Category effects in left IT are related to lexical selection: evidence from spiral fMRI

**Introduction**

Functional imaging and lesion studies of naming routinely implicate the left inferotemporal region (IT) and demonstrate conceptual category effects. How much these effects arise in lexical processing, or in more general nonverbal conceptual processing remains unclear. We hypothesized that portions of left IT are involved in lexical selection and include specialized and partially segregated lexical-semantic networks processing different conceptual categories.

**Method**

We used the semantic interference effect in the picture-word interference paradigm. This effect reflects increased lexical selection processing demands when competing lexical items are activated during picture naming. We recorded 10 normal right-handed native English speakers, overtly naming photographs of concrete entities (animals and tools), while asked to ignore simultaneous auditory distractors: pseudo-words (PW) and words semantically related (SR) or unrelated (SU) to the pictures; balanced for word frequency and length. We used a mixed event-block design, and spiral in-spiral out sequences (SPRLIO) which mitigate magnetic susceptibility artifacts in IT. Response latencies were calculated after speech filtering with time aware spectral subtraction. Data were analyzed using the General Linear Model and RFT spatial extend threshold, focusing on the contrast between SR and SU for correct responses.

**Results**

Per item analysis showed that, on average, it took longer to the subjects to name the pictures during SR (1007 ms) than SU (955 ms) (F(1,422)=55.68; p<0.001), demonstrating behavioral evidence of semantic interference in the scanner. We found statistically significant clusters of higher BOLD responses for SR than SU in ventral and anterior left IT, largely segregated by conceptual category (animal versus manipulable objects).

**Conclusion**

The results support the hypothesis that category effects in left IT are related at least in part to lexical levels of processing. The SPRLIO sequence permitted testing this hypothesis in portions of IT affected by signal dropout in conventional EPI. This is the first time that brain category effects tied to semantic interference have been documented. Contrary to previous studies we did not find evidence of anterior cingulate and orbitofrontal activity correlated with semantic interference.

**Disclosures:**

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