German unassimilated coronal nasals cause reduced inhibition

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Regressive place assimilation, whereby a segment assimilates to the place of articulation of a following consonant (often an oral stop) is cross-linguistically common for nasals, e.g., Malayalam; for coronals, e.g., Japanese; and for the coronal nasal /n/ specifically; e.g., German **[1; 3; 4; 5; 7; 8; 9]**. (See **[6]** for numerous examples). This study focuses on tautomorphemic NC sequences in the codas of monosyllables, an uncontroversial context for obligatory Regressive Nasal Assimilaiton (RNA) in German, to investigate differences in processing between nasals that are Place-specified, Place-underspecified, and Place-assimilated.

German RNA is obligatory for nasals that precede tautosyllabic [-continuant] labial or velar obstruents (i.e., stops /p b k g/); however, some unassimilated nasals do appear in nasal-obstruent sequences. Labial nasals may precede alveolar stops (e.g., *Amt* [amt] “office, agency”) and—in two words only—velar stops at syllable boundaries (e.g., *Imker* [ˈɪm.kɐ] “beekeeper”). Based on these facts, German phonology predominantly analyzes the bilabial nasal /m/ as a phoneme fully specified for Place, whereas coronal and velar nasals [n ŋ] (and some cases of [m]) derive from a nasal phoneme /N/ that is underlyingly unspecified for Place. It is typically argued that the velar nasal [ŋ] arises only as an allophonic variant of this underspecified nasal in German, always gaining its Place specification from neighboring underlying stops /k g/ (/g/-deletion obscures this environment in words such as *Ring* /ʀɪŋg/ → [ʀɪŋ] “ring”). Similarly, the surface coronal [n] derives Place specification either from neighboring stops /t d/ or from a default rule that supplies Coronal Place **[3; 7; 8]**. Theories of German phonology differ on the details, but all agree that RNA is obligatory for underspecified nasals (i.e., not /m/) before labial and velar stops in coda clusters of monosyllables.

Reaction time (RT) data are used to investigate sensitivity to violations of RNA. German native speakers (NS) were presented aurally with nonword stimuli in a phoneme detection experiment **[2]** that included [k]-detection and [p]-detection blocks. Both blocks included 3 place-matched coda trials (e.g., [zɪmp], [zɔŋk]), 3 underspecified coronal-nasal mismatch coda trials (e.g., ?[zɛnp], ?[zɛnk]), 3 place-clash mismatch coda trials (e.g., *[zɔŋp], *[zɪmk]), 27 distractors with the listening target in others positions, and 36 fillers that lacked the listening target. Seventeen German NSs (13 f, 4 m; age 18–35 years, $M = 25.2$, $SD = 4.764$) completed the experiment; five not meeting a 5-response threshold for each Context condition were excluded. A linear mixed effects model was run on the RT data. Listening Target ([k] vs. [p]) and Context (Complete Match vs. Underspecified Mismatch vs. Place-Clash Mismatch) were declared as fixed effects. Items and participants were declared as random effects. With the type III tests of fixed effects, the *F*-tests showed main effects of Listening Target, $F(1, 202) = 13.3$, $p < .001$, and of Context, $F(2, 202) = 21.1$, $p < .001$; their interaction was marginally significant, $F(2, 202) = 2.4$, $p = .097$. Overall, [p]-detection was slower than [k]-detection (by 56 ms). Place-Clash Mismatch RT ($M = 684$ ms) lagged behind Underspecified Mismatch RT ($M = 633$ ms); however, this was driven by *[ŋp], not *[mk]. Underspecified Mismatch was slower than Complete Match RT ($M = 564$ ms) across the board (see Fig. 1). On the assumption that RT inhibition indicates phonological ungrammaticality, this suggests that for RNA, phonotactic violations can be *incrementally ungrammatical*—that is, although phonemic /m/ may influence *[mk] perception, if *[ŋ], derivable only via RNA, clashes in *[ŋp], this inhibits processing more than just the failure of underlyingly underspecified [n] to adopt the Place of neighboring /p/.

