Improving children's spelling ability with a morphology-based intervention

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Abstract

Children who have difficulty with literacy development often experience pervasive and enduring trouble with spelling, even after receiving remedial instruction. Our study tests a new approach to improving the spelling of these children. We designed an instructional program emphasizing the morphological structure of words, and directly contrast its benefits to instruction that focuses on word meanings, avoiding any discussion of morphology. The intervention was conducted with French-speaking children in Grades 3 and 5 with varying literacy abilities. The results reveal that our intervention improved the spelling of all children in the study, but it was especially effective for children who displayed low spelling performance. Moreover, low-performing spellers who received the morphology instruction showed a greater improvement in their spelling of suffixes than children who participated in the vocabulary instruction. Our findings suggest that spelling instruction concentrated on morphological structure may be a powerful tool for improving children's spelling ability.

Keywords: morphology; spelling; literacy; vocabulary; intervention; French

Introduction

Learning to spell is an essential component necessary for gaining a complete command of written language. While literacy research traditionally concentrates on reading development, recently, a shift in focus to the development of spelling skill has emerged (cf. Griva & Anastasiou, 2009). This shift in emphasis is particularly important for studies of poor reading and dyslexia, as spelling difficulties are closely entwined with reading impairment. For example, spelling difficulties observed in dyslexic children are often more profound than problems with reading (e.g., Bodor, 1973). Additionally, Egan and Taintier (2011) indicate that it is rare to find children who experience reading difficulty but have typical spelling ability, while it is much more common for children who have typical reading levels to have poor spelling ability. An increased understanding of the processes that underlie spelling development will have direct and substantial consequences for children experiencing reading difficulty.

Traditional interventions for reading impairment target children's phonological awareness skills, as phonological processing is an instrumental cognitive process for reading in an alphabetic language (for reviews, see Adams, 1990; Goswami & Bryant, 1990). However, certain languages, including French, are morpho-phonological. This means that in addition to phonology, morphological information is also represented in the written form. As such, morphological processing (e.g., recognizing that the word *reheatable* is made up of three sub-parts, the prefix *re-*, the stem *heat*, and the suffix *-able*) is an important part of reading in these languages.

The importance of morphological processing to literacy skill is supported by studies reporting that increased morphological awareness is associated with better spelling performance in English and French (Deacon, Kirby, & Casselman-Bell, 2009; Sénéchal, 2000). Additionally, teaching typically developing children explicitly about the relationship between morphological structure and spelling has been shown to improve their reading and spelling skill (see Bowers, Kirby, & Deacon, 2010, for a review). Importantly, research indicates that morphological processing skills remain intact for dyslexic readers (Fowler & Liberman, 1995), so morphological awareness training may provide a powerful tool for children with dyslexia to overcome their phonological processing difficulties.

Despite this evidence, only a small number of studies have tested the use of morphological training to improve the literacy skills of poor readers. Elbro and Arnback (1996) conducted one of the first investigations of a morphology intervention for reading, examining the effects of an intervention targeting morphological skills for improving word decoding and text reading in dyslexic adolescents. While the differential benefits were modest, the authors report that the children who took part in the morphologically-focused intervention were significantly better able to spell compound words than the control group, suggesting that morphological processing may be used as a compensatory strategy for children with reading difficulties.

Elbro and Arnback's seminal study shifted the focus of remedial reading research, leading other researchers to examine the benefits of morphological training for children with literacy difficulties (see Goodwin and Ahn, 2010 for review). Although small in number, studies that have done so suggest that morphological processing can be used as a compensatory strategy for reading (Elbro & Arnback, 1996; Tsesmeli & Seymour 2009). However, the evidence remains limited and the benefit of a morphologically-focused intervention for dyslexia remains uncertain (Nagy, Carlisle, & Goodwin, 2013).

