New perspectives on quantity: Typological issues and diachronic change

Felicitas Kleber
Institute of Phonetics and Speech Processing, LMU Munich

Many languages exploit phonemic quantity oppositions in vowels, consonants or both. However, typological classification of languages into those that distinguish long and short vowels (e.g., Czech), those that differentiate between geminate (long) and singleton (short) consonants (e.g., Italian) or both (e.g., Finnish) are challenged by measurements of segmental duration in a broader spectrum of languages. German varieties illustrate some aspects of the complexity in phonemic analyses, acoustic measures, and their interaction. For German and Austrian standard German, both quantity and quality contribute to a vocalic tense/lax opposition (albeit differently; [1] for Austrian, [2] for German), Swiss German varieties are variously classified as having a singleton/geminate [3] or a fortis/lenis opposition in consonants (next to aspirated [4] and extrafortis stops [5]), while Bavarian German is controversially analyzed as having fortis and lenis obstruents that may [6] or may not [7] predict vowel length. In addition to the terminological variation, the omnipresent phonetic variation can further complicate classification. Our own measurements show that the two sets of unaspirated stops in Bavarian German – fortis (e.g. *bitter* [ˈbɪt̪ɐ] 'bitter' with a long intervocalic closure phase) and lenis (e.g. *bieder* [ˈbiː.dɐ] 'staid' with a short intervocalic closure phase) – are implemented phonetically by some speakers with a more pronounced contrast in closure duration than two comparable sets of unaspirated stops in Lombard Italian usually referred to as geminates (e.g. *fatto* [ˈfat̪ːo] 'fact') and singletons (e.g. *fato* [ˈfaː.to] 'fate'). Both varieties also feature a clear pattern of complementary length according to which long (fortis) consonants are always preceded by vowels of significantly shorter duration and vice versa [6, 7]. This, too, makes the division between vowel or consonant quantity languages less clear-cut.

Such results pose questions regarding the typology of quantity, the phonetic nature of 'good' or 'true' quantity oppositions and normalization methods, particularly in cross-linguistic comparisons. While some of the observed synchronic variation may be linked to speaker- and language-dependent differences in speech rhythm [8], articulation rate [9] or articulatory timing [10], and therefore call for relational measures in typological takes on quantity [11], other forms of variation – potentially masked by normalization – may be indicative of a diachronic change in progress [12]. The timing systems of German varieties have been [13] and still are in a state of flux as suggested among others by diachronic changes in the timing of vowel+consonant sequences [14, 15]. This in turn has a potential impact on the prosodic system of these varieties (e.g. in terms of the rhythm-class hypothesis [8]) and on their typological classification [16, 17]. However, in order to better understand diachronic variation in progress and its implications for typology, we need to better understand the synchronic variation on which diachronic accounts are based on (e.g. in the apparent-time construct [12]).

In this talk I will present descriptive phonetic and theoretical accounts of vocalic and consonantal quantity on which many typologies are based on as well as length related phonological processes – some of which are seen as driving forces of sound change (e.g. [13]) – in tandem with experimental-phonetic results from larger-scale cross-linguistic laboratory-phonological analyses of German varieties and other languages. While some of the variation found in the analyzed data at the group level have implications for typological classification, other forms of variation point to diachronic change via lexical diffusion [18] and to change through a reordering of acoustic cues to a quantity contrast (possibly through the process of enhancement [19]). Finally, I will present results from agent-based modelling that support the view of diachronic change being largely the result of phonetic biases in synchronic variation [20].

