Tracking lexical ambiguity resolution with item-level multi-voxel pattern analysis

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In order to comprehend a sentence that contains a homonym, readers must select the ambiguous word's contextually appropriate meaning. We used item-level analyses of multi-voxel patterns to track the outcome of this ambiguity resolution, by measuring the similarity between neural patterns evoked by two distinct meanings of the same word. We first scanned subjects while they read sentences that biased the interpretation of homonyms toward their most frequent, dominant meaning (e.g. money bank), and then measured the multi-voxel patterns evoked by each homonym. We then presented subjects with the same homonyms, but in sentence contexts that biased the interpretation toward a subordinate, less common meaning. For these subordinate-biased sentences, we also manipulated the relative location of the disambiguating information: the resolving context either preceded the homonym (prior-subordinate; e.g., "river...bank"), or followed it (delayed-subordinate; e.g., "bank...river"). A whole-brain searchlight analysis revealed that in bilateral inferior frontal gyrus, the delayed-subordinate and dominant patterns were more similar than the prior-subordinate and dominant patterns. Follow-up analyses reveal that this effect may be partly driven by greater mean responses for delayedsubordinate than prior-subordinate items. Additionally, in left inferior temporal gyrus, the strength of each homonym's meaning dominance predicted the similarity between the dominant-biased and subordinate-biased homonym patterns, regardless of context position. These findings demonstrate the use of item-level, similarity-based analyses to measure the activation of contextually inappropriate word meanings.