

DOES ATTENTION AFFECT PERCEPTUAL SENSITIVITY?

The influence of visual attention on perceptual quality is difficult to demonstrate. Work by Carrasco and colleagues has reported improvement in contrast sensitivity for cued stimuli, e.g. in (Pestilli and Carrasco, 2005). However there is a concern that such perceptual judgment tasks may be confounded with response bias (Schneider and Komlos, 2008). Here we use a new matching task to investigate the effect of an exogenous cue on accuracy of orientation judgments.

GENERAL METHOD

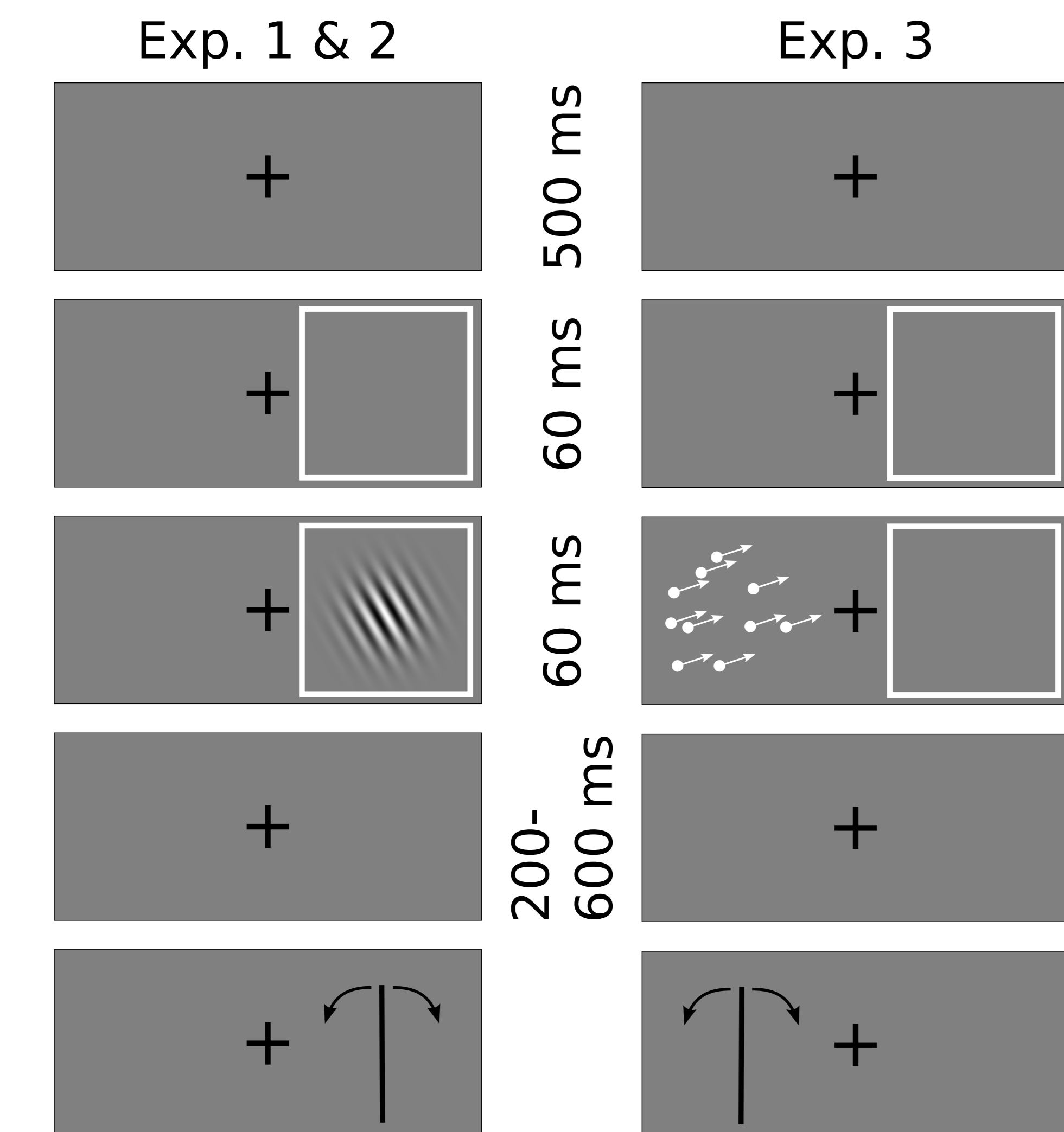


Figure 1: Procedure details: Each experiment involved a separate cohort of 20 subjects. Each subject performed 750 trials. The exogenous cue was non-predictive and preceded a randomly-rotated stimulus – a gabor patch or a coherent dot-motion circle. Participants used the keyboard to rotate a response line from vertical to match the stimulus orientation/direction. Auditory feedback was given. Participants were instructed to focus on accuracy. All statistics were computed using medians.

