Perceptual Depth Modulates Gaze Cueing: Evidence from the Ponzo Illusion

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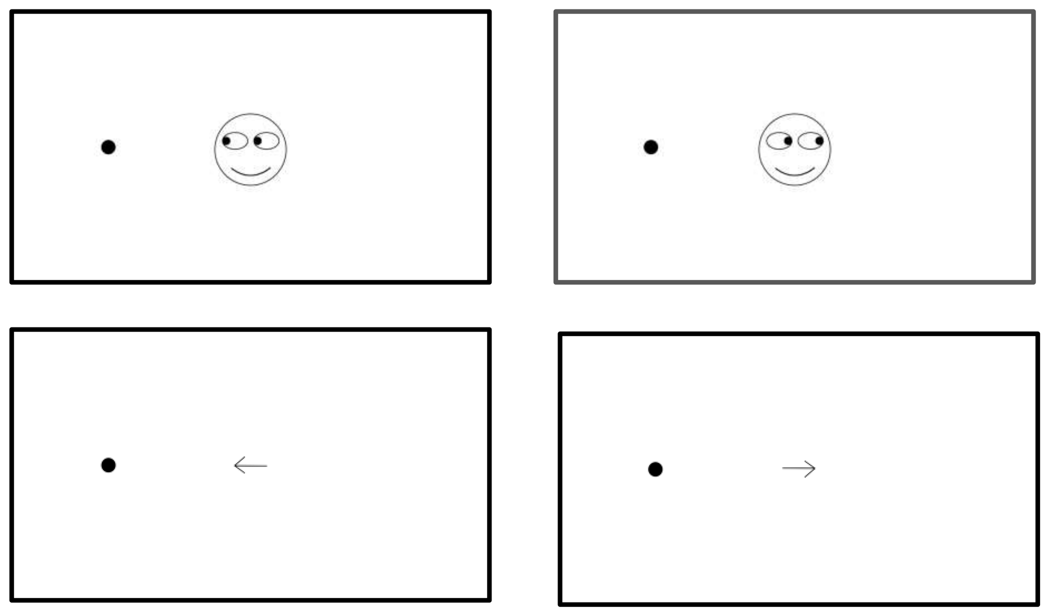
Introduction

In standard gaze-cueing studies, a variety of stimuli can serve to direct attention around the visual world. Despite this variety, the size of the cueing effect across is often comparable across stimuli (Freisen & Kingstone, 1998; Pratt & Hommel, 2003).

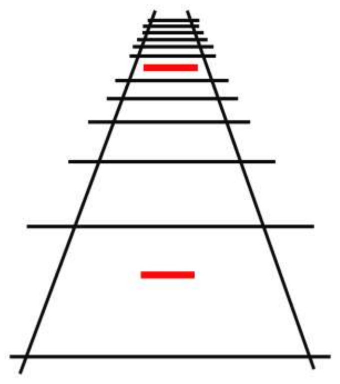


However, recent evidence suggests that faces and arrow may direct attention in qualitatively different manners. Specifically, faces direct attention to locations in the visual field while arrows direct attention to objects (Chacon-Candia et al., 2023; Marotta et al., 2012; 2018; Rafailova et al., 2026).

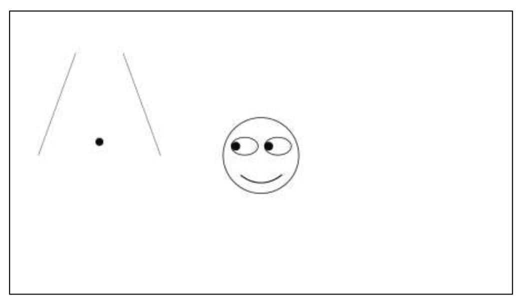
We extend this work by asking whether perceptual depth cues will modulate gaze cueing and whether this effect will be larger for arrow compared to face cues.

Manipulating Perceptual Depth

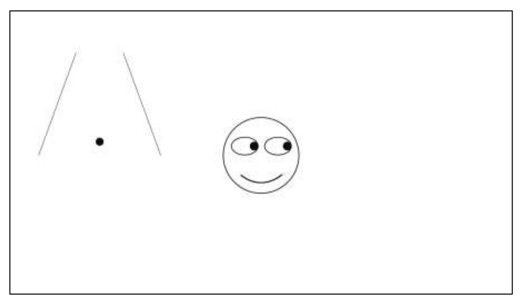
Inspired by the Ponzo Illusion, we attempted to manipulate perceptual depth by placing targets at different locations within two converging lines.



