



Brief article

# Crossmodal object-based attention: Auditory objects affect visual processing

Massimo Turatto<sup>a,\*</sup>, Veronica Mazza<sup>b</sup>, Carlo Umiltà<sup>b</sup>

<sup>a</sup>*Department of Cognitive Science and Education, University of Trento, Via Matteo del Ben,  
5, 38068 Rovereto (TN), Italy*

<sup>b</sup>*University of Padova, Padova, Italy*

Received 28 May 2004; accepted 6 December 2004

---

## Abstract

According to the object-based view, visual attention can be deployed to “objects” or perceptual units, regardless of spatial locations. Recently, however, the notion of object has also been extended to the auditory domain, with some authors suggesting possible interactions between visual and auditory objects. Here we show that task-irrelevant auditory objects may affect the deployment of visual attention, providing evidence that crossmodal links can also occur at an object-based level. Hence, in addition to the well documented control of visual objects over what we hear, our findings demonstrate that, in some cases, auditory objects can affect visual processing.

© 2005 Elsevier B.V. All rights reserved.

*Keywords:* Crossmodal attention; Object-based attention; Auditory objects; Sensory modalities

---

Attention is an important cognitive function by means of which the human cognitive system is able to select the information relevant for the current behaviour. According to the “space-based” view (Posner, Snyder, & Davidson, 1980; for a review see Cave & Bichot, 1999), selection takes place in spatial coordinates, with the spotlight of attention moving in different regions of the visual field. Alternatively, following Neisser’s (1967) original suggestion, Duncan (1984) proposed the “object-based” view, claiming that the units over which attention processes operate are discrete visual objects (for a review see Scholl, 2001; also see Driver, Davis, Russell, Turatto, & Freeman, 2001).

---

\* Corresponding author. Tel.: +39 0464 483529.

E-mail address: [massimo.turatto@unitn.it](mailto:massimo.turatto@unitn.it) (M. Turatto).

Egly, Driver, and Rafal (1994; also see Moore, Yantis, & Vaughan, 1998) reconciled these two apparently opposite theoretical positions, providing evidence for both a space-based and an object-based component of visual attention. In their study, participants were presented with a display consisting of two outlined rectangles placed on either side of the fixation point (arranged either vertically or horizontally). The authors cued the observers to the end of one rectangle. After a 75%-valid cue, the target (a luminance increment) occurred at an end of one of the two objects, and the observers had to detect it as quickly as possible. Two types of invalid trials were possible. On “within-object” invalid trials, the target appeared at the uncued end of the cued object, whereas on “between-objects” invalid trials the target appeared at the end corresponding to the cued one but in the uncued object. Results showed that response times (RTs) were lower on valid trials than on invalid trials, in accordance with the space-based component of attention. However, RTs were lower on invalid within-object than on invalid between-objects trials. Because the spatial distance between the cue and the target location was identical in the two invalid conditions, the lower RTs on the invalid within-object trials were evidence of a “same-object advantage”, showing an object-based component of attention (Egly et al., 1994).

In those same years, a new research effort was concentrated on the relation between attention and sensory modalities (e.g. Spence & Driver, 1996; Ward, 1994). Different issues, previously neglected, gained interest within this multi-sensory attentional perspective. For example, an important question to address was how the brain organizes inputs from senses having different spatial organisation (audition is first tonotopic then head-centred; touch is somatotopic; vision is retinotopic). Crucial for the aim of the present study was the issue of whether attention could be directed in space across different modalities. As a general method, crossmodal links in spatial attention have been studied, and documented, by presenting a cue in one modality and the target in another modality (Spence & Driver, 1996; Ward, 1994). Typically, results show that, for both exogenous and endogenous orienting, a spatially localized stimulus in a given modality usually elicits a shift of covert attention also in other modalities (Driver & Spence, 2004; McDonald, Teder-Sälejärvi, Heraldez, & Hillyard, 2001; Spence, Pavani, & Driver, 2000; Ward, McDonald, & Lin, 2000).

Crossmodal attention studies to date seem to have investigated only spatial links between modalities (but see Turatto, Benso, Galfano, & Umiltà, 2002; Turatto, Galfano, Bridgeman, & Umiltà, 2004), without exploring whether such crossmodal links might also take place at an “object-based” level. The lack of studies exploring this possibility is likely due to the implicit assumption that only visible units can be referred to as “objects”. However, in accordance with Bregman (1990) and with Kubovy and Van Vanlkenburg (2001), it would seem that the notion of object can be extended to audition, and possibly to touch. Here we provide evidence that auditory objects can affect the deployment of visual attention, thus revealing possible crossmodal links at an object-based level.

## 1. Experiment 1

We adapted the original experimental paradigm devised by Egly et al. (1994) to create two auditory objects, separated along the horizontal axis. They were obtained by playing a tone from the left pair of loudspeakers, one above and one below fixation, and a different tone from

Download English Version:

<https://daneshyari.com/en/article/10458101>

Download Persian Version:

<https://daneshyari.com/article/10458101>

[Daneshyari.com](https://daneshyari.com)