

Surface Features Do Not Guide Object Continuity for Objects in Motion

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The correspondence problem

The world we perceive is stable and continuous, despite **disruptions in the visual information** resulting from movements of the observer, movements of objects, brief occlusion, saccades and blinks.

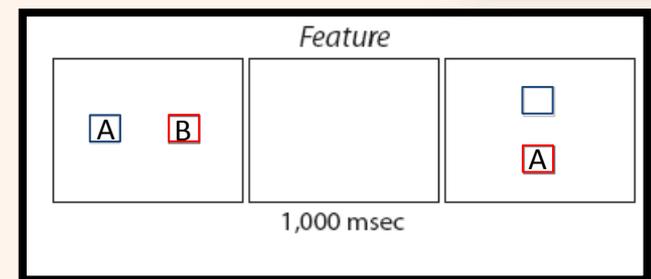
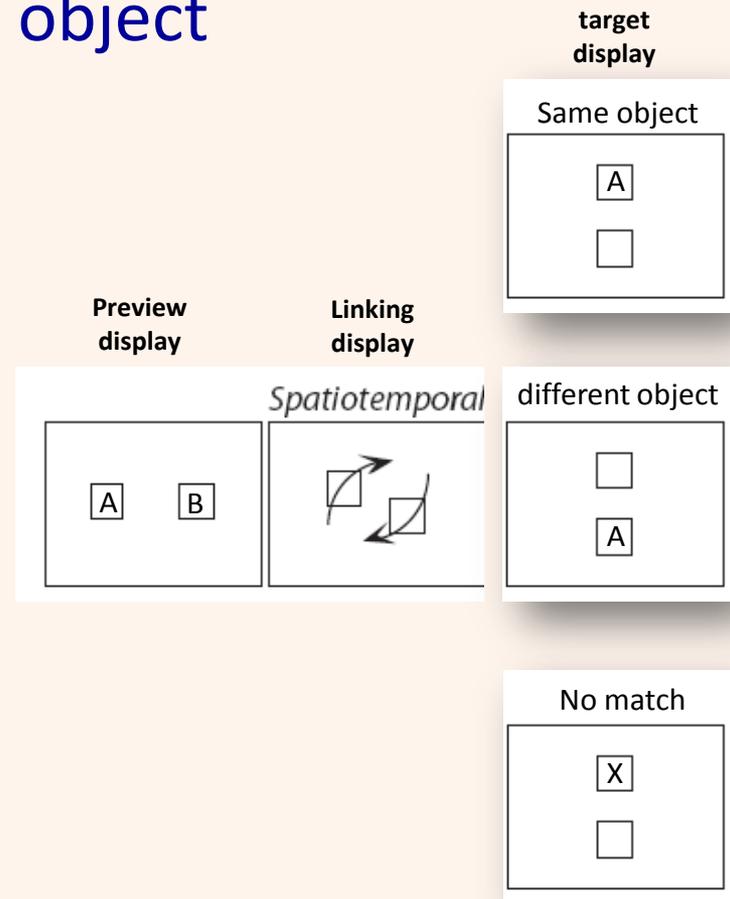
How does the visual system establish correspondence between objects visible before and after the disruption?

- Object correspondence is based only on the spatiotemporal properties of an object

- Kahneman, Treisman & Gibbs, 1992 (object file framework)
- Object-reviewing paradigm (Kahneman et al., 1992)

