

# Distractor Suppression in Visual Search

Alex Muhl-Richardson, Sergio Andrés Recio & Greg Davis

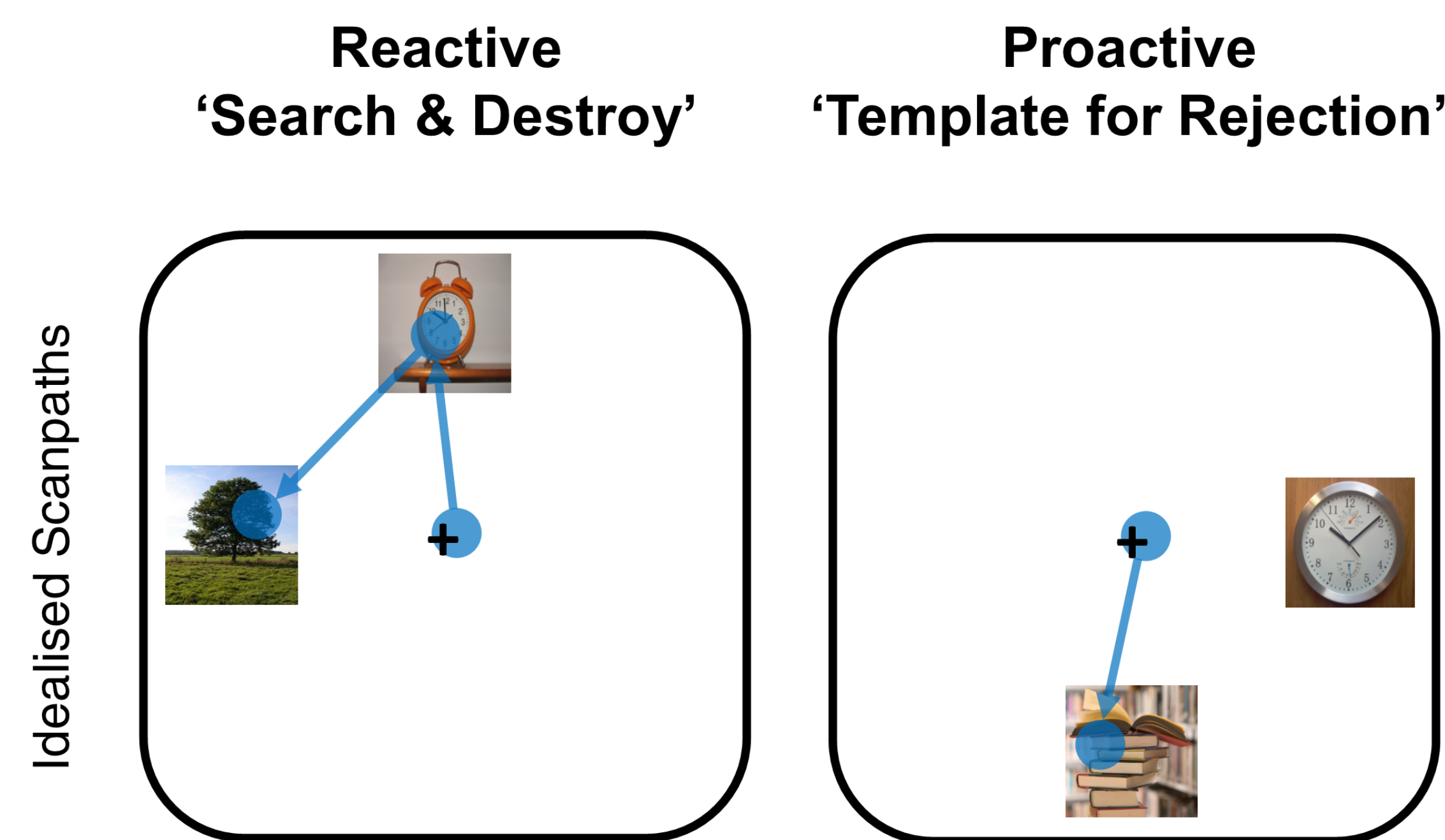
Department of Psychology, University of Cambridge