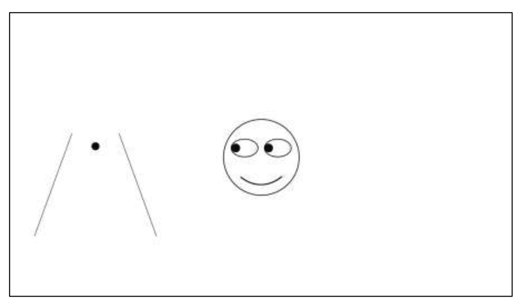
Near Congruent



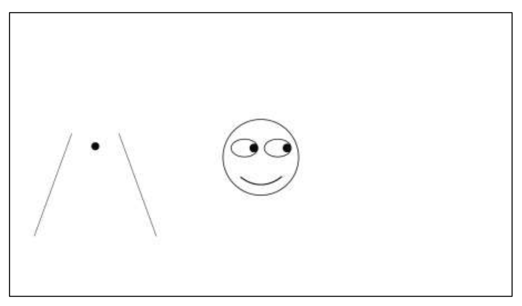
Near Incongruent



Far Congruent



Far Incongruent

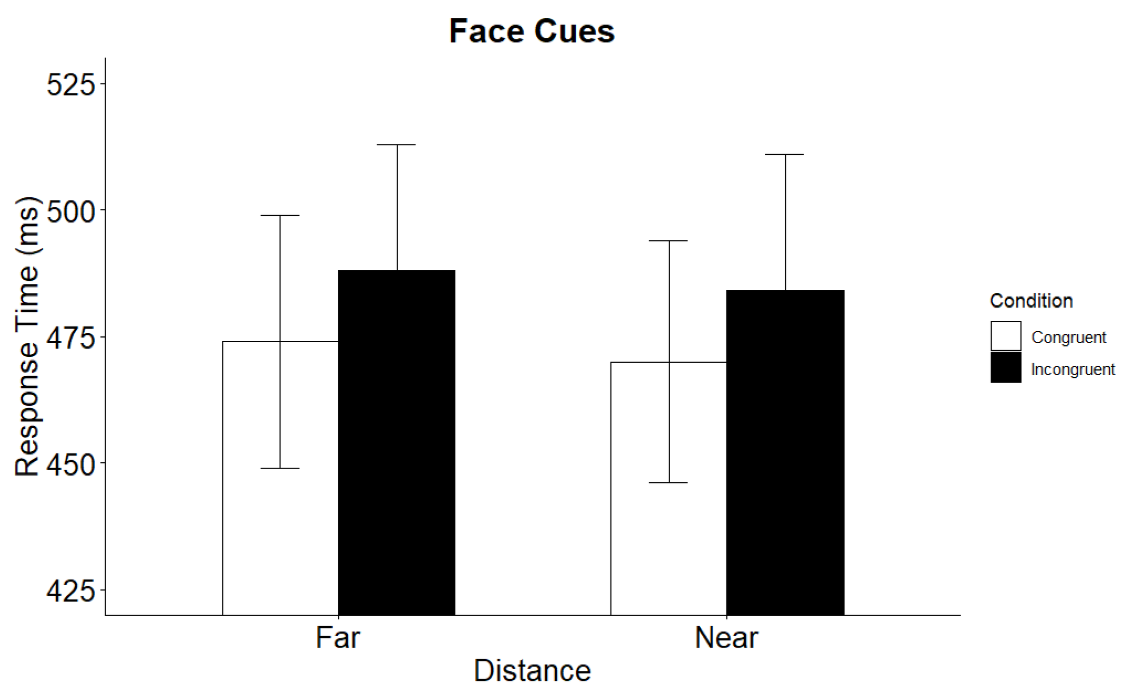


We predicted that participants would be faster to respond to near targets than to far targets and that this effect would be larger when they were cued by arrows compared to when they were cued by faces.

Exp 1

32 participants (age range 24-47 years) were recruited from Prolific™. Participants completed 256 experiment trials (128 face cue and 128 arrow). Cue type (faces, arrow) a varied randomly on a trial by trial basis.

