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Complex word reading in Dutch deaf children and adults

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ABSTRACT

Children who are deaf are often delayed in reading comprehension. This delay could be due to problems in morphological processing during word reading. In this study, we investigated whether 6th grade deaf children and adults are delayed in comparison to their hearing peers in reading complex derivational words and compounds compared to monomorphemic words. The results show that deaf children are delayed in reading both derivational words and compounds as compared to hearing children, while both deaf and hearing adults performed equally well on a lexical decision task. However, deaf adults generally showed slower reaction times than hearing adults. For both deaf and hearing children, derivational words were more difficult than compounds, as reflected in hearing children's slower reaction times and in deaf children's lower accuracy scores. This finding likely reflects deaf children's lack of familiarity with the meaning of the bound morphemes attached to the stems in derivational words. Therefore, it might be beneficial to teach deaf children the meaning of bound morphemes and to train them to use morphology in word reading. Moreover, these findings imply that it is important to focus on both monomorphemic and polymorphemic words when assessing word reading ability in deaf children.

1. Introduction

Deaf children are often delayed in different aspects of reading, especially in reading comprehension (Traxler, 2000; Wauters, van Bon, & Tellings, 2006). While it is difficult for them to use phonology in word reading (Sterne & Goswami, 2000), morphology may help them to identify words and assign meaning to longer words. When mapping meaning onto words becomes easier, both word reading and reading comprehension might improve (e.g. Tong, Deacon, Kirby, Cain, & Parrila, 2011). Therefore, in this study we investigated whether deaf children and adults use morphological processing in reading complex, polymorphemic words.

Several types of morphology exist. In inflectional morphology, grammatical contrast is expressed by adding a morpheme to a word, for example *cat* vs *cats* and *walk* vs *walked*. In derivational morphology, a morpheme is added to the base word to assign the word another meaning. For example, if you add *un-* to *related* the new word is *unrelated*, which has a different meaning than the word *related*. Similarly, *development* has a different meaning than *develop*. Inflectional and derivational morphemes can be placed at the beginning or at the end of a word (although in some languages the inflectional morpheme

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can only be placed at the end of the word). Placed at the beginning of the word, a morpheme is a prefix, but placed at the end of the word, it is a suffix. Next to inflection and derivation, a third type of morphology is compounding. In compounding, two base words are added together to form a new word (*farmhouse* is composed of the words *farm* and *house*, *teabag* of *tea* and *bag*). In the current article we will focus on both derivational morphology and compounding, since these two types both introduce a change in the meaning of a word.

As hearing children learn to read, they begin by using rote learning. They first try to 'identify' a word from the context, but soon they start with the sequential decoding of short words. To decode these words, they use phonology. They segment the word into letters (graphemes) and map these onto the sounds (phonemes) (Ehri, 2005; Frith, 1985). When children become more proficient in reading, they will be able to read those short words automatically. For longer words, segmentation might still be necessary, but segmenting individual letters is not needed. Instead, the word can be segmented into morphemes, the smallest meaningful parts. Readers identify morphemes and combine the meaning of these morphemes to identify the meaning of a word. Research has shown that morphological processing is successfully used for word reading by hearing children and adults in English (Carlisle & Stone, 2005; Taft, 1979) as well as in Dutch (Verhoeven, Schreuder, & Haarman, 2006). Furthermore, Burani, Marcolini, De Luca, and Zoccolotti (2008) showed that morphological processing is also used by Italian dyslexic children to read polymophemic words. They claimed that morphemes are efficient processing units for individuals with dyslexia, because focusing on this level allows for an intermediate step between the use of graphemes, which can lead to extremely slow reading, and the difficult task of processing complete words. While deaf children also have difficulty in using grapheme–phoneme mapping during reading, they might also benefit from using morphology. However, deaf children's use of morphology while reading longer words has not yet been studied.

Several studies already investigated the ability to use morphology in deaf children. In one of the first studies to examine this population, Cooper (1967) found that deaf children and adolescents showed a six year delay in comparison to hearing children when applying morphological rules to nonsense words. While derivation appeared to be more difficult than inflection for both deaf and hearing children, deaf children were less able to use derivation than inflection. This finding might be explained by the fact that derivation is less productive in English than inflection (Kuo & Anderson, 2006). Subsequently, Hanson (1993) studied the benefit of using morphology in learning pairs of pseudowords. Deaf college students learned pseudoword pairs for semantically related words (*book* and *read*). When pseudoword pairs were derivationally related (*ralp* and *ralpify*), their meaning was memorized more accurately compared to pseudoword pairs in which words were not related to each other (*nark* and *stritify*). More recently, Gaustad, Kelly, Payne, and Lylak (2002) showed that deaf college and middle school students can split words into morphemes and are able to give meaning to both derivational and inflectional morphemes. However, their morphological awareness was less well developed in comparison to hearing students. In a follow-up of this study by Gaustad and Kelly (2004), deaf and hearing students were matched on reading ability. It was shown that deaf and hearing students performed equally well on the easier tasks in which they had to segment and assign meaning to words with one inflectional or derivational affix. In contrast, deaf students performed significantly below hearing students on complex words with multiple bound morphemes (like *disinfectant* and *reportedly*). Thus, the above mentioned studies show that deaf readers do have some awareness of both inflectional and derivational morphology, but that their level of awareness is lower than in hearing readers.

To summarize, research has shown that deaf readers have some ability to decompose words into morphemes and assign meaning to the morphemes. However, we do not know whether they use this ability during reading. Moreover, few studies have investigated compounding, so comparisons of different kinds of morphology (e.g. derivation and compounding) have not been completed. In addition, most research has focused only on one age group and failed to compare children and adults to each other. Therefore, in the present study the reading of derivational words and compounds by deaf and hearing children and adults was studied and compared to the reading of monomorphemic words.[1]

The questions to be answered concerned the effect of hearing status and age on the processing of derivational words and compounds. We hypothesized that deaf children would perform worse in comparison to their hearing age mates in reading words with derivational morphemes and compounds as compared to monomorphemic words, because deaf children have little or no access to the morphology of Dutch language until they begin to read. Most of the deaf children in the Netherlands are attending schools for the deaf. In these schools, both Dutch Sign Language and Sign Supported Dutch (SSD; in which the Dutch word order is supported by signs) are used. But even when SSD is used, it is likely that the deaf children cannot understand all the morphemes of the word, especially when these are not free morphemes, i.e. when the morpheme does not exist as a word itself. Therefore, we hypothesized that deaf children have more difficulty when reading derivational words than when reading compounds, because they might not be familiar with the meaning and structure of the derivational morphemes yet. In contrast, we expected that deaf adults would show similar performance on the derivational words as compared to hearing adults, because the deaf adults are likely to know the meaning of the derivational morphemes. However, we expected them to be slower than hearing adults in general, because reading might be less automatized in deaf adults than in hearing adults. On the other hand, reaction times might be longer specifically for the polymorphemic words, because the use of the morphemic strategy is not completely automatized while the reading of short words has become automatic.

[1] The processing of inflectional morphology was also studied, and is reported elsewhere (Van Hoogmoed, Verhoeven, Schreuder, & Knoors, 2011).