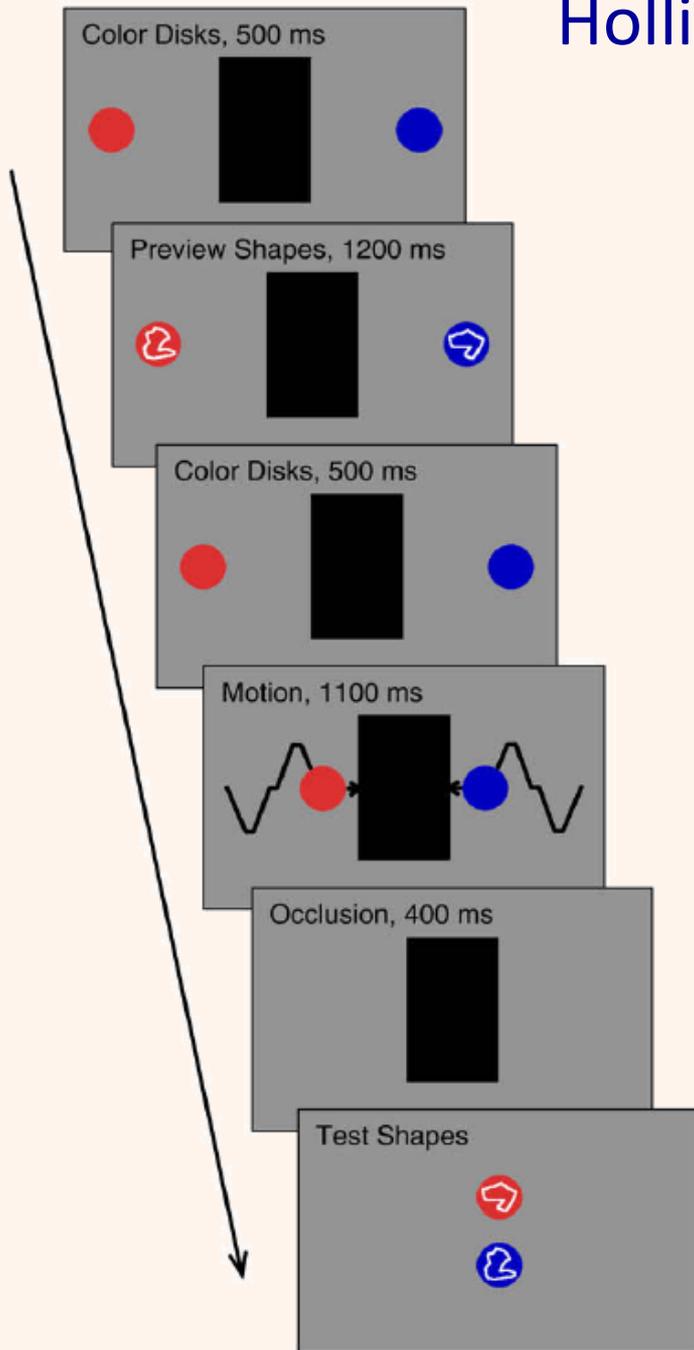
➤ object-specific preview benefit (**OSP**): a standard index of object continuity

- Mitroff & Alvarez (2007); Flombaum, Scholl, & Santos (2009)



- Other studies suggested that surface features can also guide object correspondence, at least when there is no salient spatiotemporal discontinuity that is in direct conflict with an interpretation of object continuity (e.g., Hollingworth & Franconeri, 2009; Richard et al., 2008).
- We therefore suggested that surface features congruency effects could emerge with the object-reviewing paradigm when spatiotemporal information is ambiguous but does not necessarily conflict with an interpretation of object continuity, as for example, when an object changes its trajectory while briefly occluded.

Hollingworth and Franconeri (2009)



- results showed an OSPB effect based on color congruency
- They used more difficult task (two targets) and complex stimuli (complex novel shapes)
- alternative interpretation for the results: color congruency effects emerged from the strategy observers adopted to solve the task.
- Moore, Stephens and Hein, 2010

Our study examined whether surface features can be used to establish object correspondence when spatiotemporal information is ambiguous (induced by unpredictable change in an object's trajectory under brief occlusion), using the object-reviewing paradigm and controlling for task demands.