[1] Brandstätter, J., Kaseß, C., & Moosmüller, S. Quality and quantity in high vowels in Standard Austrian German. In Leemann, A., Kolly, M.-J., Schmid, S., & Dellwo, V. (Eds), *Trends in Phonetics and Phonology: Studies from German-speaking Europe*. Bern [et al.]: Peter Lang, 79–92, 2016.
[2] Ramers, K. H. *Vokalquantität und -qualität im Deutschen*. Tübingen: Niemeyer, 1988.
[3] Kraehenmann, A. Swiss German stops: geminates all over the word. *Phonology*, 18, 109–145, 2001.
[4] Ladd, D. R., & Schmid, S. Obstruent voicing effects on F0, but without voicing: Phonetic correlates of Swiss German lenis, fortis, and aspirated stops. *Journal of Phonetics*, 71, 229–248, 2018.
[5] Zebe, F. Durational consonant categories in Alemannic and Swiss Standard German across tempo and age. *Proc. 11th Speech Prosody Conference*, (Lisbon), 225-229, 2022.
[6] Wiesinger, P. The central and southern Bavarian dialects in Bavaria and Austria. In Russ, C. V. J. (Ed.), *The dialects of Modern German*, 438–519. London: Routledge, 1990.
[7] Bannert, R. *Mittelbairische Phonologie auf akustischer und perzeptorischer Grundlage.* Ph.D. dissertation, Lund University, 1976.
[8] Ramus, F., Nespor, M., & Mehler, J. Correlates of linguistic rhythm in the speech signal. *Cognition*, 73, 265–292, 1999.
[9] Kleber, F., Jochim, M., Klingler, N., Pucher, M., Schmid, S., & Zihlmann, U. Sprechgeschwindigkeitsunterschiede zwischen den nationalen hochsprachlichen Varietäten Deutschlands, Österreichs und der Schweiz. Talk at the *46. Österreichische Linguistik-Tagung* (Wien), 2021.
[10] Hoole, P. & Mooshammer, C. Articulatory analysis of the German vowel system. In: Auer, P., Gilles, P., & Spiekermann, H. (Eds.), *Silbenschnitt und Tonakzente*. Tübingen: Niemeyer, 129–152, 2002.
[11] Hermes, A., Tilsen, S., & Ridouane, R. Cross-linguistic timing contrast in geminates: A rate-independent perspective. *Proc. 12th Seminar on Speech Production*, 52–55, 2020.
[12] Labov, W. *Principles of Linguistic Change*. *Volume 1*. Oxford: Blackwell, 1994.
[13] Lahiri, A., Riad, T., & Jacobs, H. Diachronic prosody. In van der Hulst, H. (Ed.), *Word Prosodic Systems in the Languages of Europe*. Berlin: Mouton de Gruyter, 335–422, 1999.
[14] Kleber, F. VOT or quantity: What matters more for the voicing contrast in German regional varieties? Results from apparent-time analyses. *Journal of Phonetics*, 71, 468–486, 2018.
[15] Kleber, F. Complementary length in vowel-consonant sequences: acoustic and perceptual evidence for a sound change in progress in Bavarian German. *Journal of the International Phonetics Association*, 50, 1–22, 2020.
[16] Klingler, N., Kleber, F., Jochim, M., Pucher, M., Schmid, S., & Zihlmann, U. Temporal organization of vowel plus stop sequences in production and perception: evidence from the three major varieties of German. *Proc. 19th International Congress of Phonetic Sciences*, (Melbourne), 825–829, 2019.
[17] Jochim, M. & Kleber, F. What do Finnish and Central Bavarian have in common? Towards an acoustically based quantity typology. *Proc. Interspeech 2017*, (Stockholm), 3018–3022.
[18] Phillips, B. Lexical diffusion in historical phonology. In Honeybone, P. & Salmons, J. (Eds.), *The Oxford Handbook of Historical Phonology,* 359–373, 2015.
[19] Kirby, J. The role of probabilistic enhancement in phonologization. In Yu, A. C. L. (Ed.), *Origins of sound change: Approaches to phonologization*, 228–246, 2013.
[20] Cronenberg, J., Klingler, N., Kleber, F., & Pucher, M. On the role of asymmetry in prosodic change of consonant duration: Results from an agent-based model with two German varieties. *Proc. 11th Speech Prosody Conference*, (Lisbon), 249–253, 2022.