

Project title: You can say that again! How emotional speech features are perceived and reproduced.

Project leader: Sonja A. Kotz

Function: Primary supervisor

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Proposal (250 words):

Introduction:

Language emerges from iterated learning: generations learn then teach the next generation. Over generations, speech patterns and pronunciation can change, especially in multilingual environments where dialects may form. Temporal and acoustic structures can emerge from this process. We examine whether the sound systems of languages can emerge from this process when speech sequences are learned by participants, then reproduced by following generations. Native speakers of English, German, Hindi, and Chinese have been recorded speaking nonsense sentences in several emotions. We examine how subsequent generations reproduce these sentences and which acoustic and temporal features are retained as a result of the participant's native language.

Hypothesis and Objectives:

We hypothesize that temporal and acoustic dimensions of speech become more regular over subsequent generations and adapt to the native language of the speaker. We also expect that the individual's prior exposure (i.e., culture) will determine how much features converge or diverge.

Setting and Methods:

The method uses iterative learning whereby the speech reproductions of one generation becomes the stimuli for the next generation. Acoustic features are extracted from speech recordings and we test how the distribution of various acoustic features changes over generations. Time series analysis and signal processing methods will be used to analyze the data.

Impact:

Results have implications for how speech may have evolved over time. Most linguistic history is not observable, and controlled experiments on real languages are not possible. The experiments above allow careful control of stimuli providing a powerful insight into the mechanisms of language evolution.

Requirements candidate: Highly motivated student with good English communication skills and proactive and resolute attitude. Some experience with signal processing or audio editing is a plus.

Keywords: Speech, Emotion, Learning, Acoustic features

Top 5 selected publications:

1. Banse, R., & Scherer, K. (1996). Acoustic profiles in vocal emotion expression. *Journal of Personality and Social Psychology*, 70(3), 614–636.
2. Scherer, K. R., Banse, R., & Wallbott, H. G. (2001). Emotion Inferences From Vocal Expression Correlate Across Language and Cultures. *Journal of Cross-Cultural Psychology*, 32(1), 76-92.
3. Pell, M.D., Monetta, L., Paulmann, S., Kotz, S.A., (2009). Recognizing Emotions in a Foreign Language. *Journal of Nonverbal Behavior* June 2009, Volume 33, Issue 2, 107-120.
4. Liu, P., & Pell, M. D. (2012). Recognizing vocal emotions in Mandarin Chinese: A validated database of Chinese vocal emotional stimuli. *Behavior Research Methods*, 44, 1042–1051.
5. Ravignani, A., Delgado, T., & Kirby, S. (2016). Musical evolution in the lab exhibits rhythmic universals. *Nature Human Behaviour*, 1, 0007.