

How different organizations of space modulate the same-object effect

Paola Cappucci • Alessandro Couyoumdjian • Enrico Di Pace

Abstract In the last 20 years two theoretical frameworks have mainly characterized visuospatial attention studies: (a) the space-based view suggests that attention is directed to spatial locations (Posner 1980); (b) on the contrary, the object-based view claims that attention is oriented exclusively to objects in visual space (Duncan 1984). In 1994, Egly et al., by using a modified spatial cuing paradigm, showed that when moving attentional focus within a perceptual object is less costly than between two objects (same-object effect, SOE). According to the authors, such a result would suggest that visual attention is characterized by both spatial and object components. Even if SOE seems to be extremely robust, as it has been replicated several times with different experimental paradigms (Chen 1998; Haimson and Behrmann 2001; Goldsmith and Yeari 2003), it can be interpreted in different ways.

The present study investigated the hypothesis that the same-object effect is actually just one case of a broader category of attentional effects caused by the ways the objects affect the spatial organization of the visual field. Three spatial cuing experiments, analogous to the Egly et al.'s, were run to test this hypothesis. Experiments A and B investigated the interaction between attention orienting and objects orientation by comparing the Egly et al. standard condition (that we called inside condition, IC) with a similar condition in which targets stimuli were located outside the objects (outside condition, OC). Results were similar for experiment A (in which target locations on OCs were beyond the two objects) and experiment B (in which target locations on OCs were embodied between the objects). A preliminary analysis of variance showed a significant main effect of target location cuing, that is RTs to valid trials were faster than those recorded on invalid trials ($P < 0.001$). Moreover, a three-way ANOVA with object (cued vs uncued), target

field (left vs right) and attentional orienting (horizontal vs vertical) as within-subjects factors showed a "same-object effect" both on inside and outside conditions, that is RT costs on within-objects conditions were smaller than those on between-object conditions ($P < 0.05$). Again, in experiment C we used Egly et al.'s paradigm (Egly et al. 1994) to show that SOE is modulated by the perceptual partitioning of the visual field. Therefore, an horizontal or vertical meridian line was presented during each trial. More specifically, we assumed that an horizontal meridian mainly organizes visual space in the upper and lower hemifield and a vertical meridian in the right and left hemifield. ANOVA on RT costs showed that same-object effect was greater when meridian lines were parallel to the objects in the visual field than when they were perpendicular ($P < 0.05$).

In general, our results suggest that SOE is not related to an advantage when shifting visual attention between to locations belonging to the same object in the visual field, instead it is caused by the orientation of the objects that occupy the space and the visual anisotropies that characterize visual field. Moreover our results are discussed with reference to the meridian effects and the role of perceptual objects in the construction of the spatial representation over which attention moves.

Keywords Spatial representation • Object perception • Visuospatial attention

References

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