Contact: am2662@cam.ac.uk

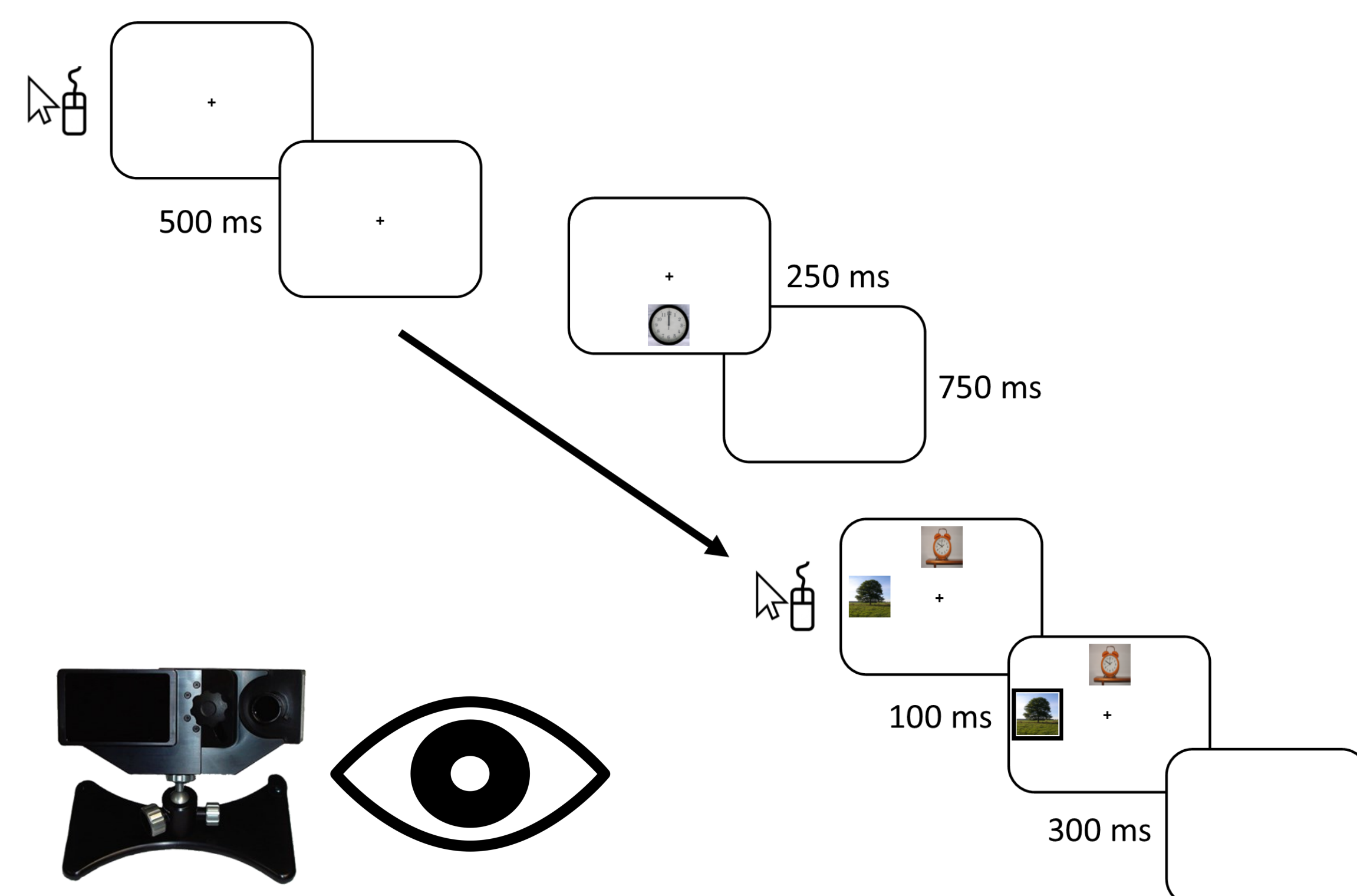
## Background

- Target templates specify visual features that guide attention towards targets during search; distractor templates are similar but facilitate the suppression and rejection of distractors.
- Distractor suppression can be reactive (search and destroy [SaD]; Moher & Egeth, 2010) or proactive (templates for rejection; Daffron & Davis, 2015; Geng, 2014).
- Previous studies have not examined the function of distractor templates in isolation (ensuring that a target template cannot be extrapolated).

## Method



- We used a simple visual search task with photographic stimuli to allow the specification of broad distractor categories with novel unspecified targets.
- In a series of experiments we recorded participants' eye movements after instructing them to either **reactively find non-targets** before responding to the target OR **proactively ignore non-targets** and respond to targets directly.

