Testing the P-Map: Lenition and Position

One claim of the theory of the P-Map (Steriade 2001) is that the perceptibility of pairs of sounds depends on the context the sounds are in, and that the knowledge of these relative perceptibilities in different contexts is used to obtain a hierarchy of correspondence constraints involved in Optimality Theory (Prince & Smolensky 1993), explaining cross-linguistic patterns of phonological typology. However, there is little direct evidence for Steriade's claim as there is a lack of experimental work testing the relative perceptibility of contrasts in different phonological contexts. For the modest number of papers that do test the relative perceptibility, there is no perceptual testing of the same contrast in different phonological contexts: only various contrasts in the same position.

This paper seeks to give a more comprehensive testing of the context-sensitive relative perceptibility of contrasts that Steriade claims. The limited prior experimental work that exists has supported the claim that the relative perceptibility of different contrasts parallels attested typological tendencies of phonological patterns. However, no previous study has tested whether these relative perceptibility rankings hold across distinct phonological contexts. The particular process in focus is lenition in the form of spirantization and devoicing.

The Experiment I ran a perception experiment with a within-subject design, run across two conditions. Condition I tested the perception of spirantization and devoicing intervocalically. Condition II tested the perception of these same processes word-finally. 19 native English speakers were presented with pairs of nonsense words with either voiced stop-voiceless stop alternations or voiced stop-voiced fricative alternations at three places of articulation, bilabial, alveolar and velar. Thus, the alternations in these tokens were between the consonants [b]-[p], [d]-[t], [g]-[k], [b]-[β], [d]-[ð] and [g]-[ɣ]. In Condition I, the contrasts were intervocalic and in Condition II, the contrasts were word-final. Listeners were asked to rate the similarity of pairs of tokens on a scale of 1-7, with 7 meaning very similar/identical and 1 meaning very dissimilar.

The P-Map predicts that spirantization would be a more perceptible contrast word-finally than intervocalically since spirantization is a much more common process intervocalically than word-finally across languages (Kirchner 1998). It also predicts that devoicing would be a more perceptible contrast intervocalically than word-finally since devoicing is a much more common process word-finally than intervocalically across languages (Beguš 2016).

Results The results for bilabial devoicing show that the mean score for word-final position was significantly higher than for intervocalic position ($Z = -3.62$, $p < .001$). For alveolar devoicing, the difference between the mean scores for intervocalic and word-final position were not statistically significant ($Z = -0.04$, $p > .05$). For velar devoicing, the mean score for word-final position was higher than for intervocalic position ($Z = -2.77$, $p = .006$).

The results for bilabial spirantization show that the mean score for intervocalic position was significantly higher than word-final position ($Z = -2.44$, $p = .015$). For alveolar spirantization, the difference between the mean scores was not significant ($Z = -0.20$, $p > .05$). For velar spirantization, the mean score for intervocalic position was significantly higher than word-final position ($Z = -3.67$, $p < .001$).

Discussion The findings overall support the predictions of the P-Map, showing that devoicing was a more perceptible phonological process intervocalically than word-finally, explaining the preference for devoicing word-finally than intervocalically universally. Spirantization was a more perceptible phonological process word-finally than intervocalically, explaining the preference for spirantization intervocalically than word-finally across languages. The unexpected results for the alveolar stimuli are speculated to be

due to the fact that the stimuli were created by recordings from a Spanish speaker who may have not produced natural alveolar stops since in Spanish, these consonants are dental (Martínez-Celdrán et al. 2003).

The results of this study support the P-Map's claim that attested phonological patterns vary depending on phonological context due to differences in the perceptual similarity of two phonological contrasts in different contexts. These findings are particularly striking since neither of these lenition processes happen in English. Therefore there was no bias in these similarity judgements, lending weight to the idea that these results reflect the universal perception of these processes and supporting the notion that there is a universal P-Map shared by all humans.

Figures

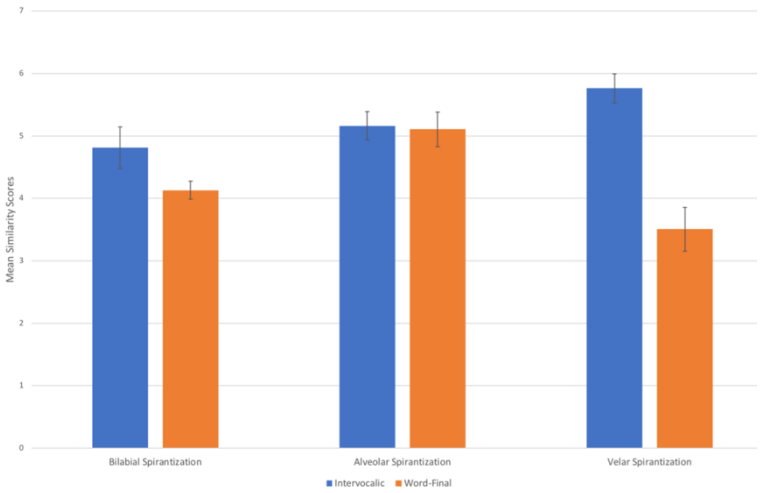

Figure 1: A summary of the mean scores for each pair of spirantization tokens, on scale from 1 (least similar) to 7 (most similar).

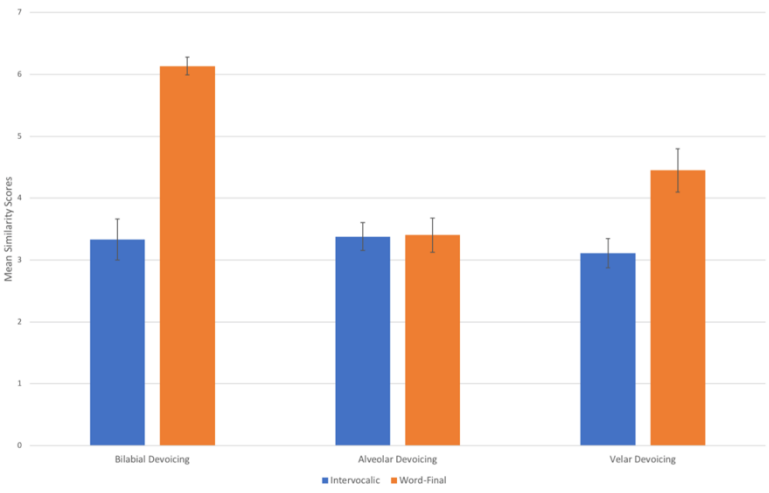

Figure 2: A summary of the mean scores for each pair of devoicing tokens, on scale from 1 (least similar) to 7 (most similar).

References

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