Studies investigating the use of morphological instruction to improve literacy have used a diverse range of teaching methods, making it difficult to disentangle which methods produce the most substantial gains, and for which literacy outcomes these gains occur. This problem is particularly

evident when considering the distinction between the effects of morphology and vocabulary instruction on literacy outcomes. Morphologically related words share similar form and meaning, so teaching morphological structure also involves discussion of word meaning. Due to this inherent association, literacy interventions incorporating the teaching of morphological knowledge tend to confound this instruction with teaching of vocabulary knowledge (e.g., St-Pierre & Dubé, 2012). As such, it is not clear whether the literacy gains reported in morphological intervention studies are a direct result of the training of morphological structure, the vocabulary knowledge that is taught concomitantly with morphological instruction, or some combination of these two.

The data examined in the present study are derived from a previous intervention where we disambiguated the potential benefit of morphological knowledge from the benefits of word meaning instruction. We isolated the teaching of morphological structure and compared its effects on spelling outcomes to that of vocabulary training for French-speaking children (Kolne, Hill, & Gonnerman, 2013). We found that morphological training provided a differential improvement over vocabulary training for spelling complex words. Specifically, our study showed that children who received instruction focused on morphological structure improved more on spelling than children whose instruction focused on word meaning. Our results suggest that a morphological instruction method improves children's spelling of complex words.

The morphologically-focused intervention may provide a compensatory tool for children who have difficulty with spelling, allowing them to overcome the reduced phonological processing abilities associated with reading and spelling difficulties. As such, the morphology intervention used in our previous study may be especially beneficial for children with lower spelling performance, as compared to those with typical spelling ability. However, our previous analysis did not differentiate the effects of the intervention based on children's literacy abilities, so the unique benefit of a morphological intervention has yet to be identified for children who struggle with spelling.

The present study revisits the data collected in our previous intervention study, this time dividing our sample into groups based on the children's spelling performance prior to starting of the intervention. In this way, we are able to assess the relative benefit of our intervention for children with higher and lower spelling performance. We will focus on the children's spelling of suffixes taught in the intervention, as this is where the differential benefit of the morphological intervention was strongest in our previous study. We hypothesize that our intervention will produce greater spelling gains for children who show difficulty with spelling, as compared to children with typical spelling performance, irrespective of instruction type. Additionally, we predict that both teaching methods are likely to benefit children with low spelling accuracy; but that the benefit of instruction focused on morphological structure will be greater than instruction focused on word meaning.

Methods

Participants

Eighty-four French-speaking children from Montreal, aged 8-to10- years old took part in the study. 36 children from Grade 3 participated (23 girls and 13 boys), as well as 48 children from Grade 5 (27 girls and 21 boys).

Children's spelling ability was assessed using a modified version of the Test Ortho3 from the Batterie d'Évaluation du Langage Écrit et de ses troubles (BELEC) (Mousty, Leybaert, Alegria, Content, & Morais, 1994). Children's scores on this test were ranked, and those falling below the 50th percentile were considered poor spellers. This identification was used for data analysis only, and both high and low ability spellers were combined in the intervention groups. Children were assigned to one of two intervention groups, based on their general spelling performance, such that good and poor spellers were equally represented in both treatment groups. In addition, the children in the two intervention groups were matched on language background (monolingual Francophone, or multilingual), and gender, with approximately equal ratios of boys to girls in each intervention group.

The intervention

All of the children took part in one of two interventions. The same 30 words were taught in each intervention, differing only in the emphasis of instruction. The first intervention provided spelling instruction that explicitly discussed the morphological structure of words (Morphology group), while the other provided instruction that focused solely on the meanings of the words (Vocabulary group), intentionally avoiding any discussion of morphological structure. For example, the Morphology group was taught that there are two parts to the word *finlandais*, namely the stem *finland* and the suffix *-ais*, while the Vocabulary group was taught that the word *finlandais* describes 'something or someone that comes from the country, Finland.' For a complete list of the words taught in the intervention each week, see Table 1.

Table 1: Target words taught each week of the intervention in the Morphology and the Vocabulary intervention groups.