Spatiotemporal
congruency

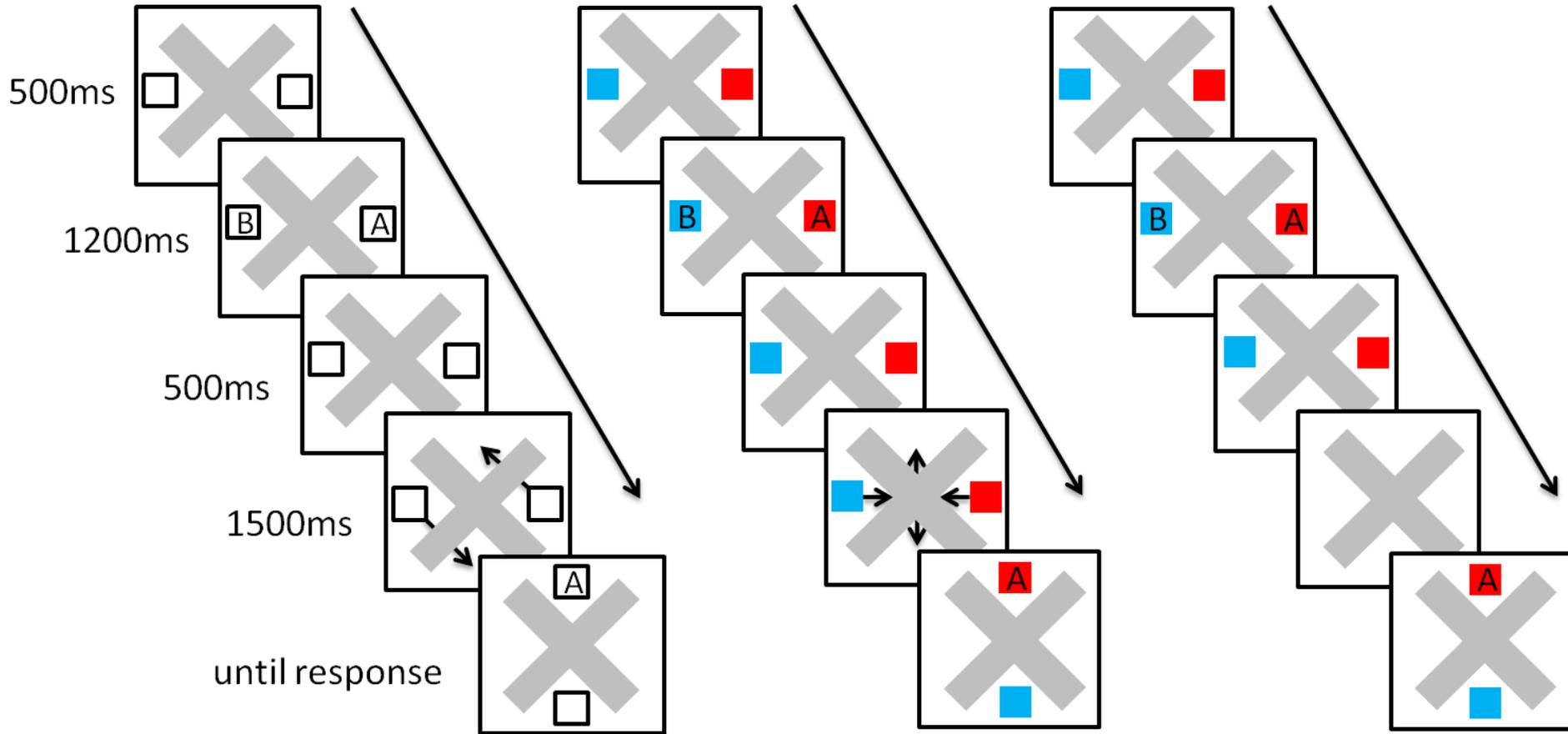
spatiotemporal
ambiguity

spatiotemporal
discontinuity

A

B

C

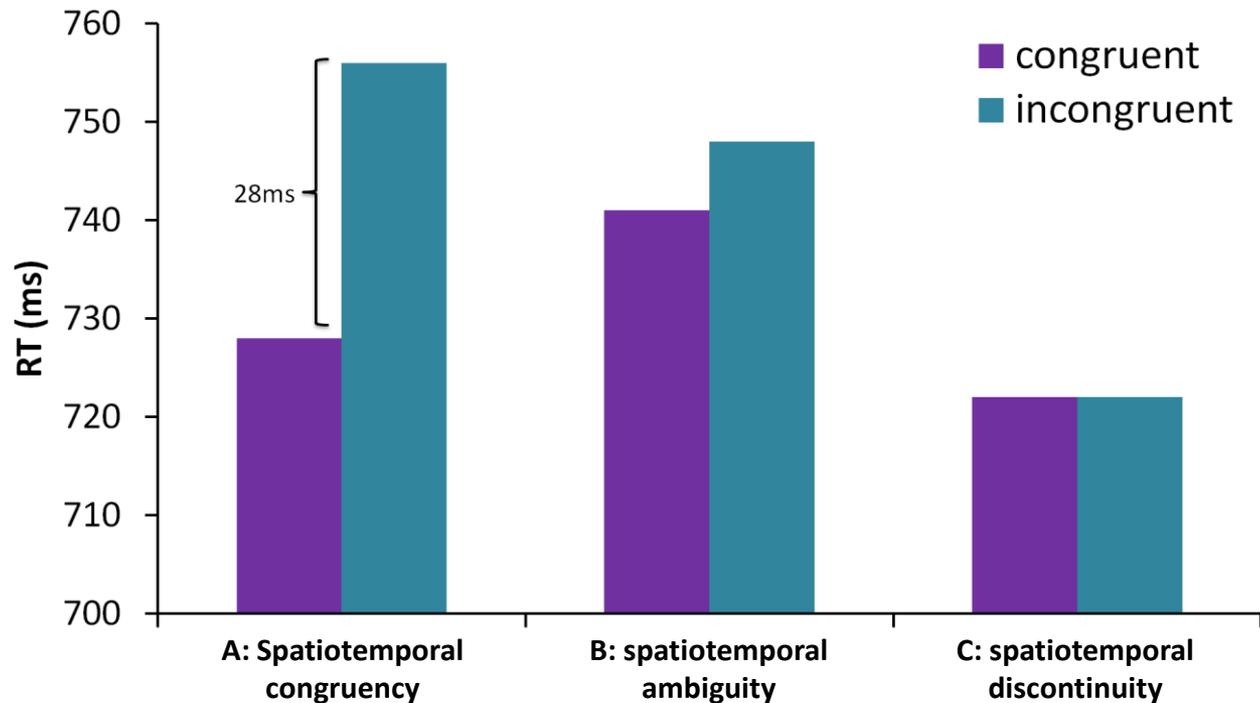


Experiment demonstration

- If object correspondence can be established on the basis of the available information, be it spatiotemporal or surface features, as long as there is no strong evidence against object continuity, then OPSB is expected to be observed in condition A and B, based on spatiotemporal congruency in A and on color congruency in B.
- If, however, object correspondence is determined solely by spatiotemporal properties, OSPB is expected to be found only in A (spatiotemporal congruency).
- OSPB effect is not expected to be found in condition C (spatiotemporal discontinuity), for spatiotemporal information is in conflict with an interpretation of object continuity.

Results

Measure: Object-specific preview benefit (OSPB)
RT(Incongruent)-RT(Congruent)



- OSPB was found only in Experiment 1 ($t(11) = 2.24, p < .05$): Object continuity was not disrupted by occlusion as long as the object followed consistent trajectory.
- No OSPB was observed in Experiments 2 (spatiotemporal ambiguity) and 3 (spatiotemporal discontinuity).

Conclusion

- Our results suggest that spatiotemporal information is crucial for establishing object correspondence (e.g., Kahneman et al., 1992), and that surface features cannot be used to establish object correspondence not only when there is salient spatiotemporal discontinuity (e.g., Mitroff & Alvarez, 2007), but also not when spatiotemporal information is ambiguous.

Thank you