Detecting additivity in neurocortical activity: representational complexity in phonology and sound.

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For more than 50 years phonologists have been able to provide an answer to a fundamental question concerning their domain: are phonological features the direct correlate of phonetic properties, or are they abstract representational units that serve to organize linguistic sounds systems, but otherwise unrelated to the physical world outside of human minds and brains? In this talk I present some data from a process of lenition in Campidanese Sardinian that resist a simple generalization and may help to shed some light on this enduring question. In Campidanese, the voiceless stops /p t tʃ k/ spirantize and voice when they are realized in intervocalic position, surfacing as [β ð ʒ ɣ], a change involving two phonetic dimensions. In contrast, the voiceless fricatives /f s/ only voice in this position, surfacing as [v z], a change involving a single phonetic dimension. The functional unity of the intervocalic position in these disparate changes suggests that these changes are all the result of a single computational process in Sardinian.

The pattern in Campidanese thus is an example of a natural language where the role of representational complexity is ambiguous. One way of shedding light on this question would be to investigate this change using neurobiological techniques sensitive to fine-grained representational differences. I discuss an ongoing project at the University of Maryland that seeks to use Magnetoencephalography (MEG) on speakers of American English to detect electrocortical differences elicited in a Mismatch Negativity experiment. The underlying hypothesis of this project is that if relative representational complexity exists in brains, it will correlate to an additivity effect in Evoked Response Potentials (ERPs) (Paavilainen et al. 2001). The preliminary results from this experiment are promising, and suggest that if the technique can be adapted to production, it may have the potential to explain the role of complexity in the pattern of lenition in Campidanese. If this is true, then neurolinguistics may be able to make an important contribution to the question concerning the phonetic content of phonological features in human languages.