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Phoneme monitoring in silent naming and perception in adults who stutter

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Abstract

The present study investigated phonological encoding skills in persons who stutter (PWS). Participants were 10 PWS ($M = 31.8$ years, S.D. = 5.9) matched for age, gender, and handedness with 12 persons who do not stutter (PNS) ($M = 24.3$ years, S.D. = 4.3). The groups were compared in a phoneme monitoring task performed during silent picture naming. The phonological complexity of the target items in the task was varied such that participants monitored either compound words or noun phrases. Performance in this task was compared to phoneme monitoring performed on aurally presented target words to investigate whether any differences observed in silent naming were also evident in perception. Analysis of the response time data, in milliseconds, indicated that PWS were significantly slower as compared to PNS in phoneme monitoring during silent naming; group differences were not obtained in the perception task. The groups were also comparable in the response time to phoneme monitoring within compound words and noun phrases in both silent naming and perception. The findings suggested that PWS were slower in the encoding of segmental, phonological units during silent naming. Furthermore, absence of such differences in perception ruled out a general monitoring deficit in PWS. Findings are interpreted within the context of the psycholinguistic theories of stuttering that postulate phonological encoding and/or monitoring as a causal variable in stuttering.

Educational objectives: As a result of this activity, the participant should: (1) describe relevant literature on phonological encoding skills in children and adults who stutter, (2) identify paradigms that can be used to investigate phonological processing in PWS, and (3) discuss the role of phonological encoding in speech production.

Keywords: Stuttering; Phoneme monitoring; Phonological encoding; Phonological complexity

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1. Introduction

Phonological processes in speech production are a set of retrieval and encoding processes involved in word form or phonological encoding (Schiller, 2000). Levelt and Wheeldon (1994) described three such processes, namely *segmental spell-out*, *metric spell-out*, and *syllabification*. Segmental spell-out involves the generation of individual sound segments that constitute words; metric spell-out involves generation of word stress; and, syllabification involves assignment of syllable boundaries during speech production. Wheeldon and Levelt (1995) proposed that the process of phonological encoding is available for editing through the prearticulatory monitoring process, which enables experimental investigation of the time course of this process. Recent data (Schiller, Bles, & Jansma, 2003) have suggested that during speech planning, speakers encode segmental and metric information in a parallel fashion, while within each of these levels, the segmental and metric units are encoded from left to right in a serial incremental manner thereby resulting in a just-in-time incremental speech production process. Consequently, the time course of phonological encoding is crucial to the timely generation of the phonetic code for speech motor planning and execution.

Starting with Brown's research in 1945, several factors at the phonological level have been linked to the presence and maintenance of stuttering (Louko, Edwards, & Conture, 1990; Paden, Ambrose, & Yairi, 2002; Paden & Yairi, 1996; Wolk, Conture, & Edwards, 1990). A review of the literature reveals several paradigms that have been used to investigate phonological encoding skills in persons who stutter (PWS) including phonological priming, nonword tasks, phoneme monitoring, and experimental manipulations of phonological complexity and its effect in speech production. The following is an overview of the findings and some of the limitations of the paradigms that have been used in the past to investigate phonological encoding in PWS.

The *priming* paradigm has been used in children (CWS) and adults who stutter (AWS) to study the organization and activation of units in the phonological output lexicon (Byrd, Conture, & Odhe, in press; Melnick, Conture, & Odhe, 2003; Wijnen & Boers, 1994). For instance, in an implicit priming paradigm involving the production of words, Wijnen and Boers (1994) reported a larger facilitatory priming effect for consonant–vowel (CV) primes (e.g., *leuven*, *leugen*, *leuze*, *leaning*, *leukerd*) than C primes (e.g., *lepel*, *lila*, *loeder*, *larie*, *luier*) in AWS as compared to adults who did not stutter (ANS). They suggested that AWS experienced difficulties in the encoding of the stress-bearing nucleus of a syllable, which was overcome by facilitating the encoding of such units with CV primes. However, in a study designed to replicate the findings from Wijnen and Boers (1994), Burger and Wijnen (1999) failed to find reduced facilitatory priming effects in AWS. Using a priming task with CWS, Byrd et al. (in press) reported that picture naming was facilitated by end-related phonological primes (e.g., /ed/-bed) as compared to onset-related primes (e.g., /bə/-bed); a reverse pattern was observed in children who did not stutter (CNS). Byrd et al. suggested that the phonological system in CWS may be less well developed or efficient compared to CNS. In contrast, Melnick et al. (2003) failed to find facilitatory priming effects for onset related primes in a picture naming task in CWS. Arnold, Conture, and Ohde (2005) reported comparable performances for CWS and CNS in the naming of target pictures with sparse and dense phonological neighborhood. Arnold et al. (2005) suggested that phonological processes contribute minimally to the difficulties experienced by CWS in producing fluent speech. Such equivocal support for a phonological encoding deficit in PWS from priming studies may, in part, be related to methodological differences. For instance, phonological encoding in CWS has been investigated using both segment (e.g., Melnick et al., 2003) and rhyme primes (e.g., Byrd et al., in