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Age of acquisition and repetition priming effects on picture naming of children who do and do not stutter

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Abstract

The effects of age of acquisition and repetition priming on picture naming latencies and errors were studied in 22 children who stutter (CWS) and 22 children who do not stutter (CWNS) between the ages of 3;1 and 5;7. Children participated in a computerized picture naming task where they named pictures of both early and late acquired (AoA) words in two consecutive stages. Findings revealed that all children's picture naming latencies and errors were reduced following repetition priming and in response to early AoA words relative to late AoA words. AoA and repetition priming effects were similar for children in both talker groups, with one exception. Namely, CWS benefitted significantly more, in terms of error reduction, than CWNS from repetition priming for late AoA words. In addition, CWNS exhibited a significant, positive association between linguistic speed and measures of vocabulary, but CWS did not. These findings were taken to suggest that the (a) semantic–phonological connections of CWS may not be as strong as those of CWNS, and (b) existing lexical measures may not be sensitive enough to differentiate CWS from CWNS in lexically related aspects of language production.

Educational objectives: After reading this article, the learner will be able to: (a) describe the effects of repetition priming and age of word acquisition in speech production; (b) summarize the performance similarities and differences of children who stutter and children who do not stutter on a computerized picture naming task; and (c) compare the results of the present study with previous work in this area.

Keywords: Stuttering; Repetition priming; Age of acquisition; Picture naming; Children

Since the 1970's, there has been much theoretical interest in explaining the onset and development of childhood stuttering from a psycholinguistic standpoint (e.g., Howell & Au-Yeung, 2002; Perkins, Kent, & Curlee, 1991; Postma & Kolk, 1993). Consequently, researchers have experimentally examined the speech-language processing systems of children who stutter (CWS), with most efforts centered on phonological and lexical processes. While findings from some studies indicate that CWS may have difficulty with phonological or lexical processing, findings from other studies have not supported this conclusion. These contradictory findings motivate the need for further investigation of language production in CWS. The primary purpose of this study was to assess the connection between semantic and phonological processing systems in CWS by examining the effects of repetition priming for early and late acquired words. To put this study into context, we first review what is currently known about the phonological and lexical processing abilities

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of CWS and present relevant background information on repetition priming and age-of-acquisition effects on speech production.

1. Phonological processing in children who stutter

Melnick, Conture, and Ohde (2003) were among the first to experimentally assess phonological processing in preschool CWS relative to children who do not stutter (CWNS). This was accomplished using a picture–word interference task, in which CWS and CWNS named pictures in the absence and presence of related and unrelated phonological primes. The authors measured, among other things, the amount of time it took children to name the pictures (i.e., speech reaction time [SRT]). Results revealed that CWS and CWNS named pictures significantly faster in the related prime condition compared to the no prime and/or unrelated prime condition. Although there were no significant between-group differences in SRT, regression analyses revealed that CWNS exhibited a significant, negative relationship between SRT and "articulatory mastery," measured using the *Goldman-Fristoe Test of Articulation-2* (GFTA-2; Goldman & Fristoe, 2000), whereas CWS did not. In essence, CWNS who had higher articulatory mastery scores named pictures more rapidly than those with lower articulatory master scores, who tended to name pictures more slowly.

Because CWS did not exhibit an association between SRT and articulatory mastery, the authors concluded that their phonological systems may be less organized or developed relative to CWNS. It is not clear, however, why a lack of association would indicate a less organized phonological system or how their phonological systems might be differentially organized relative to CWNS. Furthermore, no significant differences were found between CWS and CWNS in SRT or phonological priming effects. If CWS did have a less organized/developed system, then they should have had slower SRTs in the absence of a phonological prime (due to difficulties inherent in accessing phonemes in an unorganized system) and, perhaps, benefitted more or less from the presentation of the prime relative to CWNS. Thus, in considering these inconsistent findings, it is perhaps safest to conclude that the findings of Melnick et al. (2003) do not provide strong evidence to suggest that phonological processing in CWS differs from that of CWNS.

Since the publication of Melnick et al. (2003), several other experimental studies of phonological processing have appeared in the literature. Most recently, Byrd, Conture, and Ohde (2007) used a picture–word interference task, where target pictures were preceded by a segmental (the initial segment of the target word) or holistic (the entire target word, except for the initial segment) auditory prime, to examine phonological processing in preschool CWS and CWNS. They found that CWS were significantly faster than CWNS in the earlier developing holistic priming condition, but slower in the later developing segmental priming condition. Byrd et al. took these findings to suggest that CWS may be delayed in their ability to develop a segmental approach to phonological processing. That is, CWS may continue to rely on an earlier developing, less efficient phonological encoding system, in which speech sounds are selected as whole words rather than individual speech sounds. This protracted reliance on holistic processing may, according to the authors, result in fluency breakdowns, particularly as CWS increase their vocabulary size and begin to use longer, more complex utterances.

The notion that CWS may have difficulties with phonological encoding receives further support from studies that have revealed that CWS may be less skilled than CWNS in their ability to retain phonological information in working memory (Anderson, Wagovich, & Hall, 2006; Hakim & Ratner, 2004). Phonological working memory allows one to temporarily store verbal information so that it can be cognitively manipulated for language processing (Adams & Gathercole, 1995; Gathercole & Baddeley, 1993). However, it may also function to support language development (Leonard et al., 2007). For if, as suggested by Leonard et al., a child is unable to retain phonological information in his working memory for a sufficient period of time, then he may have difficulty forming the word's phonological representation. Thus, if CWS have difficulty with phonological working memory, it could potentially impact the integrity of their developing representations, which may make it more difficult for them to engage in segmental processing—a possibility consistent with the findings and speculation of Byrd et al. (2007).

Thus far, findings from several recent studies (Anderson et al., 2006; Byrd et al., 2007; Hakim & Ratner, 2004) support the notion that CWS may have difficulties with phonological encoding. However, in addition to the equivocal findings of Melnick et al. (2003), there is another study by Arnold, Conture, and Ohde (2005), whose findings do not support the above contention. In this study, children were shown pictured objects whose names were either high or low in neighborhood density (the number of phonetically similar sounding words). Results revealed that CWS and CWNS named low density words faster and more accurately than high density words, with no between-group differences observed. The authors concluded that phonological processing is not likely to be a major source of difficulty for CWS.