

Multidimensional Scaling (MDS) for Analyzing Perception Data

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L2 pronunciation teachers and researchers very commonly use the metaphor of perceptual “space” to discuss discriminability of L2 phones. Easily discriminated phones are perceptually “distant,” while L2 phones that are difficult to discriminate sound “close together.” Of key concern, though, is that such “distances” in perceptual space are warped by language experience, and in particular, the L1. Understanding how that perceptual space is warped—in other words, which L2 phones are perceived similarly to each other, which aren’t, which acoustic cues are listeners using to discriminate sounds, which are less faithfully employed, and how that changes over the course of learning—is of key concern to the field of L2 pronunciation. Multidimensional Scaling (MDS) is a rigorous analytical method for quantifying, visualizing, and generating rich data on the distances between stimuli and the shape of listeners’ perceptual spaces using input from a variety of possible perception tasks (Clopper, 2008). While already common in many areas of psychology, free classification has only recently been applied to L2 pronunciation (e.g. Daidone, Kruger, and Lidster, 2015), but with very promising results. A complete MDS analysis can be done in SPSS, R, Matlab, or a variety of other software packages, and the key concepts are simple to learn. Most importantly, the unique information MDS provides on learners’ perceptual spaces gives the method great potential for growth in L2 pronunciation research; previous work revealed not only how listeners grouped stimuli together, but also which acoustic cues they employed to make those judgments.

In this workshop, I will explain MDS as a method, mostly focusing on concepts rather than the mathematics, but going into considerable depth. We will discuss what kind of data and elicitation methods are appropriate for an MDS analysis, and then use anonymized data from real perception experiments to walk through an MDS analysis in SPSS (and one R-based equivalent), including all stages and decisions from interpreting stress plots and other indices of model fit, to deciding on settings for convergence, and finally comparing the results with acoustic measurements and reporting the results. Common problems and solutions to them will be discussed, with the goal of leaving the session with a powerful tool in the toolbox of research methods to ask and answer detailed questions about how L2 learners perceive the input. We will conclude with your questions and discussion of application to current and future research programs.

Learning outcomes

Participants in this session will become able to:

- Decide how and when using MDS could provide key insight into their research questions
- Organize results from an experiment in a way that enables MDS analysis in SPSS (or R)
- Conduct an MDS analysis using two different data sources, including deciding on the dimensionality of the data
- Interpret the results with respect to acoustic or phonological properties of the stimuli
- Relate those results to behavioral data

- Write up the results for a presentation or journal article

References

Clopper, C. G. (2008). Auditory free classification: Methods and analysis. *Behavior Research Methods, 40*, 575-581. doi: 10.3758/BRM.40.2.575

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