

## **A Brain-Based Feature Model of Adjective-Noun Composition**

In the present study, we compare two popular models of adjective-noun semantic composition: element-wise vector addition and multiplication using a novel approach of brain-based features of meaning (sensory-motor features: sound, color, manipulation, motion, and shape). A large literature (e.g. Fernandino et al., 2015) suggests that perceptual systems contain information that can be extracted using neural decoding (e.g. Anderson, Murphy & Poesio, 2014). Within semantic composition research, adjective-noun composition has been relatively well-studied due to their concrete nature, making this ideal for exploration of composition of these neurobiologically-based features. Using Amazon's Mechanical Turk, participants rated how much each of the words and phrases (made of all combinations of the selected adjectives and nouns) evoked the features. The two most successful, easily interpretable functions in the literature have been multiplication (e.g. Chang et al., 2009) and addition (e.g. Mitchell & Lapata, 2010). Both multiplication and addition surpass chance at matching the correct phrase, but addition outperformed multiplication (addition = 7.6/60, multiplication = 13.4/60). Addition allows the adjective to weight the important behavioral results, we predict, and are testing in current work, that addition will also be successful when using brain activity (from fMRI) as the representations of the adjectives, nouns, and phrases.