

The differential effect of processing speed on lexical retrieval and structural assembly across the lifespan

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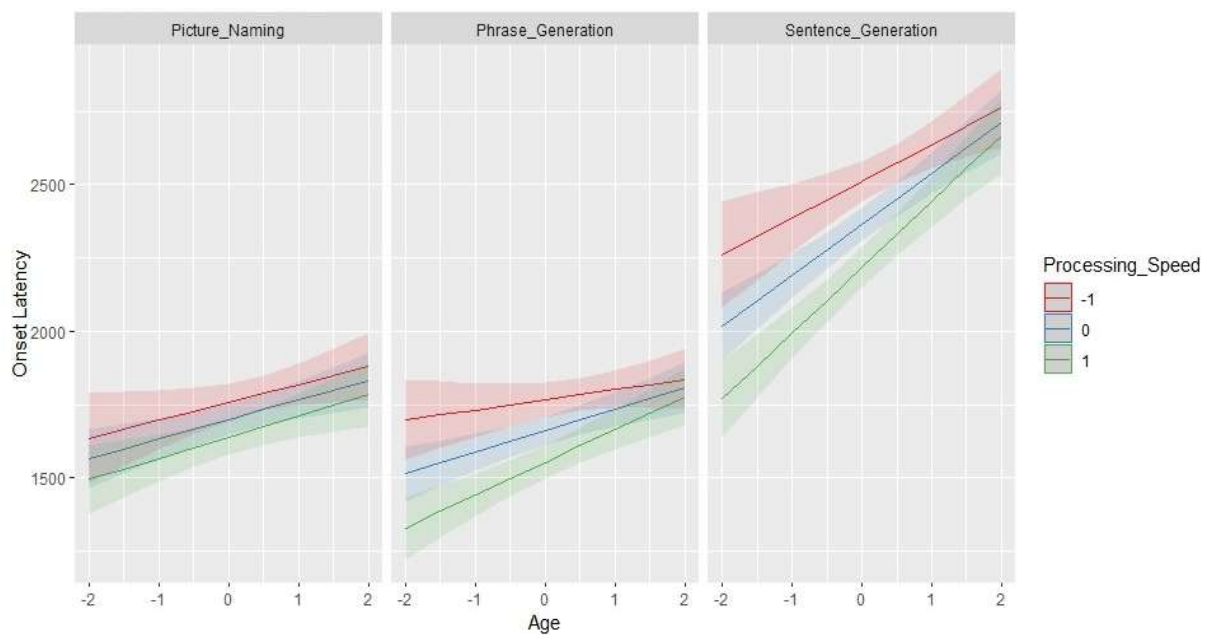
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Language production relies on the interplay between domain-specific and domain-general cognitive skills [1]. A recent study in younger adults suggests that domain-specific linguistic knowledge benefits the retrieval of lexical items, whereas domain-general skills, i.e., processing speed and short-term memory selectively support structural assembly [2]. The question is whether healthy aging can affect the interplay between domain-specific and domain-general skills in different stages of language production. We recruited 157 neurologically healthy native Cantonese speakers aged 20 to 80 years. We made sure there were at least 25 participants within each decade of life. Participants' mild cognitive impairments and dementia were screened using MOCA5 [3]. The dependent variables were speech onset (visual cue onset to speech onset) reflecting planning processes before speaking, and speech duration (utterance onset to offset) reflecting speech execution, monitoring and planning on the fly. Speech onset and duration in language production were measured for three visually cued naming tasks: word production, phrase generation, and sentence generation. We used 14 other tests to measure domain-general processing speed (number of tests = 4), short-term memory (n = 4), linguistic experience (n = 5), and non-verbal reasoning (n = 1). Confirmatory factor analysis was used to create one single score for each variable. Generalized linear mixed models were used for the analysis. As expected, older participants started to speak later, and the duration of their speech was longer. Concerning main effects across all three production tasks, we found that more linguistic experience and faster processing speed were associated with shorter onset latencies. Moreover, processing speed and short-term memory facilitated speech durations. Interestingly, we observed an interaction between processing speed, age and task: while processing speed affected picture naming onset latencies similarly across all ages, its effect on phrase and sentence generation was not consistent (see Figure 1). Among younger participants, slower processing speed was associated with longer onset latencies in the more demanding phrase and sentence generation tasks. In contrast, processing speed differences had little influence on speaking performance in older adults across tasks. These findings suggest that the contribution of domain-general processing speed to language production changes across the lifespan rather than increasing uniformly with task demands.

References

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Figure 1. Three-way interaction between processing speed, age and task for onset latencies.



Age and processing speed are on a standardized scale. Larger scores reflect older age and better processing speed skills, respectively.