Week	Morphology Group	Vocabulary Group
1	finlandais, japonais, camerounais	ogresse, huileux, galanterie
2	ogresse, délicatesse, hardiesse	finlandais, luthier, délicatesse
3	laiteux, huileux, duveteux	porcherie, laiteux, gaufrier
4	porcherie, mutinerie, galanterie	camerounais, mutinerie, abricotier
5	abricotier, luthier, gaufrier	hardiesse, japonais, duveteux
6	profondeur, puanteur, propulseur	sportif, beuglement, profondeur
7	alpiniste, portraitiste, miniaturiste	propulseur, parrainage, alpiniste
8	sportif, tardif, craintif	sournoisement, vagabondage, tardif
9	pèlerinage, vagabondage, parrainage	portraitiste, puanteur, pèlerinage
10	prodigieusement, sournoisement, beuglement	craintif, miniaturiste, prodigieusement

The words taught in the intervention contained one of a set of 10 suffixes. These suffixes are relatively frequent and productive in Quebec French, such that they are preferentially used to form new words. For each of the 10 suffixes, three different stems were chosen, resulting in the 30 complex words to be taught. These words were relatively infrequent, so it would be unlikely that the children would already be familiar with their spellings or meanings.

The intervention was taught in 10 one-hour, weekly sessions, with 3 words taught in each session. Each week the Morphology group focused on the three words with the same suffix. However, for the Vocabulary group, words with the same suffix were never taught in the same session. For example, in one week the Morphology group worked with the words *finlandais*, *japonais*, and *camerounais*, whereas the Vocabulary group learned *ogresse*, *huileux*, and *galanterie*. In each session, the children played a 'Game of the Week' with the new target words for that week. While children in each group played similar games, these games were adjusted depending the focus of the intervention (See Figure 1 for a sample 'Game of the Week'). Over the course of the ten weeks, each group ultimately learned the same set of 30 complex words.

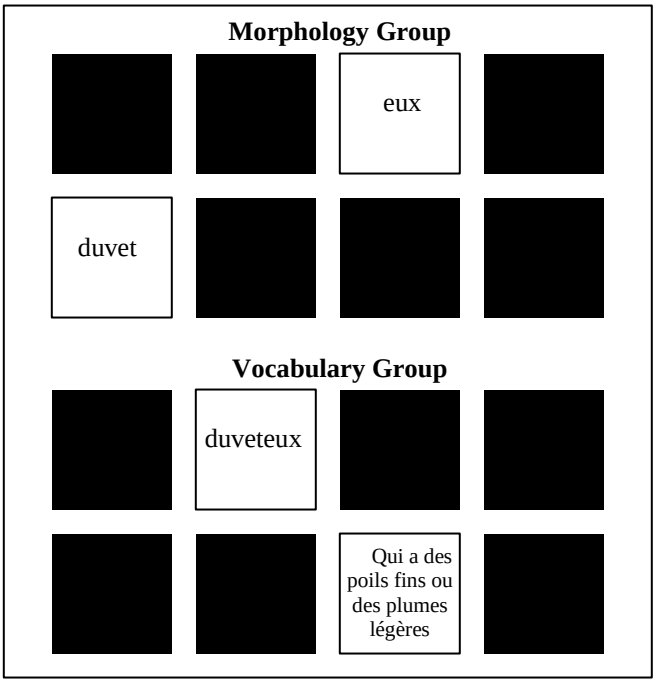

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Figure 1: Sample 'Game of the Week': Concentration Game, shown for the Morphology and Vocabulary intervention groups

Materials for assessing intervention effectiveness

The effectiveness of the intervention for improving children's spelling ability was assessed using a spelling test that we designed to target specific outcomes. The children took the test before starting the intervention (*pre-intervention*) as well as just after (*post-intervention*). The test required children to spell complex and simple words, and to generalize the spelling of stems and suffixes taught in the intervention to new words not taught in the intervention. The items on the test were either the exact complex word taught in the intervention (i.e., a taught stem and a suffix), a taught or an untaught stem without a suffix, or a combination of a taught/untaught stem and suffix in a complex word (i.e., a taught stem with a new suffix, or a new stem with a suffix, for examples, see Table 2).