For arrow cues, there was also a significant effect of condition $F(1, 27) = 10.824$, $p = 0.003$, $\eta_p^2 = 0.286$. RTs were faster for congruent compared to incongruent trials. In addition, there was a significant effect of distance, $F(1, 27) = 5.109$, $p = 0.032$, $\eta_p^2 = 0.159$. RTs were faster to far targets compared to near targets. Condition and distance did not interact.



For face cues, only the main effect of condition reached significance, $F(1,27) = 5.850$, $p = 0.023$, $\eta_p^2 = 0.178$. RTs were faster for congruent compared to incongruent trials. In contrast to what we found with arrows, there was no main effect of condition, and distance and condition did not interact.

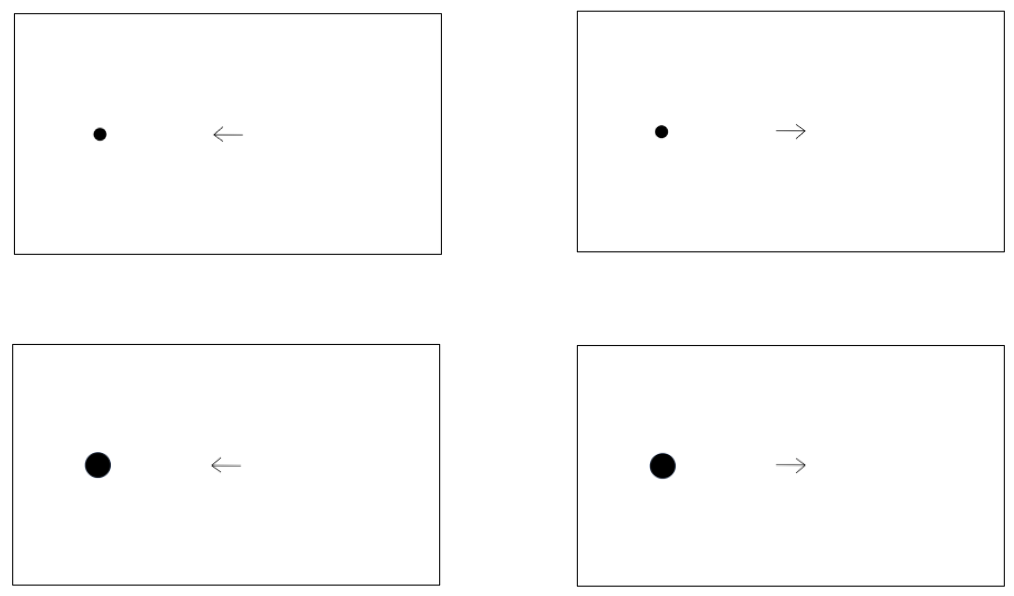
Why are participants faster on far trials?

We replicate and extend previous studies that found arrows and faces direct attention in qualitatively different ways (Chacon-Candia et al., 2023; Rafailova et al, 2026). In contrast to our predictions, participants were faster to respond to far compared to near targets.

One possibility is that far targets were actually perceived as larger since they were the same retinal size as near targets but appeared at a distance. We investigated this in Experiment 2

Exp 2

36 participants (age range 18-40 years) were recruited from Prolific™ and performed a gaze-cueing task in which the targets were small or large.



Surprisingly, only the main effect of condition was significant, $F(1, 35) = 28.15$, $p < .001$, $\eta_p^2 = 0.286$. The size of the target did not modulate RT, $F(1,35) = 1.505$, $p = 0.228$, $\eta_p^2 = 0.041$. Participants were similarly fast at responding to small and large targets. Thus, faster RTs for far targets in experiment 1 are unlikely due to changes in the perceptual size of the target.

					95% Confidence Interval	
CueType	Condition	Size	Mean	SE	Lower	Upper
Arrow	Congruent	Small	402	12.4	377	428
		Large	410	14.1	381	438
	Incongruent	Small	423	14.9	393	454
		Large	426	13.9	398	454
Face	Congruent	Small	407	14.7	377	437
		Large	408	14.8	378	438
	Incongruent	Small	417	15.2	386	448
		Large	418	14.1	390	447

Conclusions

We replicated and extended previous studies which demonstrated qualitatively different attentional mechanisms for face and arrow cues. Here we found that perceptual depth cues influenced performance when the cues were arrows but not faces.

Interestingly, this effect was in the opposite direction of what we expected. We are conducting additional experiments to more fully understand the role perceptual depth plays in gaze cueing.

References

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