
Forces in the large-scale structure of the verb lexicon

PHILLIP WOLFF
(Emory University)

It has been argued that the notion of force plays a significant role in the structure of the verb lexicon (Talmy, 1988; Copley & Harley, 2014; Gärdenfors, 2000; Mumford & Anjum, 2011; Hubbard & Ruppel, 2014; White, 2012; Warglien, Gärdenfors, & Westera, 2012; Wolff, 2007). This proposal was examined in a Big-Data analysis of the English verb lexicon. The large-scale structure of the verb lexicon was obtained by parsing approximately 200 million sentences from Wikipedia and The New York Times, extracting roughly 10,000 verbs and associated syntactic frames (> 1000 per verb), analyzing the syntactic patterns using Latent Dirichlet Allocation (LDA), and projecting the results into Euclidean space using Multi-Dimensional Scaling (MDS). This analysis revealed that verbs of English fall into three major categories, corresponding to the domains of the mental, spatial, and causal (very broadly construed). The results also revealed a general shift from continuums to categories as the granularity of the clusters was shifted from coarse to fine. Finally, the results revealed that the notion of force seems to factor into the meaning of several categories of verbs across the verb lexicon.

The prevalence of forces in the verb lexicon raises the possibility that the perception of events also involves the perception of forces. This possibility was examined in a series of experiments in which people saw a wide range of causal events while their sensitivity to physical forces acting against their hand was tested. The causal events were presented in near-photorealistic 3D animations, and the forces were generated by a small robotic arm. As predicted, people were faster to indicate feeling a force acting against their hand after viewing a causal event, regardless of the nature of causation, that is, whether the causal mechanism was hidden (e.g., turning on a light), social (e.g., telling someone to change direction), or abstract (e.g., abstract symbols turning on and off). The results imply that causation has a perceptual basis in the sense of touch.

More broadly, the results from these two lines of research imply that the components of meaning that structure the verb lexicon may reflect the dimensions of experience people are most likely to attend to in the perception of events.