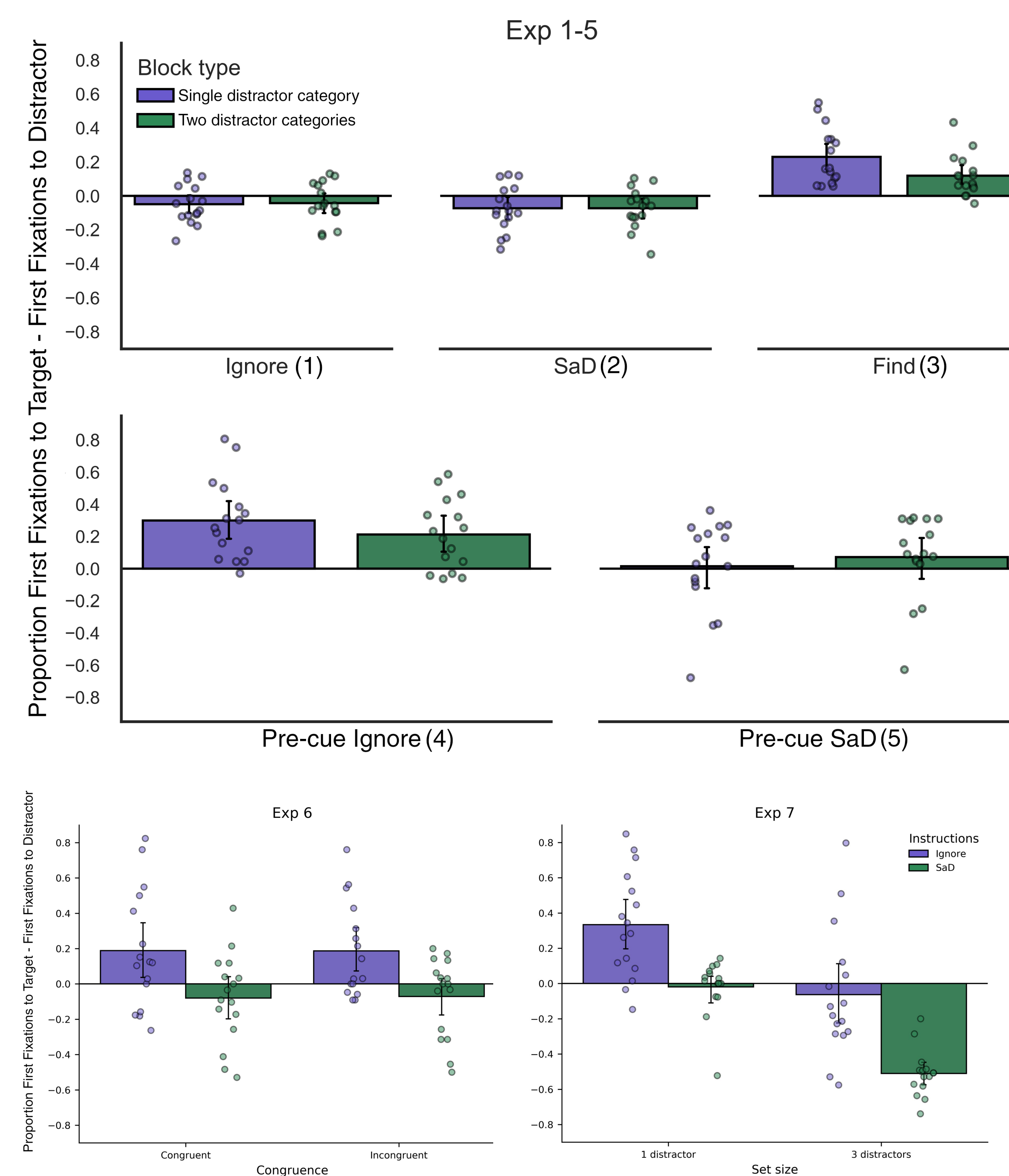


## Method (continued)

Exp.	Instruction	Pre-cue	Set size	N
1	Ignore	-	2	16
2	SaD	-	2	16
3	Find	-	2	16
4	Ignore	Distractor congruent	2	16
5	SaD	Distractor congruent	2	16
6	Ignore/SaD*	Distractor congruent/incongruent (blocked)*	2	16
7	Ignore/SaD†	Distractor congruent	2/4*	32
8	Ignore	No (SOA/fixation cross during interval)*	2	16
9	Ignore	Distractor congruent/incongruent (interleaved)*	2	16
10	Ignore	Simple colour	2	16

