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Morphological training in spelling: Immediate and long-term effects of an interventional study in French third graders

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1. Introduction

Learning to spell in alphabetical scripts often necessitates going beyond the phonological information that is first needed to select corresponding letters or graphemes. In French orthography, for example, only half of the words can be spelled by relying on phonological information only (Ziegler, Jacobs, & Stone, 1996) and therefore other information must be taken into account. Taking morphology into account for spelling considerably improves regularity and predictability. Morphology identifies the smallest units of meaning in language. A simple word is composed by one morpheme (e.g. *dance*) while a derived word (e.g. *dancer*) is made up of at least two morphemes, a base (e.g. *dance*) and a suffix (e.g. the suffix *–er*) or a base (e.g. confirm) and a prefix (e.g. dis-). The question is thus whether a morphological intervention can improve spelling performance in school-aged children. The aim of the present study was to examine the impact of an interventional study as well as the specificity of the training on spelling scores and the stability of the beneficial effects over time.

1.1. Spelling morphological words

Several studies have indicated that morphological words – that is words that belong to a morphological family – are spelled more accurately than other words. In French, several words end with a silent final letter (e.g. *port [harbor]*, pronounced /pOR/). Taking morphologically related derived words into consideration, for example *portuaire [harbor]*, should be helpful in spelling the final silent letter accurately. Sénéchal (2000, Sénéchal, Basque, & Leclaire, 2006) compared the spelling performance of three categories of words in second and fourth graders: regular words that have no silent final letter (e.g. *tiroir, [drawer]*); morphological words, in which the final silent letter can be accurately spelled by considering derived forms (e.g. *bavard, [talkative]*); and deep words that also end with a silent letter but one that cannot easily be predicted from derived forms as there are none (e.g. *foulard, [scarf]*). While children were more accurate in spelling words without a silent final letter (i.e. regular words), there was an advantage in morphological words over deep words. Words that could be derived were more easily transcribed than deep words.

There are other typical spelling difficulties that might be overcome when morphology is taken into account. In most alphabetical scripts, there are more phoneme-to-grapheme correspondences than grapheme-to-phoneme correspondences. Selecting the correct grapheme from several possibilities is particularly challenging in French orthography. In several cases, achieving the correct spelling of graphemes in a complex word may be facilitated if the base word can be retrieved. For example, in French, selecting the grapheme "*en*" against "*an*" for the phoneme /ã/ in the word *lenteur [slowness]* might be facilitated through retrieval of the base *lent [slow]*. As the base form is generally more common and shorter, its orthographic form should be easier to retrieve. Therefore, spelling a long and uncommon word should benefit from the presence of a base within the word, when appropriate. There is some empirical evidence that derived words are spelled more accurately than non-derived words matched for length and frequency. Casalis, Deacon, and Pacton (2011) asked third and fourth graders to spell derived words (e.g. *laitage*, formed with the root *lait* and the suffix *age [dairy milk]*) and simple words (e.g. *falaise, [cliff]*) matched for length and frequency. All the words contained inconsistent graphemes, i.e. graphemes that can be spelled several ways. Derived words were spelled more accurately than simple words in both grades and, importantly, the advantage was also found when the target grapheme level only was considered (e.g. "*ai*" in *laitage [milk]* and *falaise [cliff]*, see Pacton & Deacon, 2008, for a review).

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Another way to investigate the contribution of morphology to learning to spell is to examine the connection between morphological awareness and spelling performance. This approach enables the determinants of spelling achievement to be identified. We first consider correlational studies and then interventional studies.

1.2. Morphological awareness and spelling

Morphological awareness reflects both morphological knowledge and the ability to manipulate morphological units (Carlisle, 1995). Tyler and Nagy (1989) identified at least three dimensions in morphological awareness: relational knowledge refers to the ability to recognize a common base in words; syntactical knowledge refers to the syntactical properties of suffixes; distributional knowledge refers to the rules of morphological construction. There are several tasks that assess morphological awareness (for a review, see Berthiaume, Besse, & Daigle, 2010). The most popular ones include derivation in context. In this task, children have to complete a sentence with a derived form, the base form being provided (e.g. *Help: Father tells me that I am a good … (helper)*). Both words and pseudowords can be used, with the use of pseudowords enabling morphological rule knowledge to be assessed without lexical retrieval. In the analogy task, children have to produce a derived form following a model (e.g. *write/writer*, *work*; … *worker*). In the segmentation task, participants have to identify and pronounce the base form of one or a series of derived words (e.g. *growth/grow*). Finally, some tasks rely more directly on the awareness of the suffix meaning by asking participants to choose the correct definition of a pseudoword between two, depending on its suffix (e.g. *The fulmer is: the man who fulmes OR the place where one fulmes*). Thus, consistent with the fact that morphological awareness involves several dimensions, morphological awareness tasks differ in several aspects. The point therefore is not only to examine whether morphological awareness is related to spelling achievement, but also to identify which aspects are critical for spelling.

