

Impacts of structure, usage, and phonetics on Italian mid vowels

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Advancements in laboratory phonology have highlighted numerous ways that language-specific patterning extends beyond the symbolic or categorical level into the gradient domain of the acoustic speech signal, leading linguists to reevaluate the scope of the phonological grammar. Findings of gradience have altered even the core concept of phonological contrast, which was traditionally regarded as a binary distinction but now covers a continuum of contrast types.

This presentation explores contrasts among the Italian mid vowels, from a multifaceted perspective considering linguistic structure, usage, and acoustic phonetics. Under a traditional structuralist account, the Italian front mid vowels /e ε/ are separate phonemes, as are the back mid vowels /o o/. However, these height-based contrasts are demonstrably *marginal* due to the paucity of minimal pairs and the variability of the contrasts' phonetic realization, which includes inconsistency of speakers' intuitions compared to their productions (Renwick & Ladd 2016). While native speakers clearly maintain intuitions of higher and lower mid vowels (and can produce both), the factors triggering variability in phonolexical mapping require further exploration.

A phonetic analysis was conducted using data from CLIPS (Leoni et al. 2007), which includes 16 speakers from each of 15 Italian cities. The “read sentences” portion of the corpus was force-aligned using MAUS (Kisler et al. 2016) and hand-corrected, and formant values (F1, F2) were extracted at vowels' midpoint, leaving 66,100 mid-vowel tokens for analysis. Each token was acoustically classified as “high mid” or “low mid” based on normalized F1, F2 data in a kmeans clustering analysis, providing a way compare the standard transcription and acoustics. Since /e ε/ are rendered orthographically as <e> while /o o/ are identical as <o>, phonetic transcriptions were gathered from lexical items in the PhonItalia dataset (Goslin, Galluzzi & Romani 2014). This permitted calculation of functional loads and neighborhood densities using PCT (Hall, Mackie & Lo 2019). Lexical frequency data were acquired from SUBTLEX-IT (Crepaldi et al. 2015).

Functional load results show that the front vowel pair /e ε/ has the weakest lexical contrast among all Italian vowels, a typical sign of a marginal contrast, while /o o/ are separated by considerably more minimal pairs. Acoustic results indicate that while some lexical items are consistently realized with high-mid or low mid vowels, most words are highly variable. Vowel height is negatively correlated with lexical frequency, matching expectations of effort minimization. For both front and back vowels, duration and F1 are also correlated: lower vowels generally appear at longer durations, in line with expectations of intrinsic phonetic length. However, the behavior of front and back mid vowels diverges. Among stressed front vowels, height can vary by syllable structure, which is context-dependent in some Italian varieties (with a “conditioned contrast”) but not others (with a “full contrast” or mid-vowel merger). The height of back vowels is negatively correlated to lexical competition metrics of neighborhood density and minimal pair count.

Overall, these corpus-based findings indicate that the marginality of Italian mid vowel contrasts is of *different magnitude* and has different sources across front and back mid vowels. Front vowels have low functional load and are more context-dependent, while back vowels are more affected by usage. The results are interpreted in two ways, first in the context of the systemic, usage-based, and phonetic factors identified by the Multidimensional Model of Phonemic Robustness (Renwick 2014). Second, an OT formalization is proposed, by expanding the scope of effort minimization among stressed vowels in a Dispersion Theory account (Flemming 2004); in this analysis, functional factors compete against perceptual distinctiveness to trigger variable vowel height.

References

- Crepaldi, D., S. Amenta, M. Pawel, E. Keuleers & M. Brysbaert. 2015. SUBTLEX-IT. Subtitle-based word frequency estimates for Italian. In *Proceedings of the Annual Meeting of the Italian Association For Experimental Psychology*, 10–12.
- Flemming, Edward. 2004. Contrast and perceptual distinctiveness. In Bruce Hayes, Robert Kirchner & Donca Steriade (eds.), *Phonetically Based Phonology*, 232–276. Cambridge, UK: Cambridge University Press.
- Goslin, Jeremy, Claudia Galluzzi & Cristina Romani. 2014. PhonItalia: a phonological lexicon for Italian. *Behavior Research Methods* 46(3). 872–886. <https://doi.org/10.3758/s13428-013-0400-8>.
- Hall, Kathleen Currie, J. Scott Mackie & Roger Yu-Hsiang Lo. 2019. Phonological CorpusTools: Software for doing phonological analysis on transcribed corpora. *International Journal of Corpus Linguistics*. John Benjamins 24(4). 522–535. <https://doi.org/10.1075/ijcl.18009.hal>.
- Kisler, Thomas, Uwe D. Reichel, Florian Schiel, Christoph Draxler, Bernhard Jackl & Nina Pörner. 2016. BAS Speech Science Web Services – an Update on Current Developments. In *Proceedings of the 10th International Conference on Language Resources and Evaluation (LREC 2016)*, paper id 668. Portorož, Slovenia.
- Leoni, Federico Albano, Francesco Cutugno, Renata Savy, Valentina Caniparoli, Leandro D’Anna, Ester Paone, Rosa Giordano, Olga Manfredi, Massimo Petrillo & Aurelio De Rosa. 2007. Corpora e Lessici dell’Italiano Parlato e Scritto. <http://www.clips.unina.it/>.
- Renwick, Margaret E. L. 2014. *The Phonetics and Phonology of Contrast: The Case of the Romanian Vowel System*. Berlin, Boston: De Gruyter Mouton.
- Renwick, Margaret E. L. & D. Ladd. 2016. Phonetic Distinctiveness vs. Lexical Contrastiveness in Non-Robust Phonemic Contrasts. *Laboratory Phonology: Journal of the Association for Laboratory Phonology* 7(1). 1–29. <https://doi.org/10.5334/labphon.17>.