

# The role of context sonority in the typology and perceptibility of geminate consonants

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Positional typology of geminate consonants suggests that sonority of the adjacent segments plays an important role in determining whether or not geminates are allowable in a specific context. One particularly consistent observation is that most languages restrict geminates to the high sonority environment – that between two vowels (e.g. Bengali, Maranungku, Somali). In some languages, geminates are allowed next to high-sonority consonants to the exclusion of the low-sonority neighbors. For example, in Finnish, geminate obstruents are found after liquids and nasals, as in *kartta* “map” and *vintti* “attic” (Karlsson, 1999, p. 13). In Italian, certain stop and fricative geminates can appear before liquids: *soffrire* “to suffer”, *applicare* “to apply”. Other marginal examples of sonorant-adjacent geminates are found in languages like Ge’ez (Gragg, 1997, p. 180) and Cypriot Greek (loanwords, Armosti, 2009, p. 6). Similar behavior of a gradient nature is attested for concatenated or “fake” geminates: In Hungarian, concatenated geminates are prohibited next to obstruents, optional next to nasals, and common next to liquids (Pycha, 2010; Siptar and Torkency, 2000, p. 291-292). Concatenated geminates in Russian are more frequent when followed by sonorants than when followed by obstruents (Kasatkin and Choj, 1999).

As an explanation for the prevalence of intervocalic geminates, superior perceptibility of durational properties in the high sonority context has been proposed (Bradley, 2001; Padgett, 2003). This explanation also predicts a gradient dependency between the perceptibility of duration and context sonority, whether or not individual languages choose to implement this gradient dependency in their phonology or refer to a specific point on the sonority scale as a cut-off for allowable environments.

The present study seeks to provide an experimental insight into the connection between perceptibility of geminates and sonority levels of the segmental context. For this connection to have a potential of a ‘universal’ explanation for the typological pattern, it must hold independently of the specific languages tested. In addition, to avoid language-specific phonotactic biases, speakers of the language without phonemic consonant duration should be tested. To this end, native speakers of American English, a language without phonemic geminate consonants, served as participants in the perceptual discrimination experiment. A male native speaker of American English recorded the stimuli, where the alveolar stop consonant [t] with a closure of 100 ms or 200 ms was embedded in the V(C)\_V or V\_(C)V environment, the adjacent consonant being one of the six sounds of varying sonority: [l], [n], [s], [f], or [p]. Eighteen listeners took part in the experiment to date. Participants listened to pairs of tokens, where both contained short targets, both contained long targets, or one contained a short and another one - a long target, and tried to detect the difference. The fact that consonant duration had been manipulated was not mentioned in the instructions to participants.

The results showed that sensitivity to durational differences, measured as d’ (d-prime), declined together with the sonority of the environment. The most pronounced difference was detected between the intervocalic (highest sonority) and the [p]-adjacent (lowest-sonority) environments. In addition, participants showed more sensitivity to durational differences when target consonant was in the onset rather than coda: Sensitivity was higher in response to the *aC.ta* stimuli than in response to the *at.Ca* stimuli, where [t] is the target.

These results demonstrate that listeners’ ability to detect durational differences in consonants is related to the sonority level of the adjacent sounds. This finding is compatible with the hypothesis that geminates’ preference for the high-sonority environment may be due to the perceptual advantage this context provides. In addition, the results underline, once more, the prominent status of the syllable onset position for the perception of phonological contrasts. Other studies have reported on the perceptual advantage of consonantal contrasts in the onsets, such as voicing, place of articulation and manner of articulation (Miller and Nicely, 1955; Fujimura et al., 1978; Ohala, 1990; Benki 2003, inter alios). This study expands on the previous work and introduces consonant duration as another type of contrast better perceived in the onset than in the coda position.

Among the issues that remain to be explored is the actual mechanism which translates higher-sonority context into better perceptibility of duration. There is also the fact that most languages choose the cut-off point between vowels and consonants in defining the allowable context for geminates, while few utilize the differences in the remainder of the sonority scale. Finally, it has been proposed that the sonority of the consonant itself affects the perceptibility of its duration and thus, the phonology and typology of geminates (Podesva, 2002; Kawahara 2006; Hansen; 2012). It is possible that context and target sonority interact in determining the perceptibility of the target's duration, forecasting languages with a complex positional typology of geminates. For example, we may expect a language where only geminates of a certain sonority level are allowed in contexts of certain sonority. To my knowledge, languages with such complex restrictions on the geminate phonotactics have not been reported, suggesting limitations in the explanatory power of the perceptual approach.