EXPERIMENT 1: VALIDLY CUED GABORS ARE JUDGED MORE ACCURATELY

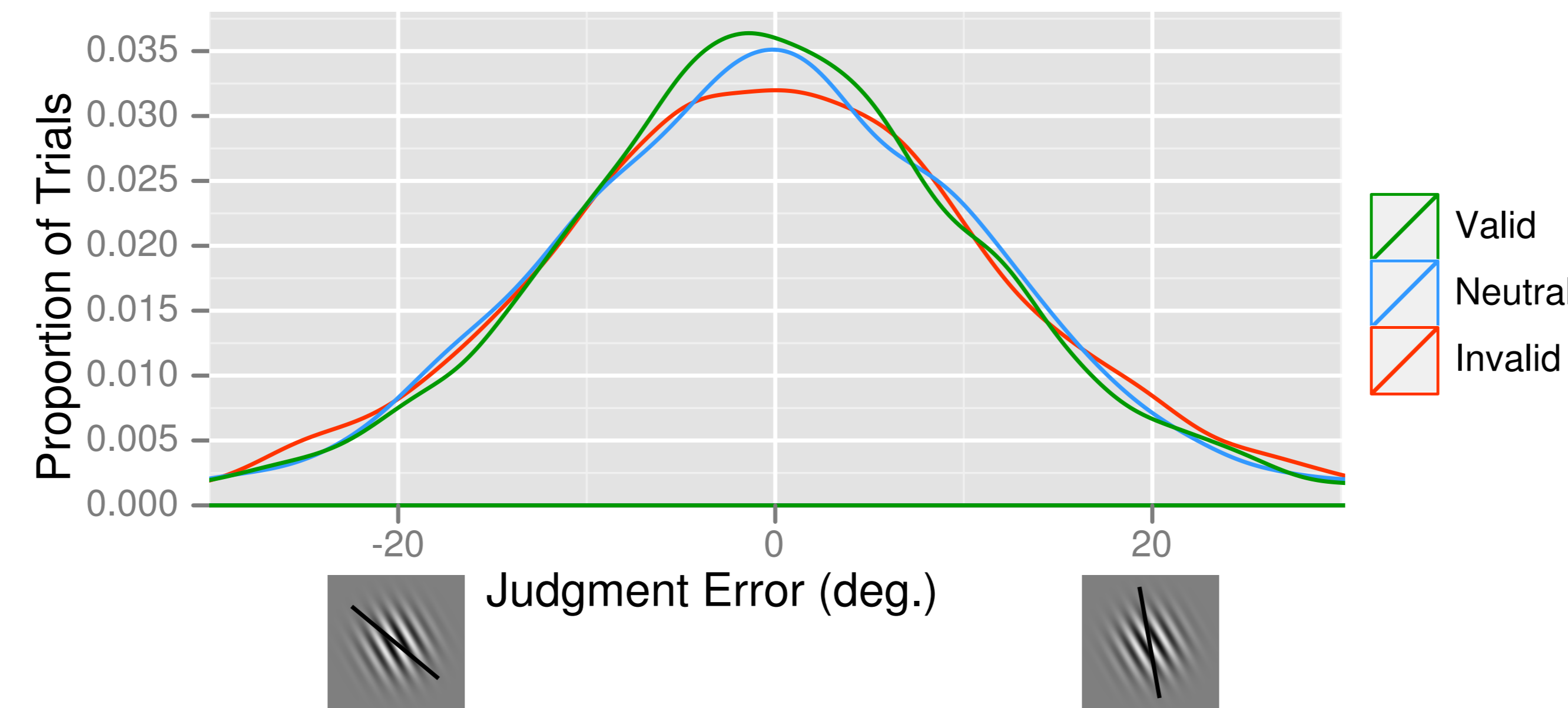


Figure 2: Gabor orientation accuracy was affected by cuing (ANOVA; $F(2,38)=4.3$, $p=.02$). Specifically, validly cued trials are reported more accurately than invalidly cued trials (Tukey's HSD, $p=.01$). The same pattern was seen for reaction time ($F(2,38)=20.6$, $p<.001$; HSD, $p<.001$).