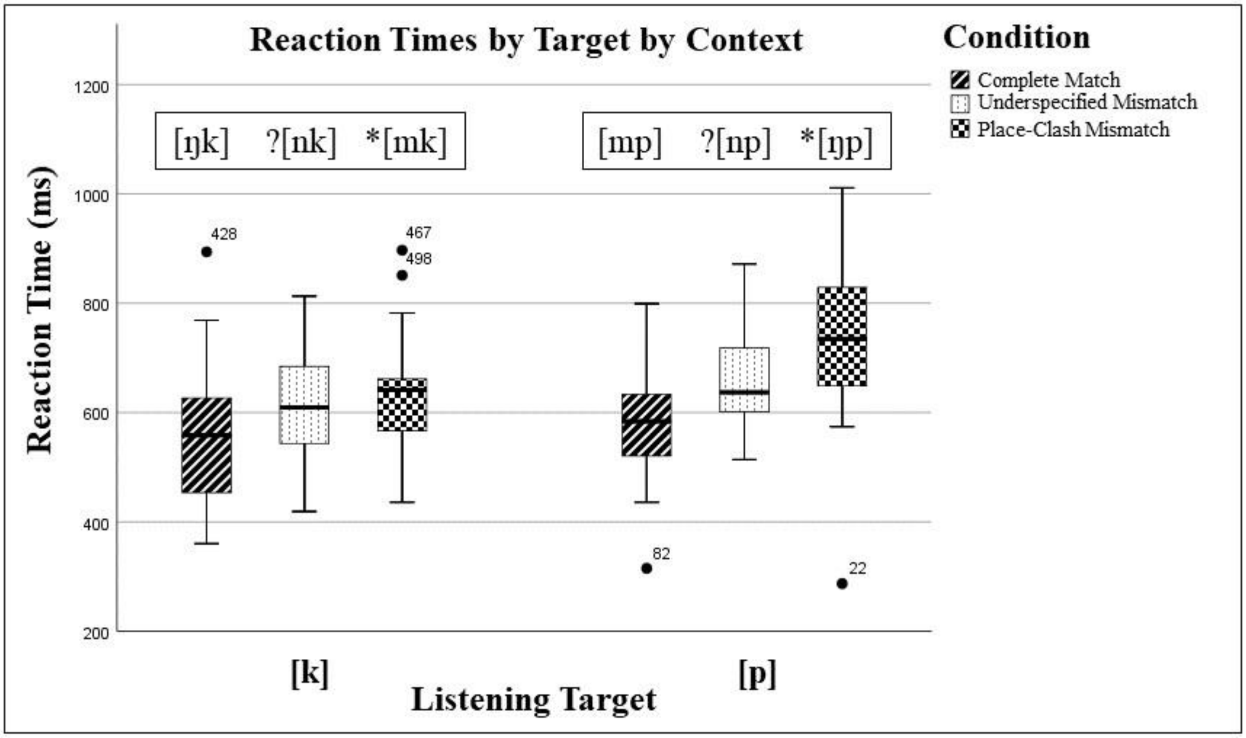

Figure 1. Reaction time results of the phoneme detection experiment.

References

[1] Avery, P., & Rice, K. (1989). Segment structure and coronal underspecification. *Phonology, 6*, 179–200. Retrieved from https://www.jstor.org/stable/4419997

[2] Foss, D. J. (1969). Decision processes during sentence comprehension: Effects of lexical item difficulty and position upon decision times. *Journal of Verbal Learning and Verbal Behavior*, *8*, 457–462. doi: 10.1016/S0022-5371(69)80089-7

[3] Hall, T. A. (1992). *Syllable structure and syllable-related processes in German*. Tübingen, Germany: Max Niemeyer.

[4] Otake, T., Yoneyama, K., Cutler, A., & Van der Lugt, A. (1996). The representation of Japanese moraic nasals. *Journal of the Acoustical Society of America, 100,* 3831–3842. doi: 10.1121/1.417239

[5] Paradis, C., & Prunet, J.-F. (1991). *The special status of coronals: Internal and external evidence*. San Diego, CA: Academic Press.

[6] Speeter Beddor, P., & Evans-Romaine, D. (1995). Acoustic-perceptual factors in phonological assimilations: A study of syllable-final nasals. *Rivista di Linguistica, 7,* 145–174. Retrieved from http://linguistica.sns.it/RdL/1995.html

[7] Wiese, R. (1996). *The phonology of German*. Oxford, U.K.: Clarendon Press.

[8] Yu, S.-T. (1992). *Unterspezifikation in der Phonologie des Deutschen* [Underspecification in the phonology of German]. Tübingen, Germany: Max Niemeyer.

[9] Yu Cho, Y.-M. (1999). *Parameters of consonantal assimilation*. Munich, Germany: LINCOM EUROPA.