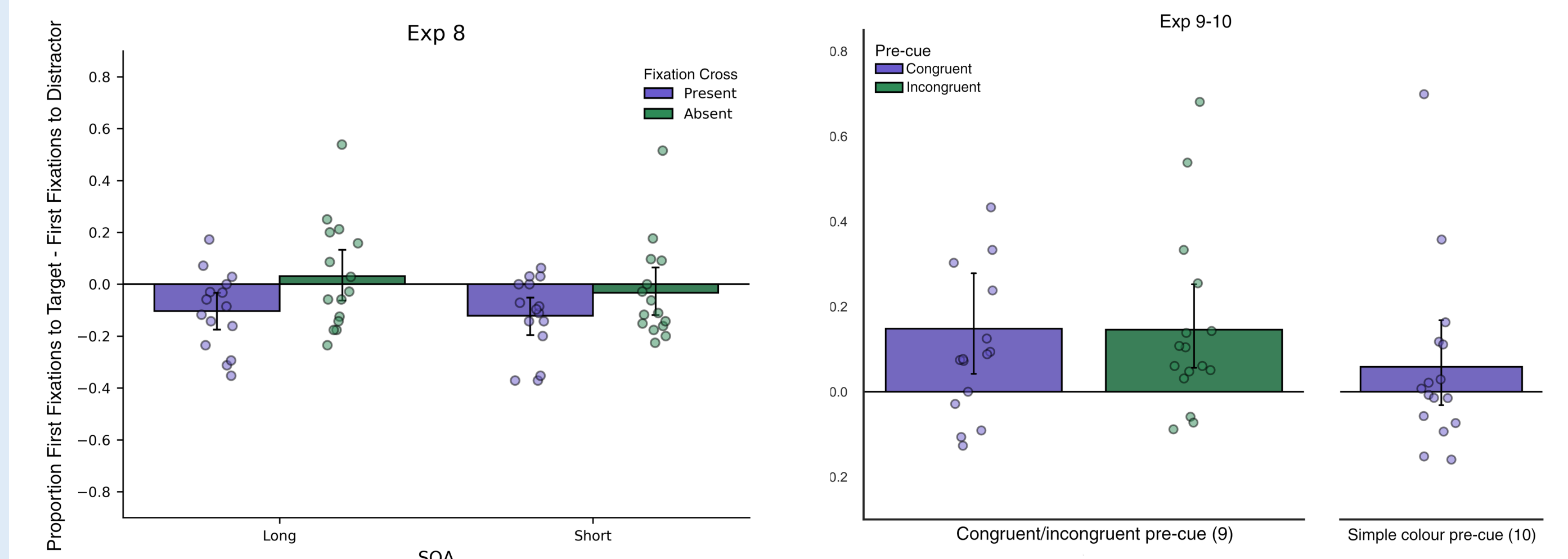
Note: \* = manipulated within-subjects, † = manipulated between-subjects

## Results



## Results (continued)

- In **exps. 1 and 2** a greater proportion of first fixations were to distractors,  $F(1,15) \geq 4.65$ ,  $ps \leq .048$ ,  $\eta^2 \geq 0.24$ ; in **exp. 3** a greater proportion of first fixations were to targets,  $F(1,15) = 33.93$ ,  $p < .001$ ,  $\eta^2 = 0.69$ .
- In **exp. 4** a greater proportion of first fixations were to targets,  $F(1,15) = 12.60$ ,  $p < .001$ ,  $\eta^2 = 0.56$ ; in **exp. 5** there was no effect  $F(1,15) = 0.37$ ,  $p = .550$ .
- In **exp. 6** there was a significant interaction of instruction and first fixation location,  $F(1,15) = 4.99$ ,  $p = .041$ ,  $\eta^2 = 0.25$ ; in **exp. 7** the same interaction was present,  $F(1,30) = 18.12$ ,  $p < .001$ ,  $\eta^2 = 0.38$ .
- In **exp. 8** there was interaction between SOA and first fixation location,  $F(1,15) = 1.41$ ,  $p = .253$ , but the presence of the fixation cross during the interval did interact with first fixation location,  $F(1,15) = 10.03$ ,  $p = .006$ ,  $\eta^2 = 0.41$ .
- In **exp. 9** a greater proportion of first fixations were to targets,  $F(1,15) = 6.11$ ,  $p = .026$ ,  $\eta^2 = 0.29$ ; in **exp. 10** there was no effect,  $t(15) = 1.11$ ,  $p = .285$ .



## Discussion

- We examined visual search in the absence of any kind of target template.
- The location of the first fixation participants made after the onset of the search array was used as an indicator of their distractor suppression strategy.
- Participants initially failed to show reliable early guidance to targets or distractors.
- However, when instructions to ignore were combined with a pre-cue of any photographic stimulus, there was a reliable tendency to first fixate targets.
- This pattern of first fixations is consistent with a proactive, template for rejection, approach to distractor suppression when searching without a target template.
- We speculate that the pre-cue may generate a shift in attentional weighting that facilitates proactive suppression of distractors.
- This work has implications for applied search tasks and we are currently running a series of experiments examining distractor suppression in X-ray baggage search.

## References

Daffron, J. L., & Davis, G. (2015). Templates for rejection can specify semantic properties of nontargets in natural scenes. *Journal of Vision*, 15(15), 16. <http://doi.org/10.1167/15.15.16>

Geng, J. J. (2014). Attentional Mechanisms of Distractor Suppression. *Current Directions in Psychological Science*, 23(2), 147–153. <http://doi.org/10.1177/0963721414525780>

Moher, J., & Egeth, H. E. (2010). Search and destroy: Observers use an inefficient explicit feature-based inhibition strategy in visual search. *Object Perception, Attention and Memory (OPAM) 2010 Conference Report 18th Annual Meeting*, 1529-1532.