EXPERIMENT 1: CUING BENEFIT IS SEEN FOR INDIVIDUALS

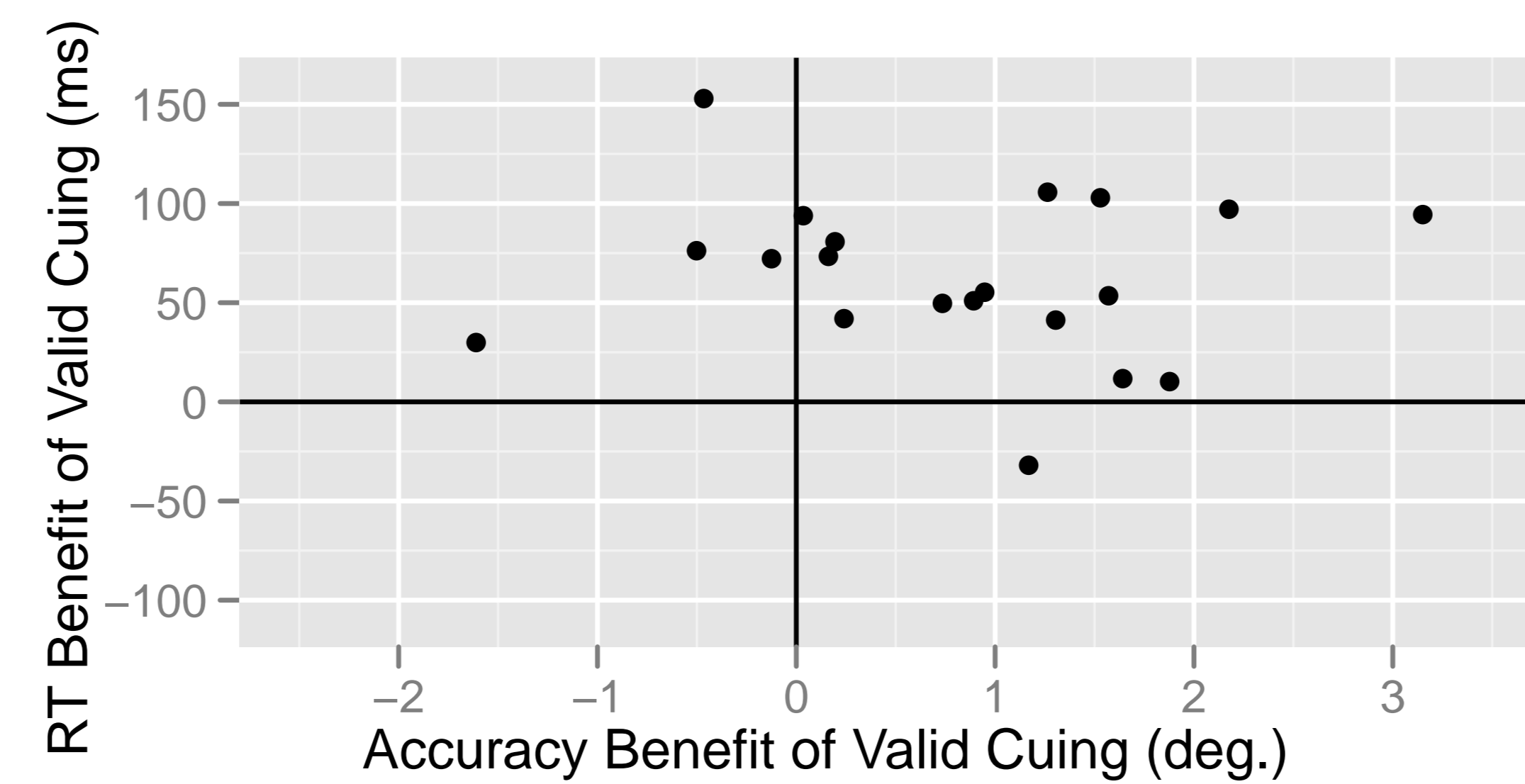


Figure 3: Most participants are faster and more accurate after valid cues. Points show individual differences in accuracy and RT between valid and invalid trials.

EXPERIMENT 2: BETTER PERCEPTION, NOT DIFFERENT DECAY RATES

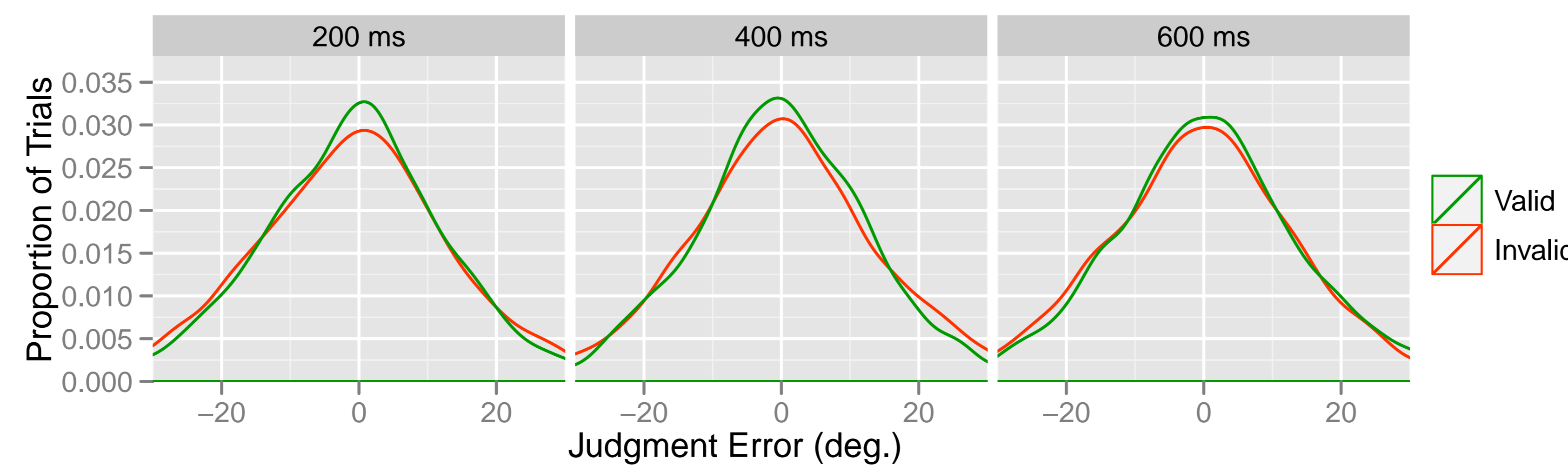


Figure 4: Cue validity by response delay: Is the cue validity effect in Experiment 1 explained by a better percept or slower perceptual decay? Experiment 2 used three delays before participants could respond. We replicated the validity effects for accuracy ($F(1,19)=9.8$, $p<.01$) and RT ($F(1,19)=18.9$, $p<.001$), but found no effect of delay overall on accuracy and no change in the validity effect at different delays ($F<1$).