Table 2: Sample items on the spelling test.

	Word taught in the intervention	Word on the spelling test
Exact word	profond-eur	profond-eur
Taught stem, no suffix	duvet-eux	duvet
Taught stem, untaught suffix	gaufr-ier	gaufr-***ette***
Untaught stem, taught suffix	propuls-eur	***institut***-eur

Procedure

The spelling test was administered to all of the children simultaneously. The words were presented within a sentence read by a native speaker of Quebec French. Words were repeated as many times as needed for all students to fill in the blanks with the appropriate word.

Results and Discussion

We predicted that the intervention, regardless of the focus of instruction, would lead to greater improvements in spelling for the lower ability spellers, than for the children with higher spelling ability, so we compared the overall change in spelling scores from pre- to post-intervention of high performing and low performing spellers. Moreover we predicted a differential benefit of morphological instruction for the spelling of suffixes when considering only children with spelling difficulty. Thus, we also analyzed the relative effects of the two instruction types for children who displayed lower spelling ability before the intervention began.

Three children were absent from either the pre- or post-intervention assessment, and these children were excluded from the following analyses.

The spelling test was scored based on whether the whole words were spelled correctly, as well as whether the stems and suffixes of complex words were spelled correctly. Thus, each complex word received three scores, one for the whole word, one for the stem, and one for the suffix. Mean percent correct scores on the whole words, stems, and suffixes were calculated for the following analyses.

Effectiveness of the intervention for high and low performing spellers

To determine whether our intervention was differentially effective for high or low performing spellers, we compared the changes in overall spelling accuracy for all the words on our test. A two-way ANOVA was conducted with the factors Test Time (pre- and post-intervention) and Spelling Ability (high and low performing spellers). The results showed a main effect of Test Time (pre- and post-intervention), such that all children improved post-intervention $F(1,64) = 26.24$, $p < .001$. Moreover, the interaction of Test Time and Spelling Ability (high and low performing spellers) was significant, such that low performing spellers benefited more than high performing spellers $F(1,64) = 10.83$, $p = .002$ (See Figure 2). These findings support our hypothesis, suggesting that the intervention, irrespective of instruction type, was successful for all children, and children with spelling difficulty were aided most by the intervention.

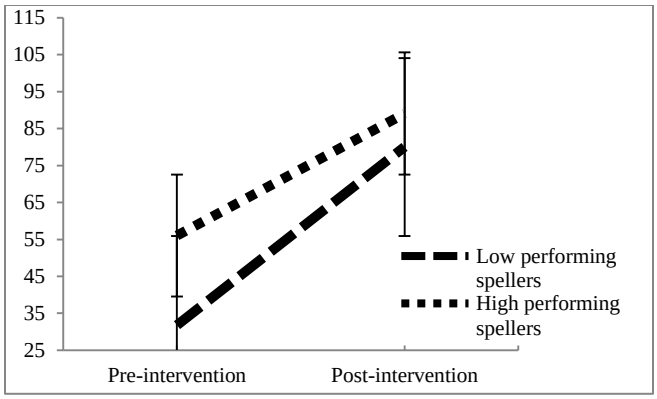

Figure 2: Overall mean percent correct on the spelling test items for high and low performing spellers at pre- and post intervention

Differential effects of instruction type for low performing spellers

The primary purpose of this investigation was to differentiate the effects of a morphology intervention from vocabulary instruction for children with low spelling ability. Thus, we contrasted the effects of our two instruction types on children's spelling ability. We specifically focused on the performance on suffixes taught in the intervention, as this is where the differential benefit was found when considering all children together.

