The purpose of this investigation was to explore systematically the relationship of phonological processing, morphological knowledge, and orthographic knowledge to spelling performance independent of visual memory in elementary school children with and without language impairment. After controlling for age, nonverbal intelligence, articulation, and visual memory, oral language, and orthographic knowledge contributed uniquely to spelling performance for children with typical language, but only morphological knowledge contributed uniquely to spelling performance of children with SLI. Interaction effects of linguistic variables and language group status were not statistically significant; although examination of the individual models for children with SLI and children with typical language revealed differences in the types of knowledge that predicted spelling in each group. The results indicate that spelling instruction should take into account children’s linguistic knowledge and explicitly relate their linguistic knowledge to spelling. It likely is necessary to teach spelling to children with language impairment using approaches that may differ in some ways from those used to teach spelling to children with typical language.

More than 40 years of research has confirmed the linguistic basis of literacy (e.g., Catts et al., 2002; Mattingly, 1972). Studies that have examined the contribution of language to literacy have focused almost exclusively on reading with much less systematic focus on spelling (e.g., Catts et al., 2002). To fully understand literacy, there is a need to investigate the linguistic basis of spelling separately from the linguistic basis of reading.

Spelling has long been considered a skill that primarily relies on visual memory. Despite a continued focus on memorization in the teaching of spelling, there is evidence that children as early as preschool recognize that a link exists between print and speech and attempt to represent various linguistic properties of words in their spellings. Proliferate children who struggle to learn to spell words (and thus little visual memory of words) demonstrate the ability to produce phonetically plausible spellings of words (Read, 1971, 1986). In addition, visual memory deficits do not appear to characterize poor spellers. Adults who are good readers but poor spellers do not have impaired visual memory compared to adults who are good readers and good spellers (Holmes, Malone, & Reddenbach, 2008).

Researchers have begun to explore the role of linguistic knowledge in spelling, but most studies have addressed only one area of linguistic knowledge. The roles of phonological processing, morphological knowledge, and orthographic knowledge have been the focus in most studies of the development of English spelling (Bourassa & Treiman, 2001). With few exceptions (e.g., Apel et al., 2012; Walker & Haukas, 2006), most studies of the linguistic basis of English spelling have evaluated the role that each type of linguistic knowledge plays in isolation.

In addition, the spelling of children with SLI differs from spelling of children with typical language both quantitatively (i.e., number of spelling errors) and qualitatively (i.e., types of spelling errors). Evidence from multiple investigations suggests that these differences arise from differences in linguistic knowledge (e.g., MacDowell & Doddrell, 2004; Stillman, 2006).

The purpose of this investigation was (a) to consider concurrently the contribution of phonological processing, morphological knowledge, and orthographic knowledge to spelling in children with and without language impairment, (b) to identify the linguistic predictors of spelling for children with typical language to linguistic predictors of spelling for children with SLI, and (c) to examine the interplay among the linguistic predictors of spelling for children with typical language to linguistic predictors of spelling for children with SLI.

**METHOD**

**Participants**

Participants were 32 children with SLI (M age = 8.9, SD = 12 months; 8 boys, 24 girls), 10 children with typical language (M age = 9.4, SD = 12 months; 6 second graders, 17 third graders, 7 fourth graders), and 40 children with typical language (M age = 9.4, SD = 12 months; 16 second graders, 17 third graders, 7 fourth graders). Children with diagnoses other than speech and language impairment, reading, and/or writing impairment (i.e., cognitive impairment, autism, hearing loss) were excluded. All children passed a hearing screening bilaterally prior to testing and spoke English as a first language. Children in the typical language group 85 and above and children in the SLI group scored below 85 on the Core Language Index of the Clinical Evaluation of Language Fundamentals-Fourth Edition (CELF-4; Semel et al., 2003).

**Procedures**

Participants completed a language, reading, and writing assessment battery.

**Assessment Battery**

- Test of Written Spelling-4
- Comprehension Test of Phonological Processing
- Test of Written Language-4
- Arizona Articulation Profile-3 Scale
- Wide Range Assessment of Memory and Learning-2

**Target Measures**

- Morphological Knowledge
- Phonological Knowledge
- Orthographic Knowledge

**Predictor Measures**

- Phonological Processing
- Comprehension Test of Phonological Processing
- Morphological Knowledge
- Test of Written Language-4
- Arizona Articulation Profile-3 Scale
- Wide Range Assessment of Memory and Learning-2

**Phonological Processing**

- CTOPP Blending Words
- CTOPP Memory for D ignite
- CTOPP Nonword Repetition-3
- CTOPP Rapid Letter Naming

**Morphological Knowledge**

- TMS Decomposition

**Orthographic Knowledge**

- PAL-3 Short Letter Sounds
- PAL-3 Long Letter Sounds
- PAL-3 Letter Boundaries

**RESULTS**

**Does phonological processing, morphological knowledge, and/or orthographic knowledge uniquely predict spelling in elementary school children with typical language?**

- No.

**Does phonological processing, morphological knowledge, and/or orthographic knowledge uniquely predict spelling in elementary school children with language impairment?**

- No.

**Does linguistic knowledge interact with group membership to predict spelling?**

- No.

**DISCUSSION**

The present investigation was to examine concurrently the relative contributions of phonological processing, morphological knowledge, and orthographic knowledge to spelling performance of children with and without language impairment in the elementary grades. The results indicate that morphological knowledge predicts spelling in children in the elementary grades.

Overall, the multiple regression model for children with typical language explained almost 60% of the variance in spelling performance. The linguistic knowledge variables accounted for almost 50% of the variance in spelling performance for children with typical language. In contrast to the philosophy that drives much spelling instruction, visual memory did not contribute unique variance to spelling (only about 3%). Orthographic knowledge was a significant predictor of spelling performance in children in the elementary grades, accounting for almost 23% of the total variance. In addition, morphological knowledge was a unique predictor of spelling performance, accounting for almost 16% of the total variance. Somewhat surprisingly, particularly given the focus that phonological processing has received in the literature and in the classroom, it was not a unique predictor of spelling for children with typical language.

Overall, the multiple regression model for children with language impairment explained almost 70% of the variance in spelling performance. The linguistic knowledge variables accounted for almost 40% of the total variance, indicating that for children with language impairment (like children with typical language) linguistic knowledge is a strong predictor of spelling performance. The only unique linguistic predictor of spelling for children with language impairment was morphological knowledge, accounting for 17.1% of the total variance.

Contrary to our hypothesis, interactions of linguistic variables and language group membership were not significant. However, the examination of the relative contribution of each linguistic variable to spelling performance for each group suggested that there may be some differences that were not captured by our overall multiple regression interaction model. For example (i.e., age, nonverbal intelligence, articulation, and visual memory) accounted for 10.8% of the total variance and none of the control variables contributed significant unique variance to spelling performance. In contrast, control variables accounted for 32.1% of the total variance for children with language impairment, and articulation contributed significantly to the unique variance in the spelling performance of children with language impairment (17.4% of the total variance). Thus, children with language impairment may rely more on nonlinguistic skills when they spell than children with typical language.

At least some types of linguistic knowledge predict spelling for children with and without language impairment; however, typical spelling instruction in elementary schools appears to explicitly connect visual memory and written language (see Schlag, 2002). Because children with language impairment are less accurate at spelling words, particular attention on how to effectively teach spelling to this population is warranted. Future research should evaluate empirically the effectiveness of linguistic spelling instruction for children with SLI. Spelling instruction for children with SLI should focus on improving linguistic knowledge that is used by children to spell words and explicitly teach about the links between spoken and written language.

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