EXPERIMENT 3: DOT-MOTION JUDGMENTS ARE LESS AFFECTED BY EXOGENOUS CUING

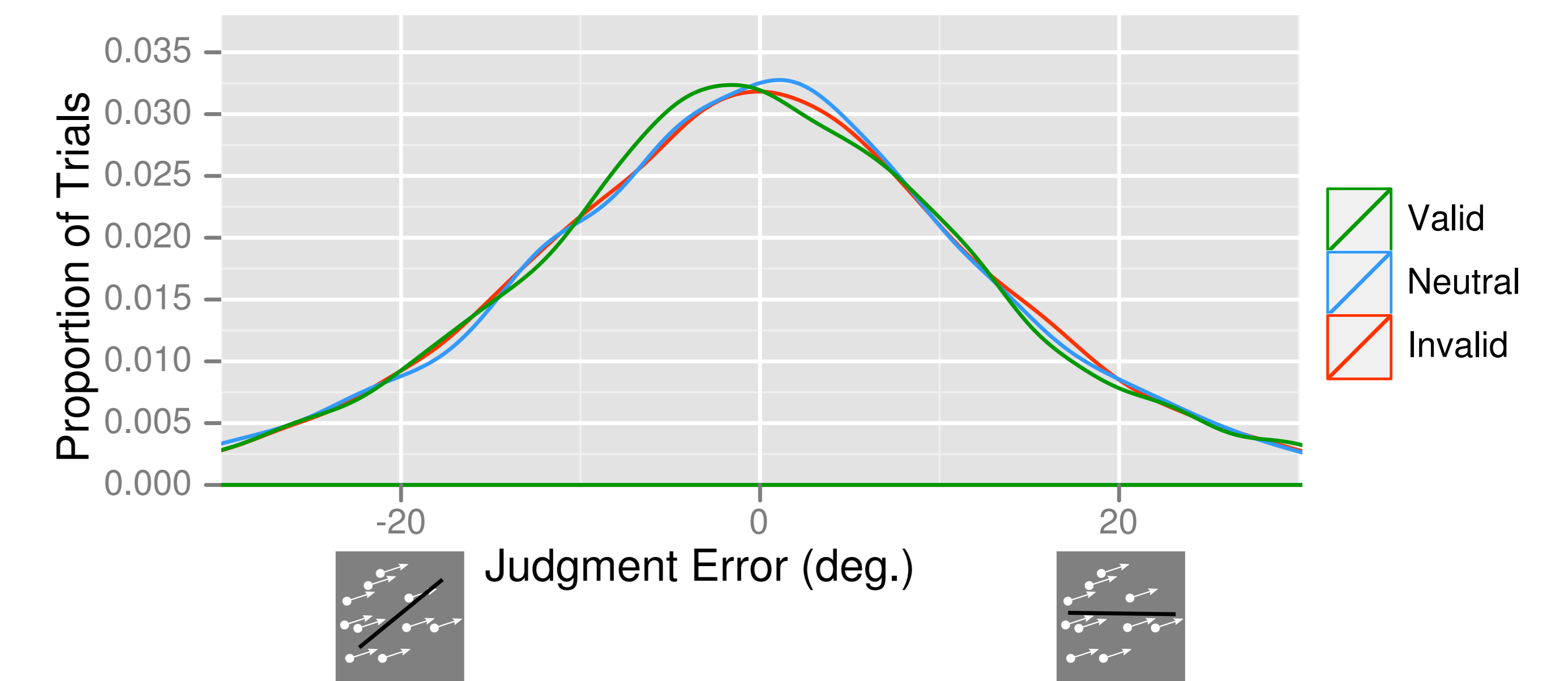


Figure 5: Diminished cue validity effects: Motion judgment and static orientation judgment rely on different visual pathways. We tested whether cuing benefited judgments of the direction of coherent dot motion. There was no effect of cue validity on accuracy ($F(2,38)=1.1$, $p>0.1$). There was an effect of validity on RT ($F(2,38)=20.9$, $p<.001$). Overall, accuracy matched Experiment 1.