The differential benefit of the instruction type for low performing spellers on suffixes was assessed with a two-way ANOVA, with the factors Test Time (pre- and post-intervention) and Instruction Type (morphology or vocabulary. The results of this analysis show that all children improved from pre- to post-intervention, $F(1,31) = 36.06$, $p < .001$. The interaction of Test Time and Instruction type was also significant, indicating that children in the morphology group showed a greater improvement on the spelling of suffixes from pre- to post-intervention than children in the vocabulary group, $F(1,31) = 4.77$, $p = .04$ (see Figure 3). This finding suggests that a morphologically focused intervention is beneficial for children experiencing difficulty with spelling.

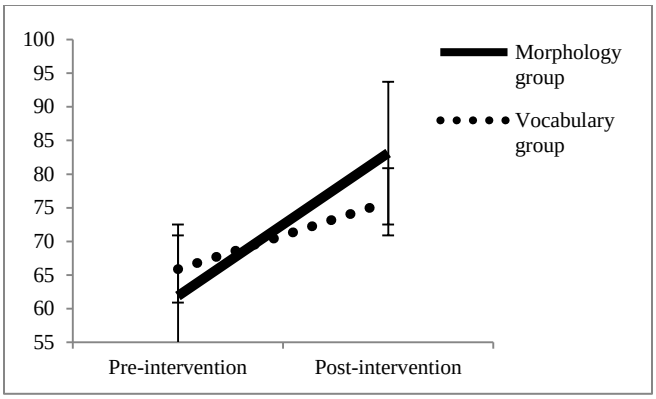

Figure 3: Mean percent correct on the suffixes for low performing spellers in the Morphology and Vocabulary groups at pre- and post intervention.

General Discussion

We have provided support for a beneficial role of morphological instruction for improving the spelling ability of children who are experiencing literacy difficulties. Our intervention taught children using complex words composed of stems and suffixes. Regardless of the method of instruction, children gained exposure to these words orally, and in print, and they gained practice writing them. The present findings suggest that this experience working with complex words leads to spelling improvement for children of all spelling abilities. Moreover, our intervention was especially helpful for children who scored low on a general spelling measure, as compared to children who scored higher. If morphological processing skills remain in tact for struggling readers, as evidence suggests (Fowler & Liberman, 1995), than instruction that exposes children to morphologically complex words seems to allow these children to take advantage of this strength and overcome their difficulty.

Importantly, this study provides novel evidence for the unique benefit of morphologically-focused instruction for children with spelling difficulty, independent from any concomitant vocabulary gains. Previously we reported that children of undifferentiated spelling ability show a greater improvement on their spelling of suffixes when they participate in an intervention using a morphology-based instruction method as opposed to a vocabulary-based method. The present findings indicate that morphology instruction is also differentially beneficial for improving spelling for low performing spellers. Not only does learning these suffixes help children spell the words taught in the intervention, it also assists them with spelling these suffixes in any context. Given that 60-80% of new words that school-aged children must acquire are morphologically complex (thus they contain suffixes) (Nagy and Anderson (1984), an intervention that improves spelling of morphemes is valuable for children struggling with spelling.

Conclusion

Problems with spelling are pervasive for children who face literacy difficulties. Our study demonstrates that an intervention exposing children who struggle with spelling to morphologically complex words improves the spelling performance of these children. A teaching method focused exclusively on morphological structure is especially beneficial for low performing spellers. Such an intervention provides struggling spellers with a tool that makes use of their strengths and that is not limited to the context of the intervention.

The goal of this study was to isolate the benefit of morphological instruction from vocabulary instruction for low performing spellers. However combining the teaching of morphological structure and word meaning may provide the greatest improvements, and will be investigated in future studies. Additionally, we have chosen to focus only on the effects of our intervention for spelling outcomes, but a morphologically-based intervention may influence many other literacy outcomes, including word decoding, reading fluency, and reading comprehension, all of which require further exploration. Thus, this study constitutes an important initial step in the on-going pursuit to help children who struggle with literacy.

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