Verb reading in developmental language impairment

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Abstract

This research addresses the issues of frequency and regularity in verb reading and their importance for the organization of the mental lexicon in DLI francophones. A reading task probes response latencies and response accuracy for DLI and control participants on frequent and infrequent inflected forms of verbs. DLI participants are slower at reading verbs even if their mean accuracy rates are higher than controls'. Results also indicate that the type of suffix on the verb affects controls and DLI participants differently in their accuracy rates: DLI participants exhibit higher error rates on less frequent inflections, while controls do not. Finally, unusual patterns are found for DLI participants on regular versus irregular verbs: regular verbs are *slower* to be read by DLI participants. These results are compared to findings from a previous simple lexical decision study. They are interpreted as indicating that DLI word reading patterns are qualitatively different from those evidenced by controls.
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1. Introduction

Developmental language impairment (DLI) is a language acquisition deficit found in the absence of an articulatory, psychological, neurological, cognitive, or psychosocial deficit that could be construed as the cause of the linguistic problem (Bloom & Lahey, 1978; Zangwill, 1978). Reports on cross-linguistic studies of DLI have shown a deficit which can affect syntactic structures, inflectional and derivational morphology, compounding, and morpho-phonology. DLI subjects show difficulties in appropriately producing, judging and correcting inflected verb forms across languages (Clahsen, 1989; Dalalakis, unpublished Ph.D. dissertation, McGill University, 1996; Gopnik, Dalalakis, Fukuda, Fukuda, & Kehayia, 1997; Leonard, 1996; Leonard, Bortolini, Carelli, McGregor, & Sabbadini, 1992), including French (Rose & Royle, 1999). Psycholinguistic factors such as probability of occurrence also play a role in DLI per-

formance. Word-frequency affects both acquisition of lexical items (Rice, Oetting, Marquis, Bode, & Pae, 1994) and verb production in DLI subjects (Rose & Royle, 1999; Ullman & Gopnik, 1994). By contrast, degree of morphological transparency (i.e., regularity within an inflectional paradigm) and word-internal structure, which are instrumental in non-impaired lexical access, do not appear to influence DLI subjects' word recognition performance (Kehayia, 1997).

Tallal, Sainburg, and Jernigan (1991), Leonard et al. (1992), and Joanisse and Seidenberg (1998) have proposed that DLI is the result of an auditory processing deficit that affects morpheme recognition. Thus a subject with DLI will have difficulty processing morphological representations because of factors such as processing speed limitations (Tallal et al., 1991) or low phonetic salience (Leonard et al., 1992). Within a connectionist framework, Joanisse and Seidenberg (1998) propose that subjects with DLI are unable to build normal phonological representations due to low phonetic salience. Fletcher (1990), Vargha-Khadem (1990), and Vargha-Khadem, Watkins, Alkock, Fletcher, and Passingham

(1995) have linked DLI to an expressive speech disorder (amongst other things). According to this view, the grammar of a person with DLI is essentially intact, but consonant clusters (e.g., *walked* /wakt/) are more difficult to pronounce and thus will be simplified (here, by deleting the tense morpheme) during speech. It has also been proposed that DLI is not the result of a processing problem, but rather, that it is caused by the lack of features required for the application of linguistic rules (Dalalakis, unpublished doctoral dissertation, McGill University, 1995; Gopnik et al., 1997; Kehayia, 1997), and that DLI subjects lexicalize inflected words as "whole-chunks" without any internal morphological structure (Kehayia, 1994, 1997). DLI could thus be an impairment in representation of word-internal structure caused by the lack of sub-lexical features which are inherent in operations such as agreement, pluralization, compounding and tense marking. This study addresses the issue of access and representation of inflected verbs in the mental lexicon of French-speaking DLI subjects. In particular, it investigates the extent to which the presence of an overt morphological deficit is reflected in differential word reading patterns and a structurally 'altered' mental lexicon. We propose to use the reading task as a measure of lexical access in order to further refine theories of DLI. More specifically, we will probe effects of morphological regularity in reading, in addition to frequency effects that could arise during this task.

Traditionally, psycholinguistic studies of the lexicon have focused on access to words as evidenced by response latency (RL) measures in lexical decision (LD) tasks. The methodologies used for constructing LD tasks have gradually been refined (using masked priming, for example) in order to prevent strategic effects from arising. However, one particular component of the lexical decision task—the decision-making process—creates a linguistically unnatural environment which could cause task-specific effects to influence results. These effects are not a priori related to word access. Subjects could also be making judgments on the visual appropriateness of a word, deciding, for example, that COBRA looks like a "better" word in English than ZEBRA (Besner & Johnston, 1989). The LD task can be conceived as consisting of two consecutive processing stages: the first being lexical access and the second, a post-lexical checking and integration phase where the legality of the word (or root + affix combination) is verified (Manelis & Tharp, 1977). It is thus difficult, when analyzing results from the LD task, to evaluate which effects are related to lexical access and which ones are related to a post-lexical checking phase. Therefore, it has been proposed to use the reading task as a complement to the LD task: since subjects are not asked to judge the lexical item during a reading task, one would not expect them to be influenced by the visual "appropriateness" of a word in the language. In addition, since reading does not necessitate lexical decision, one would not expect subjects to resort to a post-lexical checking phase (Hyönä, Laine, & Niemi, 1995; Manelis & Tharp, 1977). On the other hand, the reading task may pose problems because it may not systematically force lexical access in order to trigger a response: one can read words by operating grapheme-to-phoneme correspondence rules without necessarily accessing the lexical level (Booth, Perfetti, & MacWhinney, 1998; Perfetti, Bell, & Delaney, 1989). However, when using the reading task in conjunction with the lexical decision task, we can assume that any effects that are found across both tasks can be attributed to lexical access procedures and not to epiphenomena related to specific task demands.

Among effects that have been observed during on-line experiments, frequency is the most robust one. It has been claimed, that the reading task is not as strongly affected by surface (whole-word) frequency as the LD task (Balota & Chumbly, 1985). However, research on French derived words has shown root frequency (the cumulative frequency of all word forms derived from the same root) effects, as well as surface frequency effects, when reading suffixed (as opposed to prefixed) words (Beauvillain, 1996; Holmes & O'Reagan, 1992).

In addition, Beauvillain (1996) shows that, in word reading with eye monitoring, the duration of the first gaze at a word is not affected by surface frequency but by root frequency, while the duration of the second gaze is affected by the surface frequency of the word. Consequently, derived suffixed French words seem to be read through decomposition before they are read whole. In Finnish word reading with eye monitoring, gaze durations on inflected words were also found to be affected by morphological structure (Hyönä et al., 1995). It is therefore probable that reading tasks tap both frequency and morphological processes involved in lexical access.

Another effect found in reading tasks is the sound-spelling correspondences regularity effect. Words with regular sound-spelling correspondences have been shown to be read faster than words with irregular sound-spelling correspondences (Seidenberg, 1997). Furthermore, surface frequency and regularity (of sound-spelling correspondences) have also been shown to interact during word reading: irregular words are read faster when they are more frequent and slower when they are less frequent, while regular words are read at the same speed, whether they are frequent or not (Seidenberg & Waters, 1989; Taraban & McClelland, 1984). Studies of French reading have also shown neighbourhood, frequency and (orthographic) regularity effects (Ans, Carbonnel, & Valdois, 1998). Unfortunately, many studies of word reading have concentrated on the issue of regularity of sound-spelling correspondences, while few have addressed the problem of regularity of *morphological* structure.