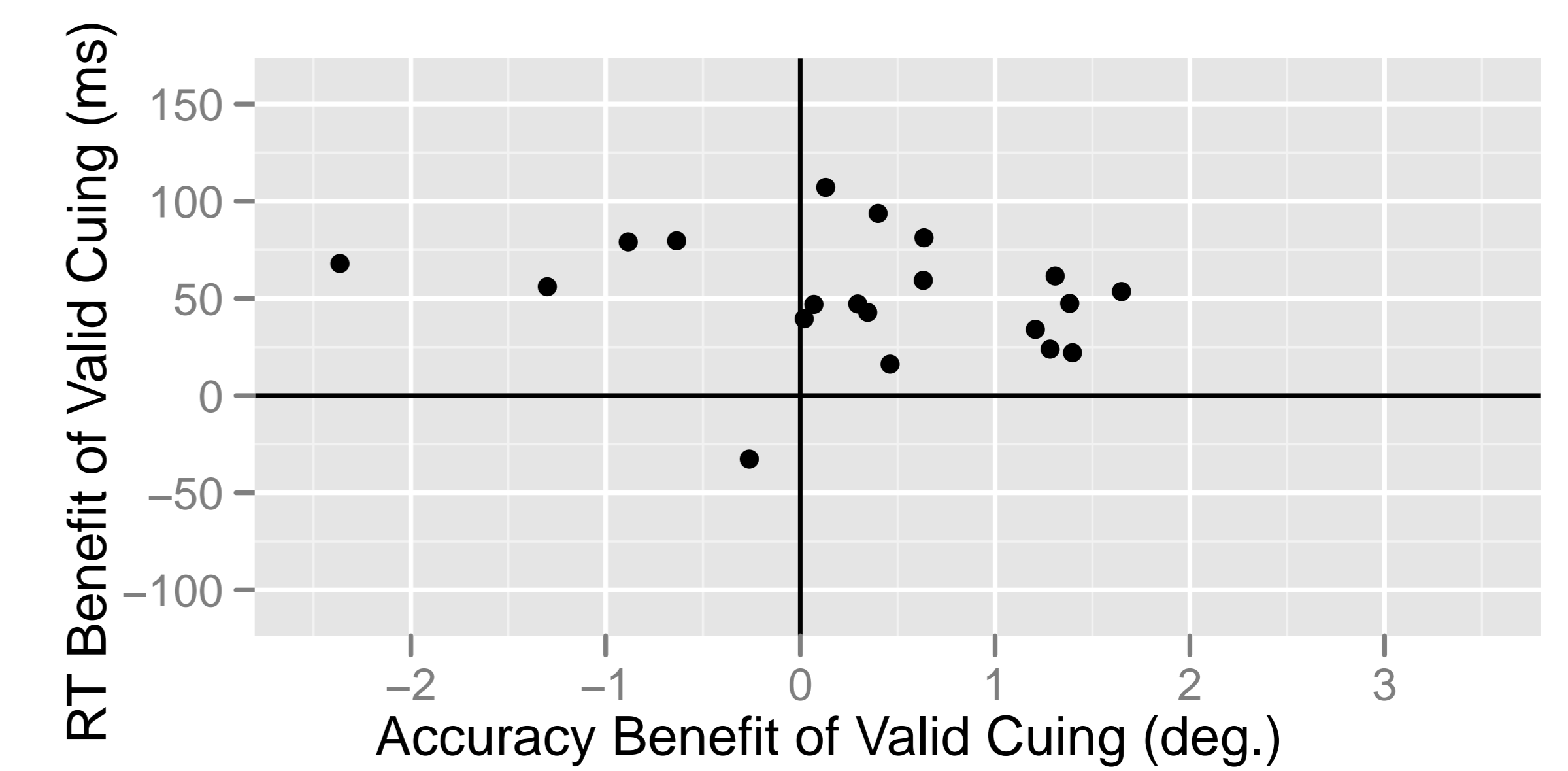


Figure 6: Most participants benefit from cuing. Though the ANOVA was non-significant, 15 out of the 20 participants are faster and more accurate on valid trials (the same proportion as in Experiment 1).

Conclusions:

- ▶ Attentional cues can improve perceptual quality.
- ▶ The attention-perception link may differ for static vs. dynamic stimuli.
- ▶ Effects are likely due to a better initial percept.
- ▶ An orientation matching task provides a powerful way to measure factors that affect perceptual quality.

Bibliography:

- Pestilli, F. and Carrasco, M. (2005). Attention enhances contrast sensitivity at cued and impairs it at uncued locations. *Vision Research*, 45:1867–1875.
- Schneider, K. A. and Komlos, M. (2008). Attention biases decisions but does not alter appearance. *Journal of Vision*, 8(15):3, 1–10.