Do phonological dependencies affect the scope of phonological advance planning?

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We investigated how the presence or absence of phonological dependencies affects the scope of phonological advance planning – how much of the utterance speakers phonologically encode before they start articulating. The form of some pre-nominal adjectives in French depends on the phonological and morphosyntactic context. For instance, the adjective *nouveau* ("new") takes the form *nouveau* [nuvo] when preceding a (singular) masculine noun with a consonant onset, but *nouvel(le)* [nuvɛl] when preceding a masculine noun with a vowel onset or a feminine noun. Such morphosyntactic and phonological dependencies put constraints on the scope of phonological planning: Speakers must minimally have retrieved the onset of the noun before they can start to articulate the end of the adjective in a phrase like *le nouveau camion* ("the new truck") or *le nouvel avion* ("the new airplane"). Our aims were to find out whether planning scope varies as a function of utterance-specific constraints (variable vs. invariant adjectives; masculine vs. feminine noun gender), whether it varies between languages (French, in which such phonological dependencies exist, vs. German, in which they do not), or whether planning scope is similar across utterances and languages and set to satisfy constraints when present.

In Experiment 1, we compared the production of utterances with adjectives that display phonological alternations like *nouveau* to utterances with adjectives that do not vary depending on context (e.g., *le joli camion/avion*: "the pretty airplane/truck"). To this end, native French speakers (N = 44) used determiner + adjective + noun phrases to describe pictures of objects that were modified to elicit a variable or an invariant adjective.

Previous research has shown that the time spent looking at an object (*gaze duration*) is a good indicator of the time it takes to phonologically encode its name (e.g., Meyer & Van der Meulen, 2000). Following this line of research, we measured both speech onset times and gaze duration, and took the difference between those two measures, the *eye-speech lag* (Levelt & Meyer, 2000) as our dependent variable indexing the scope of advance planning. To clarify, if participants start to speak at an early point relative to the time spent looking at the picture, the scope of planning is small. On the other hand, if speech onset is late relative to gaze duration, the scope of planning is large.

We fitted three Bayesian linear mixed effects models to the data, where the dependent variable was successively: speech onset, gaze duration, and eye-speech lags. We observed that speech onsets were longer for utterances with variable adjectives than for those with invariant adjectives (Fig. 1) – even among feminine nouns, when the adjective's form was predictable from the noun's gender irrespective of its phonology. Unexpectedly, however, there was a similar but stronger effect of adjective variability on gaze durations, whereby variable adjectives were associated with shorter eye-speech lags. We observed little evidence for an effect of noun gender on any of the dependent variables, nor for an interaction between adjective variability and noun gender.

Next, we investigated whether speakers of a language in which phonological dependencies exists in determiner + adjective + noun phrases use a larger planning scope than speakers of a language without such constraints. To this aim, we compared the French data to data from native German speakers (N = 47) tested in German, which does not have adjectives that depend on phonological context. We only included French trials with feminine nouns and invariant adjectives, and their most similar German equivalents. We observed weak evidence that French speakers used a larger scope of planning than German speakers (Fig. 2).

In summary, speakers take longer before starting to articulate when the utterance contains an adjective the form of which potentially depends on the phonological context. The analogous pattern in the eye-movement data prevents an unequivocal interpretation of the results in terms of planning scope. A preliminary assessment of the duration of the adjective across conditions suggests that part of phonological encoding may be done after the onset of articulation.

References

Levelt, W. J. M., & Meyer, A. S. (2000). Word for word: Multiple lexical access in speech production. *European Journal of Cognitive Psychology*, *12*(4), 433-452. https://doi.org/10.1080/095414400750050178

Meyer, A. S., & Van der Meulen, F. F. (2000). Phonological priming effects on speech onset latencies and viewing times in object naming. *Psychonomic Bulletin & Review, 7*(2), 314-319. https://doi.org/10.3758/BF03212987

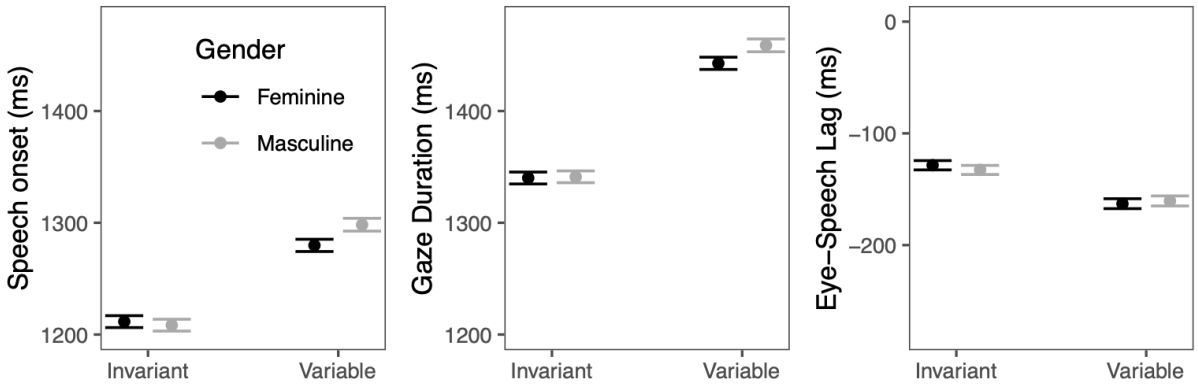

Fig. 1 Mean speech onset (left), gaze duration (center) and eye-speech lag (right) per noun gender and adjective variability condition in Experiment 1. Error bars indicate ±1 standard error of the condition mean.

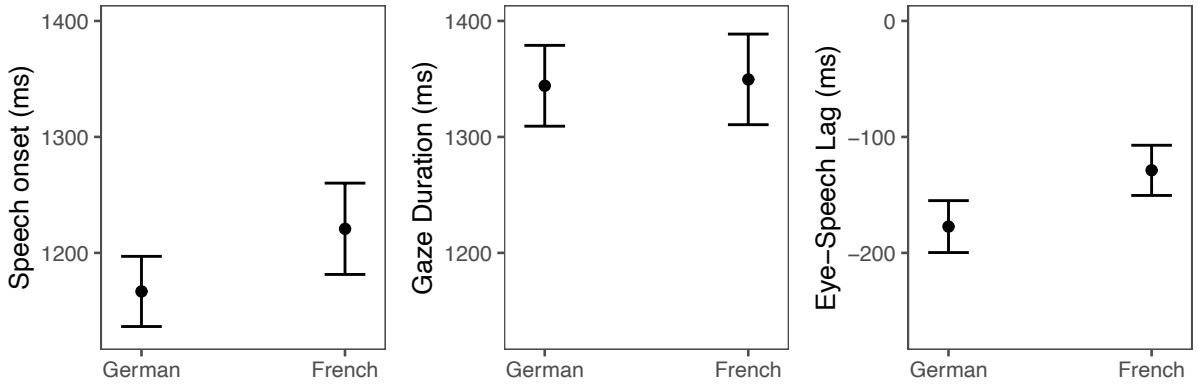

Fig. 2 Mean speech onset (left), gaze duration (center) and eye-speech lag (right) per language. Error bars indicate ±1 standard error of the mean across participant means.