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Title: Segmental and Syllabic Processing in Healthy Younger and Older Adults: An Electrophysiological Study

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Abstract:

Lexical access models for speech production generally include three processing stages, namely, retrieval of conceptual-semantic, syntactic, and phonological information (see Figure 1). Neuroimaging studies have examined the time-course of these stages in young adults. However, there is scant research investigating the time-course of the various phonological substages in younger, and particularly in older, adults.

This study made two comparisons in healthy younger and older adults: 1) a between-subjects comparison of the effects of age on the phonological retrieval process, and 2) a within-subjects comparison of the time-course of the phonological substages, segments vs. syllables. The ERP component N200, reflecting response inhibition, was elicited using a Go/Nogo paradigm with implicit picture naming. Additionally, P300 and Visual Evoked Potential (VEP) components were investigated to account for cognitive effort and sensory processing contributions to performance.

Results support the Transmission Deficit Hypothesis (Burke et al., 1991) of age effects at the phonological level, as N200 latencies on both phonological tasks were later (100 ms) in the older, as compared to the younger, group. In particular, within the older group, retrieval of syllabic information was significantly later (50 ms), as compared to retrieval of segmental information. These findings further suggest that the phonological breakdown is greater at the syllabic, than segmental, level.


Additionally, P300 and VEP results revealed no significant latency delays between groups and on both tasks. Thus, the data suggests that phonological processing delays in the older group were neither due to cognitive nor early visual processing delays, but rather to stage-specific phonological processing deficits. However, group differences in amplitude of the P300 on the segment task, and VEPs (at 201-250 ms) on both tasks, were seen. These findings suggest that with age greater cognitive effort was needed to perform the segment task, and greater visual attention was expended on both tasks.

Lastly, results support the parallel view of processing for segmental and syllabic phonological substages, although in the older adults the data showed that syllabic access is affected more than segmental access.

Implications of the study are that healthy older adults might benefit from practice with phonological tasks, mainly of syllabic information, to improve retrieval.

Figure 1

Lexical Access Model of Speech Production

Picture:	
	
<u>Stage 1: Conceptual/semantic and syntactic processing</u>	
Concept:	[horses]
Semantic and Syntactic elements:	'horses'=animal, has a tail, mane, etc.; plural noun
<u>Stage 2: Phonological processing</u>	
Morpheme:	horse + s
Sound segments:	/h/ />/ /r/ /s/ /l/ /z/
Syllable and stress:	/h>r/ /sIz/, two syllables, initial syllable stress
Combined:	[h>r]' [sIz]
Phonetic code:	[h>r]-[sIz]
Articulation:	"horses"

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