relation with reading than is the case for more transparent orthographies (Katzir et al., 2012; Nation & Snowling, 2004; Ziegler & Goswami, 2005). Analyzing small units within words is not sufficient to identify words of a deep orthography; analysis of larger grain sizes, particularly of whole words, is needed. Hence, vocabulary knowledge strongly benefits reading an opaque orthography.

The prediction that patterns of reading skills vary with orthography has not consistently been supported, as some studies did not find such differences (McBride-Chang & Kail, 2002; Patel et al., 2004) or suggest that measurement characteristics such as ceiling effects in phonological awareness tasks can lead to an underestimation of the effect of phonological awareness on reading skills in transparent languages beyond the early stages of reading (Caravolas, Volin, & Hulme, 2005).

The current study creates reading profiles for Grade 3 children across three orthographies (i.e., Afrikaans, English, and Setswana) and examines these by comparing the *structure* and *strength* of the associations between the reading and cognitive skills. The interpretation of similarities and differences is guided by the theories on orthographic depth. Although most literacy studies have focused on the English language, there is no reason to assume that the *structure* (i.e., the general pattern) of relations among skills that contribute to reading would differ across languages. However, the *strength* of these relations may depend on the orthography in question, in line with theories on orthographic depth.

1.5. Cognitive skills

1.5.1. Short-term memory

In addition to specific skills, such as phonological awareness and vocabulary, general cognitive skills have also been found to contribute to individual differences in reading performance (e.g., Swanson & Howell, 2001). The relevance of these skills could vary with orthographic complexity. Short-term memory has mainly been found to contribute to new word learning (Baddeley, Gathercole, & Papagno, 1998; Gathercole, 1995, 2006; Jarrold, Thorn, & Stephens, 2009), particularly for words in the opaque English language. However, there is some evidence that the link may also be present in less opaque languages, such as Luxembourgish and German (Engel de Abreu & Gathercole, 2012). The mechanism underlying the relation between short-term memory and reading skills is, however, subject of discussion (Melby-Lervåg, 2012; Melby-Lervåg et al., 2012). Some state that phonological memory is a predictor of word reading and word acquisition merely because of its shared variance with phonological awareness (Durand, Hulme, Larkin, & Snowling, 2005; Jarrold et al., 2009; Melby-Lervåg et al., 2012), whereas others have shown that for young children, the contribution of the phonological loop and of phonological awareness can be distinguished (Alloway, Gathercole, Willis, & Adams, 2004; Gathercole,

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