The Benefit of Scene-Like Interactions on Object Identification Arises in LO Rather than Being a Consequence of Parietal Attentional Modulation

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Interacting objects are better recognized than noninteracting objects

Our visual experience is generally not of isolated objects, but of scenes, where multiple objects are interacting. Such interactions have been shown to facilitate object identification compared to when the objects are presented as not interacting (Green & Hummel, 2006). Where is the neural locus for this advantage?

Questions

1) Given that LOC shows greater responses to interacting than not interacting object pairs, could this region be critical for the behavioral benefit of coding of object relations?
2) Could IPS also be involved producing the advantage for interacting objects?

TMS Experimental Design

Subjects performed the target detection task after offline theta burst stimulation was delivered to LO or IPS or with no TMS. On each trial, a pair of objects was shown as interacting or not interacting (by reversing the orientation of one or both of the interacting objects). Subjects detected if the target label, shown in Chinese characters, matched one of the previously presented objects.

Results

* In the absence of TMS, target detection was more accurate when object pairs were shown as interacting than not interacting, thus replicating the Green & Hummel (2006) result.
* This benefit for interacting objects was completely abolished after TMS was delivered to LO but not when delivered to IPS.

Conclusions

* The identification of objects is facilitated by scene-like interactions.
* Normal LO activity is required for this behavioral benefit.
* Disruption of IPS activity has no effect on the facilitative effect of the interactions, suggesting that attentional modulation from IPS plays no role in this benefit.
* Given that LO is the first area where intact objects are distinguished from texture, the results suggest that inter-object relations are specified at the same cortical locus as object shape.

Object pairs shown as interacting elicit greater activity in LOC than when shown side-by-side

Object pairs shown as interacting consistently (in three experiments) elicited greater BOLD responses in LOC compared to their side-by-side depictions (Kim & Biederman, 2010). IPS, a region suggestive of visual attentional processing (Wojciulik and Kanwisher 1999) sometimes showed a similar pattern of results to that of LOC.

% BOLD

Fam-Inter

Nov-Inter

Fam-Side

Nov-Side

Target Detection Task

TMS was applied prior to each session

Sample Stimuli

Functionally Defined LO and IPS

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