In general, morphological awareness measures predict spelling outcomes once the contribution of general factors (verbal and nonverbal abilities, phonological awareness, verbal short-term memory) have been controlled (Deacon, Kirby, & Casselman-Bell, 2009). Several of the aforementioned studies included measures of morphological awareness tasks and examined the connection between scores in morphological awareness and spelling. Sénéchal et al. (2006) found a significant correlation between morphological awareness, as assessed by the analogy task, and the morphological word spelling score. In the Casalis et al. (2011) study, by contrast, the morphology contribution was not specific as the analogy task score was significantly correlated to both spelling scores, derived and controls (see also Fejzo, 2016, for recent and detailed results). Nevertheless, the question of causality remains.

1.3. Intervention focused on morphology

The most direct way to test the connection between morphological awareness and spelling is to conduct interventional studies, in which the spelling performance of an experimental group, trained in morphological analysis, is compared to that of a control group.

Several interventional studies have focused on dyslexics or poor readers/spellers as a way to improve literacy skills. In general, these have found some positive effects but they will not be detailed here as their first aim was to identify spelling strategies that could be used by disabled readers and/or spellers, particularly as effective alternatives to phonological processing of written language. Surprisingly, only a few studies have investigated this issue in a general population. Nunes, Bryant, and Olsson (2003) designed an interventional study conducted in third and fourth graders. They constituted five groups: morphological training alone, morphological training with writing, phonological training alone, phonological training with writing, and a control. The pre-test and post-test assessments were similar and included reading and spelling measures, as well as a mathematical assessment, which was expected to be unaffected by training. Critically, the spelling assessment included words and pseudowords that involved conditional phonological and morphological rules. As well as a whole score based on word spelling accuracy, a morphological score was computed based on the correct spelling of the suffix (e.g. *ment* in *statement*, whether or not *state* was spelled correctly). The morphology training included lessons about word stems and grammatical categories in relation to both inflectional and derivational affixes (e.g. learning about agentive endings like *–ian* in *magician*). In the morphological training with writing, children had to spell the derived form (e.g. *magician*) after having completed the sentence orally, like the without writing group. Training was conducted in 12 weekly sessions. Pairwise comparisons revealed that both training groups with writing performed better in the post-test than both the control and training groups without writing. In the same vein, Devonshire and Fluck (2010) compared a morphological training study with a classic written activity program in third and fourth graders. Note that, in their preliminary study, Devonshire and Fluck conducted a short training session with children in a broad range of ages – from Grade 2 to Grade 6 – and found that third and fourth graders were the most receptive to the morphological program. The results clearly indicated a greater improvement between pre-test and post-test on all the measures in the morphological group (see also Taha and Saiegh-Haddad (2016) for a study conducted in Arabic).

There are at least two reasons why it is important to examine the impact of morphological intervention on spelling scores. First, from a theoretical view, it has been suggested that besides phonological information, morphological information contributes to spelling scores. However, the impact of this morphological information remains to be uncovered, particularly the causal nature of this connection. We need to understand whether the contribution of morphology is located in overcoming some local difficulties or is more general: a better understanding of this language level improves spelling as it makes morphemic units more salient, for example. In this context, the issue of the specificity of the contribution needs to be addressed. In other words, does morphological awareness contribute specifically to “morphological” words or generally to spelling achievement? We thus consider two categories of words, derived and simple. Second, from a more practical view, we know that spelling achievement is quite difficult, especially in highly inconsistent orthographies like French. There is therefore a need to examine whether or not an intervention based on morphology is effective and if the advantages remain over weeks or months.

1.4. The current study

The aims of the present study were the following. First, to examine whether an intervention based on morphology improved spelling achievement. For this purpose, an experimental group, benefiting from morphological training, was compared to a control group. A key issue in interventional studies is the choice of the control group. Here, we decided not to include a group with phonology training, as our participants were third graders without difficulties (therefore mastering phoneme to grapheme correspondences). By contrast, as we decided to use the written modality for training (a more effective training, see Nunes et al., 2003 for spelling, Hulme, Bowyer-Crane, Carroll, Duff, & Snowling, 2012, for reading), an appropriate control group was constituted of children receiving typical classroom spelling lessons. Our second aim was to

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